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Baku-Tbilisi-Ceyhan
Crude Oil Pipeline:
Turkey

September 2002

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BOTAŞ

Contents

Background

This document is the Non-Technical Summary (NTS) of the Environmental Impact Assessment (EIA) of the Turkish section of the Baku-Tbilisi-Ceyhan Crude Oil Pipeline Project (BTC Project). In Turkey, the BTC Project comprises 1,076 km of pipeline (and associated facilities) from the Georgian border to the Mediterranean coast and a marine terminal at Ceyhan. The EIA has been carried out in conformance with best international practice. The EIA's main objectives were to ensure that all potential impacts of the BTC Project on the physical, biological and human environment were fully investigated, mitigated where necessary and reported to interested parties.

The findings of the EIA process for the complete BTC Project are presented in three separate Reports, one for each country (Azerbaijan, Georgia and Turkey) that the pipeline crosses. In Azerbaijan and Georgia, the report is termed an ESIA (Environmental and Social Impact Assessment), however all three reports cover both environmental and social issues.

For Turkey, local and international EIA experts have examined all BTC Project activities that have the potential to give rise to environmental and social impacts. The examination was underpinned by extensive studies of baseline aspects and a carefully planned public consultation programme. Close interaction between the EIA and the BTC Project design has enabled the majority of impacts of concern to be designed out of the BTC Project or be reduced to an acceptable level. The BTC Project is committed to further studies, monitoring, careful management and reporting during the construction, commissioning and operation phases.

Benefits to Turkey and the region

The exploitation of the hydrocarbon reserves of the Caspian States of the former Soviet Union is widely recognised as essential for this region's future development and its long-term political and socio-economic stability. Caspian reserves are currently estimated at between 17-33 billion barrels. This compares to proven reserves in the United States of 29 billion barrels and 15 billion barrels in the North Sea[1]. In one field, known as the Azeri, Chirag and Gunashli (ACG), estimated recoverable reserves are 5.2 billion barrels. However, local and regional energy demand within the greater South Caucasus and Central Asia regions is, and is anticipated to remain, insufficient to warrant the level of extraction of petroleum resources necessary to drive this economic uplift. Additional export capacity to wider geographical markets is therefore required to accommodate new production from the ACG field. Limited options already exist for exporting Caspian crude oil, but the capacity and reliability of these fall far short of that required to meet long-term regional objectives.

[1] "BP Statistical Review of World Energy - June 2001"

Introduction

BP is leading the US $2.9 billion Project to design and install a new pipeline. This pipeline will transfer up to 50 million tonnes of crude oil per annum (or one million barrels per day) from Sangachal on the Caspian Sea coast, via Azerbaijan, Georgia and Turkey to the Mediterranean. Crude oil will be supplied to international markets via tankers loaded at a new marine terminal to be located near Ceyhan (Adana Province in the Gulf of Iskenderun) on the Turkish Mediterranean coast. The entire pipeline route, which is 1760 km long, is shown in Figure 1.

Figure 1. Baku-Tbilisi-Ceyhan Crude Oil Pipeline Route

Construction of the pipeline will enable crude oil to be transported more economically and safely and with less environmental risk than if it was to be transported by a combination of pipelines and tankers via the Turkish Straits.

BP is managing the BTC Project on behalf of an international group of companies, herein referred to as the BTC Company (BTC Co) which was formed in July 2002. Funding for the BTC Project will be from a variety of sources including the equity funding of the BTC Co. themselves as well as from international senior lenders, including the International Finance Corporation (IFC) (commercial funding arm of the World Bank Group for the private sector), the European Bank for Reconstruction and Development, Export Credit Agencies, Commercial Banks and Political Risk Providers.

Routing this oil pipeline through Turkey will facilitate the development of an energy corridor between Asia and Europe. Transit and operating fees for the Turkish section of the pipeline are capable of generating up to US $200 million per annum during the first 16 years of operation and up to US $290 million per annum during the following 24 years of operation, depending upon the actual volumes of crude oil transported through the BTC Pipeline. Turkey will benefit from a share of the profits from the proceeds of oil sales by, TPAO (Turkish Petroleum Company), construction and operation of the pipeline by BOTAŞ and through the employment and skills training opportunities for local Turkish people.

BOTAŞ will build the BTC Pipeline and produce the EIA Report under a lump-sum turnkey contract for US $1.4 billion for the BTC Co. The BTC Project represents a major commercial opportunity for Turkish companies, who are expected to conduct the major part of construction.

There are a number of anticipated benefits for settlements situated along the route of the proposed pipeline and in the vicinity of the marine terminal, particularly during the construction period in terms of short-term and, to a lesser extent, long-term employment. In addition, off-set benefits will accrue to the environment and settlements in the vicinity of the pipeline and marine terminal by virtue of the planned community and environmental investment programmes currently under development.

The Project has been developed within a strict legal framework and this is summarised in box 1.

Box 1. Overview of the Legal Framework for the BTC Project

The BTC Project is being implemented within the framework of an Inter-Governmental Agreement (IGA) between the three countries through which the pipeline will pass. This includes unexecuted forms of the three Host Government Agreements (HGA) and with respect to the Republic of Turkey, the Lump-Sum Turnkey Contract and the Treasury Guarantee which together form the binding international and controlling domestic law governing the BTC Project.

Each HGA is also executed by the Governments and BTC Co. as a legally binding contract defining the fiscal and legal regime under which the BTC Project is to be developed. The HGAs clearly demonstrate the requirements of specific environmental and social standards and procedures as well as a broader range of national and international standards and guidelines. The HGAs also define the transit fee regime and the tax framework for the pipeline for the lifetime of the BTC Project and establishes the administrative responsibility of different governments for the BTC Project, in addition to the transit right of way and the security of the pipeline. The HGAs also specify the work that the BTC Participants must undertake, including environmental and social impact assessments. The EIA is one of the most important steps in the permitting process and is a requirement for the implementation of the BTC Project. This EIA has been written to fulfil the requirements of the World Bank Guidelines, EC Directives and Turkish legislation.

As both Turnkey Contractor and Designated Operator, BOTAŞ is responsible during Project implementation and operation respectively for all environmental planning, mitigation, management and monitoring in Turkey. This is an ongoing process and will not stop with the approval of the EIA Report by the Ministry of Environment (MoE). Rather, as Turnkey Contractor and (subsequently) Designated Operator, BOTAŞ is (and will remain) responsible for delivery of all commitments made in the EIA Report and for the development and implementation of the various outline Management and Monitoring Plans presented in the EIA Report (Appendix C) to the satisfaction of BTC Co. and the Turkish regulators.

Project overview

The development of the BTC Pipeline Project is being undertaken by a group of petroleum companies (TPAO, SOCAR, BP, Statoil, Unocal, Itochu, Delta Hess and ENI) currently referred to as the BTC Co. BOTAŞ, the state-owned Turkish Petroleum Pipeline Corporation is responsible for designing, constructing and operating the pipeline, marine terminal and associated facilities in Turkey on behalf of BTC Co.

Introduction

The route of the Turkish section of the BTC Pipeline is between Turkgozu, in Ardahan Province, on the Georgian-Turkish border and Ceyhan in Adana Province on the Mediterranean coast. From the Georgian border to the BTC Marine Terminal Ceyhan, the total length of the Turkish section is approximately 1,076 km. It will cross the provinces of Ardahan, Kars, Erzurum, Erzincan, Gumushane, Sivas, Kayseri, Kahramanmaras, Osmaniye and Adana. The route of the BTC Pipeline and marine terminal location in Turkey are shown in figure 2.

Figure 2. Baku-Tbilisi-Ceyhan Crude Oil Pipeline Route – Turkey section

The BTC Pipeline will be buried along its entire route, except at surface facilities (Above Ground Installations - AGIs). These installations include:

- four pump stations, to transfer the oil along the pipeline, each occupying between 13 and 18 ha of land
- one pressure reduction station, to control the pressure in the last 130 km section of the pipeline, occupying approximately 6 ha
- fifty two block valve stations that will allow sections of pipeline to be isolated for maintenance or in the case of an emergency, approximately 40 m by 40 m in size
- metering stations (at the first pump station and at the BTC Marine Terminal) to measure the quantities of oil entering and leaving the pipeline within Turkey

The four pump stations will be permanently staffed therefore require accommodation facilities. The pipeline will be equipped with a 'leak detection system'. It will be operated continuously and will only be out of service during planned maintenance periods. The pipeline and all facilities have been designed to withstand earthquakes.

The new BTC Marine Terminal will be located on the northern shores of the Gulf of Iskenderun near Ceyhan (see figure 3).

Figure 3. Location of new and existing marine terminal

Introduction

The terminal's principal function will be the storage of crude oil transported along the pipeline prior to its loading onto tankers and export to world markets. Located adjacent to an existing BOTAŞ site, the terminal, will comprise the following facilities:

- equipment to reduce the pressure of oil in the pipeline
- a 'tank farm' of seven oil storage tanks, with associated facilities including a fire station and an electricity substation
- approximately 6 km of loading lines from the tank farm to the end of the jetty
- an export jetty (approximately 2,600 m in length) and associated oil loading facilities
- on-site wastewater treatment plant
- housing compound and general facilities for permanent staff
- a backup system for the monitoring and control of the entire BTC Pipeline system (primary control of the pipeline will be exercised from Sangachal in Azerbaijan)

The general layout of the marine terminal is shown in figure 4. It will occupy an area of approximately 70 ha.

Figure 4. Layout of marine terminal

The overall BTC Project schedule is shown in figure 5.

Figure 5 Schedule to Project Completion

Activity	2002	2003	2004	2005
EIA Disclosure to Public				
EIA Determination by MOE				
EIA Approval				
Mobilisation of Construction Effort				
Pipeline Construction				
Pump Station and Other AGI Construction				
Ceyhan Marine Terminal Construction				
Commissioning				
Issue of Work Completion Certificate and commencement of normal operations				

Environmental, health and safety policies

In addition to meeting international and Turkish standards on environment, health and safety, the BTC Project has been designed to meet the requirements of the BTC Co. on whose behalf it will be constructed and operated. As the organisation responsible for planning, construction and operation of the BTC Project in Turkey, BOTAŞ recognises that it has a responsibility to manage environmental and social issues so that adverse impacts are mitigated and positive benefits are maximised.


Health Safety & Environmental Policy

bp

David Woodward


HS&E Commitment Statement

NO harm to any person

NO damage to Property or the Environment

BOTAŞ Petroleum Pipeline Corporation

EIA process and methodology

This document summarises the EIA, which has been undertaken by the international consulting company, Environmental Resources Management (ERM), together with specialist Turkish partners, Energy and Environmental Investments Inc (ENVY), Veri Arastirma and the Centre for Black Sea and Central Asia Studies (KORA). KORA is established under the auspices of the Middle East Technical University (METU), Ankara.

The main objective of the EIA process to date has been to ensure that all potential impacts of the BTC Project on the physical, biological and human environment are fully investigated, reported and, where necessary, managed. As such, the EIA incorporates both environmental and social assessments.

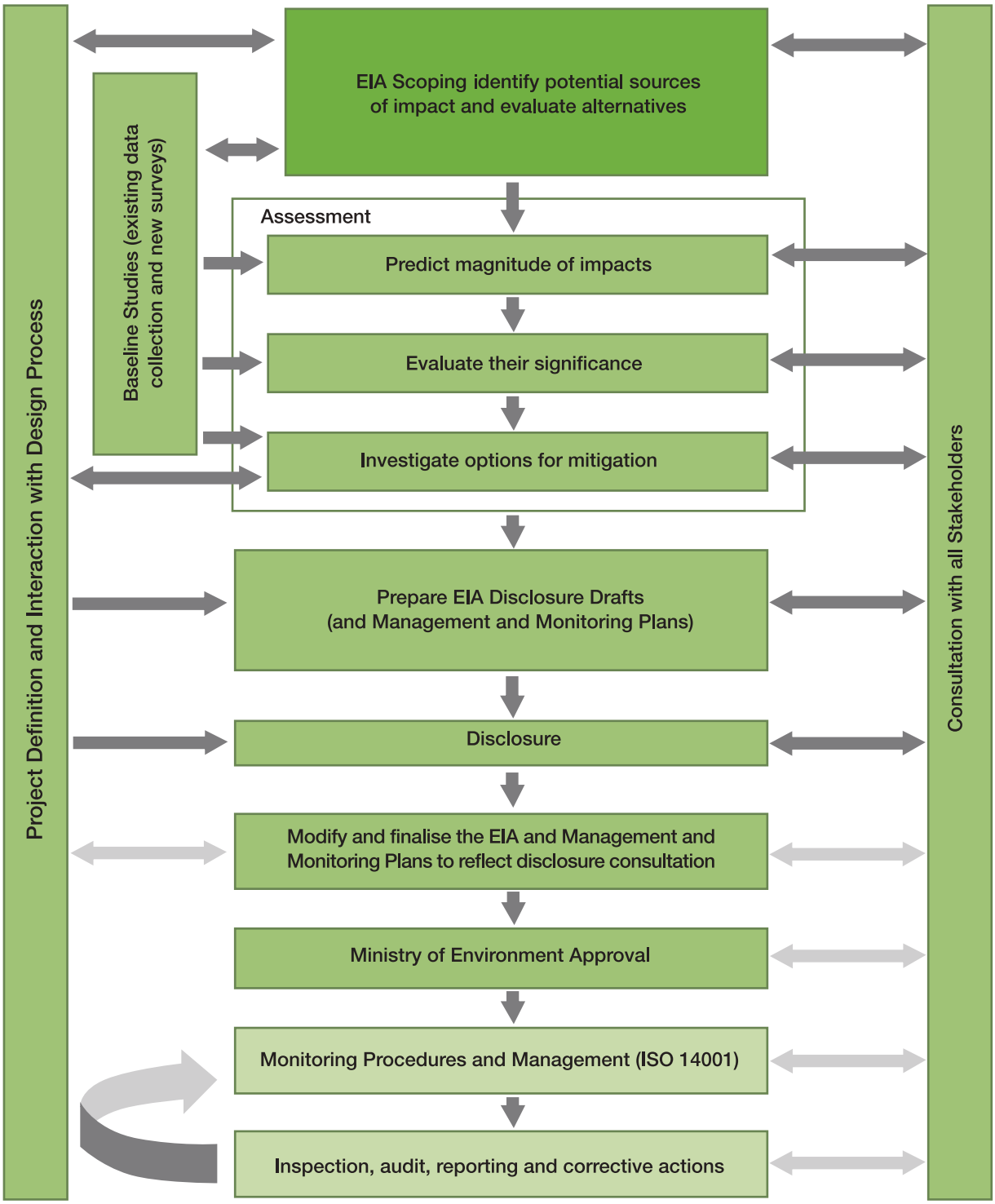
The EIA process formally commenced in summer 2000, when the first corridor options were discussed between BTC Owners and the Turkish government agencies. Since then, the EIA studies have helped to determine the route and the EIA process has applied a range of techniques to identify, predict, evaluate and mitigate the potential impacts associated with the BTC Project (see box 2). These have ranged from stakeholder consultations to systematic field surveys to quantitative modelling of predicted emission levels. For ease of reporting, this process can be presented as a stepped sequence of activities (see figure 6), but, in practice, it is a dynamic and iterative process.

- Impact identification started in scoping and continued throughout the EIA. Essentially it looked at all potential project interactions with environmental and social systems, and with the aid of expert judgement and stakeholder consultation focused on those interactions of most importance for the EIA
- Predicting impacts took into account mitigation measures already contained in project design. For some issues, such as noise and air quality, impacts could be calculated and modelled using computer programmes. For others, such as archaeology and employment, this was not possible. For these, expert judgement and stakeholder consultation had a critical role
- The significance of impacts was evaluated against criteria developed for the BTC Project. These criteria varied, so that for noise clearly established numerical limits set by Turkish law and international standards were used. For other aspects, such as ecology or livelihoods, expert judgement, Turkish and international guidance, and stakeholder consultation all helped set the criteria
- Through mitigation, the BTC Project has sought to reduce negative impacts to as low as reasonably practical, and through enhancement, to maximise benefits and positive impacts. Mitigation focused especially on those impacts evaluated as most significant, and was generally applied in a hierarchical approach

Box 2. Mitigation in the BTC Project was largely applied through a hierarchy whereby:

- **a primary objective was to avoid impacts completely, eg through routing decisions around settlements and archeological features, or adopting a technology that avoided a certain type of emission**
- **if avoidance was not possible, then impacts were reduced at origin, eg through narrowing the Right of Way (strip of land in which pipeline construction activities take place) or minimising wastes**
- **where avoidance or reduction at origin could not be achieved, then the impact was managed on site, eg through erosion control measures, landscaping, protective fencing, and waste management**
- **where none of the above were practical, impacts were managed at the receptor, eg through transplantation of rare flora and fauna, moving beehives away from pipeline construction corridors, and conducting safety awareness training in local schools and settlements**
- **some impacts were completely unavoidable and have required 'repair' mechanisms such as reinstatement of the pipeline corridor**
- **where none of the above were practical, compensation was applied, eg for affected agricultural land users/landowners and fishermen**

Figure 6. Overview of the EIA Process



Introduction

The outcome at the end of the prediction-evaluation-mitigation sequence was a residual impact, ie that which is predicted to remain after mitigation. Sometimes this impact was viewed as either unacceptable or having room for improvement. Further mitigation was then examined or alternative design or routing solutions were developed. In a number of instances, therefore, the sequence was applied in a cyclical manner until a satisfactory outcome was achieved, rather than as a once-through sequence. The impacts discussed and reported in the EIA include both the potential and residual ones, but it is the residual impacts that are pertinent to decision-making.

In addition to the activities outlined above, and Public Consultation described later in this Summary, the EIA included two other important activities:

- EIA - Design interaction: the design engineering and EIA teams have interacted closely throughout the development of the BTC Project, particularly in key areas such as determining the pipeline route, selecting the sites for the marine terminal and AGIs, undertaking environmental risk assessments and developing land reinstatement measures
- Baseline data collection: through desk studies, field surveys and consultation, baseline data collection has been a fundamental EIA activity since the early stages of the BTC Project. Some of the main studies are summarised in box 3 below:

Box 3. Baseline Data Collection

Basic Engineering Phase (and EIA Scoping)

- Cultural Heritage (Archaeology) Survey
- Habitat Survey (Phase-I)
- General Environmental Aspects Surveys (geology, soils, water crossings and water resources)
- Stakeholder Identification
- Geohazards Survey
- Soil Sampling at the Proposed Tank Farm location for the BTC Marine Terminal
- Preliminary Consultation with Authorities

Detailed Engineering Phase

- Project Information Distribution
- Bird Survey
- Marine Turtle Survey
- Cultural Heritage (with archeological focus) Surveys
- Seasonal Marine Surveys (chemistry and biology)
- Geohazards Surveys
- Habitat Survey (Phase-2)
- Environmental Input (Ecology and Archaeology) into Route Narrowing Works
- Surface Water and Groundwater Quality Survey
- Noise Survey
- Air Quality Survey
- Soil Survey
- Local, Regional and National Authority Consultation
- Socio-economic Household Questionnaire
- Socio-economic Settlement Questionnaire (with village heads known as Muhtars)
- Public Consultation Meetings with Local Communities
- Impact Assessment on Fishing

Public consultation

Public consultation, apart from being good practice, is an absolute necessity to understand how a project will impact stakeholders and to obtain their ideas and opinions on how the impacts should be managed. The feedback from consultation is an important influence on project design and implementation. Consultation is also an early opportunity for local people to become better informed about planned activities. The BTC Project has carried out public consultation in line with national regulations, IFC requirements and international best practice.


Consultation meeting, Kahramanmaras


NGO meeting Ankara


Consultation meeting, Osmaniye

Consultation will continue throughout the design, construction, operation and closure phases of the BTC Project. To date, the process has involved a 24 month period of conducting surveys, in-depth interviews, community meetings and working group meetings with a range of stakeholders including: settlements along the route and in the vicinity of the marine terminal, provincial and local authorities (elected and appointed), government departments, academics, international and national non-governmental organisations (NGOs) and other interest groups, (see box 4).

Consultations to date have highlighted a number of key issues, including both perceived benefits and concerns associated with the BTC Project. These issues revolved around the environment, employment, land acquisition and compensation, safety, security and health, reinstatement of land, infrastructure, agricultural activities, and the impact of construction workers, construction camps, pump stations, and the marine terminal on local residents. These issues have been fed into the BTC Project design processes and the EIA.

This Non-Technical Summary of the EIA has been prepared specifically for public disclosure and comment. The report is being widely disseminated and is available for comment for a period of 60 days from late June to late August 2002. Following the 60-day disclosure period, all comments received will be addressed and incorporated as appropriate into the EIA, prior to formal submission to the Ministry of Environment of the Turkish Government.

Box 4. Public Consultation and Disclosure

During the initial consultation phase approximately 500 Press Packs and over 2,000 Information Packs were distributed. Workshops and meetings were attended by approximately 260 NGOs and 60 Press organisations. Face-to-face interviews were held with 1,855 households along the pipeline route and near the marine terminal. An additional 424 face-to-face interviews and 210 telephone interviews were held with Muhtars in affected settlements.

During the disclosure process, approximately 22,000 Community Pamphlets and over 10,000 copies of this Non-Technical Summary were distributed to settlements along the pipeline route and near the marine terminal before and during the disclosure meetings. Ninetyfive hard copies of EIA were distributed to governorship offices (10), sub-governorship offices (30), national and local university libraries, and national public libraries. Over 600 CDs of full EIA were distributed to National NGOs, state authorities and the media. The full draft EIA report was also made available for public review on the World Wide Web at www.caspiandevelopmentandexport.com, with appropriate links to all Project Partners web sites. Precise locations were advertised in advance through the national and local press.

A total of 49 meetings were held in 36 settlements representing over 100 settlements along the pipeline route. In addition, meetings were held with all provincial authorities; both appointed and elected (10 meetings in total) of the provinces and districts along the pipeline route. Meetings were held with national and international NGOs, donors, academics and interest groups in Ankara and Istanbul (3 national meetings). On a local level, 11 meetings were held with local NGOs, local media and other local interest groups at the provincial centres along the pipeline route and in the vicinity of the marine terminal. Meetings were also held with national government departments (1 general meeting and 11 individual and focus group meetings)

Regular meetings have been held with the Ministry of Environment to update them on progress.

During construction and operation, a Project Community Relations Team will manage consultation and community liaison.

The project setting

As stated above, the EIA included extensive baseline studies of the physical, biological and social conditions along the route and at the marine terminal site. The following text summarises the general setting for the BTC Project.

The physical environment

In the north, the pipeline route crosses a variety of terrains ranging from the scenically attractive landscapes of the Yalnizcam and Allahuekber mountains to the flat and rolling agricultural land either side of the Otlukbeli mountains. North of Erzincan, the Otlukbeli Mountains are striking, almost plateau-like hills with grassy sub-alpine meadows. Further west they rise into the true alpine zone, with dramatic landscapes characterised by extensive views across sparsely-vegetated mountains.

Further south, agricultural landscapes on marl and karst predominate. Near Refahiye, are the Tecer Mountains with high quality landscapes of craggy mountains, broad grassy valleys, and forests beyond. After the Kizilirmak Valley the route follows the Sivas Provincial Highway to Imranli, crossing numerous rivers along the way. East of Sivas is distinctive karst landscape, a complex, hilly terrain formed from narrow ridges of gypsum enclosing small basins appearing as stony hummocks in a rolling grassy plain. Continuing south of the Acioz River is an unremarkable landscape of agriculture, roads, and with numerous rivers and streams.

Towards the southern end of the route are the distinctive stepped plateaux of the Uzun area, followed by the pine forested foothills and hills of the Taurus Mountains. This is followed by the intensively farmed, irrigated Cukurova Plain, finally reaching the low, rounded, maquis-covered hills near the Marine Terminal site on the Mediterranean coast.

Yalnizcam Mountains*: The pipeline climbs steeply into the southern part of the Yalnizcam Mountains to above the treeline, reaching altitudes of 2,500 m above sea level where, in spring, wildflowers and the adjacent mountain ranges provide a high level of scenic value

Imranli*: The route descends steeply to cross the meandering Acioz River, its valley forming a green band of meadows and trees in an otherwise more barren landscape

Posof*: The route climbs steadily into the rolling, forested hills interspersed by sub-alpine meadow clearings (2,100 m above sea level) north of Posof before passing west of the town

Soils along the route reflect local geology, land form, land use and climate. In the steep mountains and high valleys of the north-east, soil erosion is active though soil formation through weathering largely balances this. The area was once active volcanically and extensive sheets of tuff (ash) are common; soils derived from this have low fertility. Highland grazing and valley-bottom horticulture drives much of the local economy, but forestry is also important. Westward, for approximately half of its entire length, the route crosses plains soils, exploited to produce rain-fed cereals. Small, almost circular, basins enclosed by hard gypsum with large subsurface caverns occur East of Sivas.

The route shares a significant length of the East Anatolian Natural Gas Pipeline (NGP) corridor where in some places unsuccessful reinstatement has resulted in noticeable levels of soil erosion and riverbank degradation. Turning south, the relief increases and plains give way to irrigated valleys with silt and fine sand soils. The Taurus Mountains have sandy, often infertile, soils supporting conservation forestry and small-scale grazing. The southern foothills of the Taurus comprise soils derived from soft limestone, and landslides are common. Further south the irrigated plains have fertile sandy soils supporting a thriving horticultural economy. The route terminates at the coast in low hills with soils of volcanic origin.

The route crosses six watersheds, containing several large rivers, and numerous smaller streams. In the Aras watershed in the northeast, the route crosses three transboundary rivers flowing into Georgia the Posof, the Kura and the Hasankale. Water quality in these rivers tends to vary between good and poor, reflecting the levels of industrial inputs and intensity of farming in their catchments. Many rivers and streams are important for fish, supporting a number of species that are protected and/or have a commercial value. Surface water resources along the route also include dams and reservoirs. The route has been selected to avoid these.

Aquifers occur along the route in a number of locations: the Pasinler Plain, the Erzurum Plain, the Goksun Plain and the Adana-Ceyhan Plain. These aquifers are of two general types:

- Confined aquifers are separated from the surface by impermeable rock strata and are not particularly vulnerable to pipeline construction or operation. The total length of confined aquifer crossed is approximately 40 km
- Unconfined aquifers are in continuity with the land surface and are therefore potentially vulnerable to disturbance and contamination during construction or operation. The total length of unconfined aquifer crossed is approximately 140 km

Groundwater is an important resource for settlements along the route, where much of the drinking water is drawn from springs and wells.

Biodiversity

Species: Turkey has a rich and varied ecology with a high degree of endemism (species that are unique to a particular area). Over 500 endemic plant species have been observed along the 500 m route corridor. Examples of approximately 10% of Turkey's 1,876 globally-threatened plant species and 30% of the country's 178 globally-threatened vertebrate animals have also been observed within 250 m of the route. These proportions will be much lower for the actual working corridor itself. Globally endangered species include an orchid (*Ophrys reinholdii ssp. Leucotaenia),* a cyclamen (*Cyclamen coum),* Meadow Viper *(Vipera ursinii),* and White-headed Duck *(Oxyura leucocephala).* An additional 24 species of nationally threatened plants occur within the 500 m route corridor, the rarest in a national context being *Barbarea auriculata var. paludosa* and *Verbascum subserratum,* both of which are Critically Endangered. Little information exists to identify nationally threatened fauna, but 15 bird species whose maximum breeding population in Turkey is 500 pairs or below occur within the 500 m route corridor.

Montagu's harrier

Ferruginous duck

Internationally Important Sites: The pipeline crosses the centre of the area in which the Ulas and Alacorak Lakes lie (five lakes being considered for designation as Internationally Important Wetlands under the Ramsar Convention) but has been routed carefully to avoid all the lakes by approximately 1 km. The lakes support two globally-threatened birds (including White-headed Duck globally the rarest bird along the route), and at least 13 nationally-rare bird species. Construction is planned to occur in late summer between the end of the birds' breeding season and the main autumn migration period, stringent mitigation measures will be adopted to minimise disturbance and habitat damage.

Nationally Important Sites: The route crosses two sites protected under national legislation Posof Wildlife Protection Area, established primarily for the globally-threatened Caucasian Black Grouse, and Sarikamis Forest designated as a Natural Site for its important Scot's Pine forest communities. The reasons for the chosen routes are discussed in box 5.

Further west, the route passes within 100 m of a third site, the Gumushane-Kelkit-Cemali Wildlife Protection Area, established to protect Turkish Chamois and Wild Goat. It also passes in close proximity to two Important Bird Areas (IBAs): Ardahan Forest and Erzurum Plain (which have no legal protection). In addition, 55 ecologically sensitive areas have been identified along the route, mainly on the basis of the plant species they contain.

The project setting

Box 5. Routing Considerations through Protected Areas

Posof (Wildlife Protection Area). In Georgia, the district of Akhalkalaki raised serious security concerns, and thus the pipeline route was altered to avoid this area. Consequently, the pipeline entry point into Turkey changed and now crosses into the Posof Wildlife Protection Area. The area cannot be avoided and following consultations with the official staff of the Erzurum Regional Directorate of Forestry responsible for the protection of the Posof area construction work will be allowed within the area providing necessary precautions are taken to avoid disturbance to the Caucasian Black Grouse and damage to their habitats. Detailed studies were undertaken to develop an acceptable route through this area.

Sarikamis Forest (Natural Site Area). Alternative routes were considered. A route to the west of the current corridor would have proved difficult to construct and is prone to earthquakes, landslides and other geohazards. A route to the east would have traversed a greater linear distance of the Sarikamis Forest. The current route corridor traverses the fringes of the forest area and utilises a natural tree break as the pipeline corridor.

The most valuable ecological site along the route comprises the **Alacorak and Ulas Lakes** - a complex of five lakes that meets the criteria for designation as a Ramsar site, ie a Wetland of International Importance. The many important species of waterfowl that use the lakes includes the globally threatened White-headed Duck, (*Oxyura leucocephala).* The BTC Pipeline route has been selected so that it is generally separated from the lakes themselves by approximately at least 1 km.

Otlukbeli Mountains north of Erzincan*

Sarikamıs Forest, Ardahan

Cultural heritage setting

Turkey, being a cradle of many different cultures and civilisations during history, in addition to serving as a bridge between eastern and western cultures has a rich archeological and cultural heritage resource. Consideration of these heritage resources has played an important part throughout the planning of the pipeline. Desktop studies followed by field investigations revealed a total of 179 (excluding recent information from work carried out between June-September) archeological sites within a 2 km wide corridor. Sites discovered during fieldwork, were registered in accordance with the relevant legislation, and appropriate administrators and experts participated directly in the field studies or have been informed. The presence of cultural heritage resources was a considerable factor in route development.

The social environment

The settlements along the pipeline route and those neighbouring the BTC Marine Terminal are broadly similar in socio-economic characteristics. The majority of settlements are small and rural with fewer than 2,000 inhabitants. Ten percent of Turkey's population resides in the ten provinces in which the pipeline and marine terminal are located, and 0.2% live within a 4 km wide corridor centred on the pipeline Right of Way.

Population patterns along the pipeline route in general reflect local environmental characteristics. The more mountainous and gently rolling steppe landscapes of the north-east contain relatively isolated high altitude villages with a low and decreasing population density. Conversely, the southern provinces are experiencing in-migration, and are thus more densely populated and generally

more urbanised. Settlements along the pipeline route experience seasonal migration, particularly in northern and some central provinces, where accessibility to isolated villages is hindered in winter months. The settlements neighbouring the marine terminal, have generally had a stable population over the past five years, with the exception of slight increases in the numbers of men associated with construction and operation of various industrial facilities since the 1970s.

Although Turkey is characterised by a diversity of languages, cultures and traditions, the majority of surveyed respondents are Turkish speaking Sunni Muslims. Many of the settlements along the pipeline are geographically remote and often traditional in their attitude towards women and 'outsiders', whereas settlements in the marine terminal study area have already been exposed to increasing levels of industrialisation and are thus more accustomed to outside influences and the socio-cultural differences (see box 6).

Box 6. Participation of Women in Public Consultation

Ensuring the engagement and participation of women has been a focal point of the public consultation programme. In some instances, barriers had to be overcome where women were unable to attend public consultation meetings. Such barriers included:

- Involvement in domestic or agricultural activities such as the upkeep of animals, seasonal harvesting or care of children and elderly

- The perception that women's interaction with 'outsiders' (especially other men) may damage family honour

Separate women's meetings and individual meetings with women in their homes were held to ensure that women were able to easily access project information and had the opportunity to ask questions freely. This meant the participation of women at a number of the consultation meetings was particularly high, for example in Goksun district centre, Kahramanmaras where 140 women attended one women's meeting.

The main concerns raised by women are generally associated with security and safety, health, impacts to local infrastructure and agricultural activities and employment (particularly for their husbands or sons although in some cases for the women themselves).

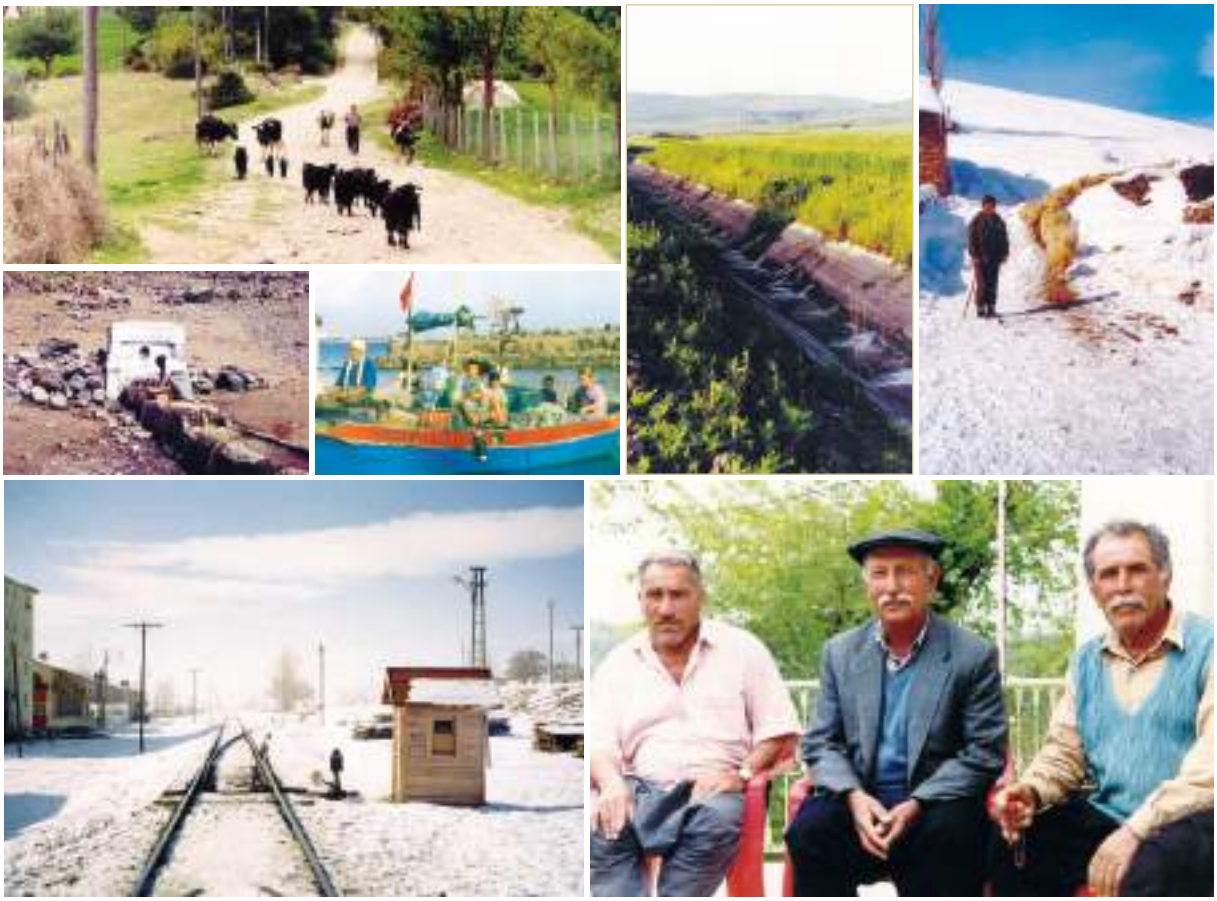
Eighty percent of surveyed rural households, within the pipeline corridor, either use or own land for agricultural purposes. Moving along the pipeline route, communal land is replaced by state land as the second most common form of landownership. Livestock grazing dominates the northern and central areas of the pipeline route. The flat southern irrigated Cukurova Plain supports a thriving and diverse agricultural and horticultural economy. Finally, close to the marine terminal, soil fertility falls with the presence of volcanic hills separated occasionally by valleys devoted to agricultural crops. Rain-fed agriculture (non-irrigated) is most widespread in the northern and central provinces, whereas irrigated agriculture becomes increasingly important moving west and south.

Along the pipeline route, there is a high dependency on land with cereal and livestock production as the main sources of livelihood (income and subsistence based). Bee keeping is found in all the provinces along the pipeline route, but is most widespread in Kars and in the central provinces of Sivas and Kayseri. Industry and service sectors are on the whole limited to urban areas, largely in the provincial centres.

Consultation meetings with women, Sivas

Consultation meetings with women, Kayseri

The project setting



1. Livestock, Osmaniye
2. Irrigation channel, Adana
3. Shepherd, Sivas
4. Water fountain, North East Anatolia
5. Fishing boat, Sahil Sitesi, Adana
6. Railway crossing, Erzurum
7. Yenigun Residents, Osmaniye

In the vicinity of the proposed marine terminal, many local residents rely on fishing, agriculture and animal husbandry. This dependence on natural resources continues in spite of the on-going depletion of these due to land expropriation for development purposes and decreased access to fish stocks as a result of jetty developments along the Iskenderun Gulf coast. Waged employment contributes only a small proportion of income to settlements in the study area.

All provinces, in which the BTC Project is located, with the exception of Adana, have levels of Gross Domestic Product (GDP) per capita below the average for Turkey. Approximately 7% of the adults surveyed reported that they are unemployed. These figures do however hide the high levels of underemployment, variations between rural and urban areas and the lack of available formal waged employment.

Infrastructure availability and quality correlates with the degree of urbanisation. Most surveyed settlements are linked to electricity and telecommunications networks, although supply is usually irregular, particularly in central provinces. Water provision varies. In Erzincan and Adana, nearly all surveyed settlements have regular piped water, whereas in Ardahan the majority of settlements have no proper water supply and rely on surface or groundwater sources (eg village fountains, wells, tanks). Sewage and waste disposal is a problem in most surveyed settlements. Residents often identify the absence of formal disposal systems as a factor contributing to poor health. Few of the surveyed settlements have services beyond primary schools, coffee houses, local markets and transport services. A wider range of services of potential use during construction (eg banks, health clinics) is available in district centres.

Engineering and route selection

Planning the concept

The BTC Project is the culmination of several years of detailed assessment of options for the export of crude oil from newly developed Caspian oil fields. The assessment has taken account of issues such as safety, technical feasibility, environmental and social implications, capital and operating expenditure, schedule, operability, reputation and Government agreements.

A number of strategic alternatives for the export of Caspian oil were considered. One option was the 'No Development Option'. This option would obviously remove all potential negative impacts arising from the construction and operation of the BTC Project. However, the benefits of the BTC Project (US $1.4 billion for Turkey), including the income accruing from transit tariffs for the Government of Turkey and the increased operational employment opportunities (mainly at the BTC Marine Terminal), would not be realised.

Possible alternative methods of transporting crude oil were assessed, namely by waterway, road, rail and pipeline. The studies concluded that a pipeline was the most safe and environmentally acceptable option. Pipelines terminating at the Black Sea would require tanker traffic to pass through the Turkish Strait or oil to be off-loaded into a pipeline to bypass the Turkish Strait. An Environmental Risk Assessment and additional studies concluded that a pipeline through Azerbaijan, Georgia and Turkey to the Gulf of Iskenderun was commercially viable, and a more favourable environmental option and was therefore the preferred solution.

Development of the pipeline route in Turkey

The BTC Pipeline route in Turkey has developed through a number of phases and as a result of a number of influencing factors. The various phases of route development and some of the studies and factors that fed into it are shown in figure 7.

Ongoing interaction between the EIA and pipeline design teams resulted in environmental and social constraints being taken into consideration wherever possible in the routing of the pipeline (see box 7). Several route corridors in Turkey, between the Georgian border crossing and the marine terminal in the Gulf of Iskenderun, were evaluated to determine the most advantageous 10 km wide 'Corridor of Interest'. Specific studies were carried out to refine this to a 500 m wide 'Preferred Route Corridor' and then to a 100 m wide 'Specified Route Corridor' in conjunction with the full EIA process. Studies included appraisal by pipeline engineers and specialists in geotechnical engineering and geohazards, assessment by environmental specialists including archeologists and ecologists, and assessment by experts on social issues. The final stage in the development of the route was the refining of the 100 m wide corridor to the 'Construction Corridor' (working width) within which the pipeline will be constructed.

Box 7. Geohazards

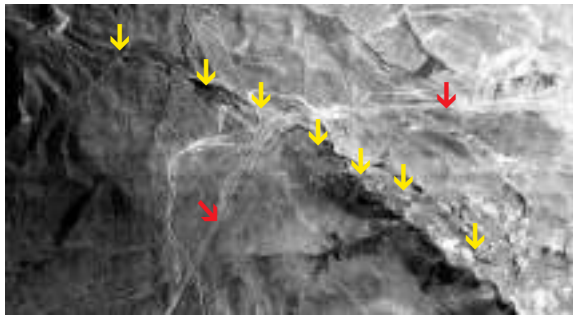
Geohazards had an especially important role to play in pipeline route development. By definition a geohazard is a physical feature that could pose a hazard to the construction or operation of the pipeline. Geohazards encountered during the BTC Project design included areas vulnerable to landslides, fault zones and gypsum areas prone to rapid ground subsidence and ground instability under seismic events. The BTC Project addressed these geohazards through a programme of baseline studies to understand their precise nature and then developed a solution through avoidance, route alignments (eg across fault zones), and other design measures.

A typical example of how the BTC Project addressed geohazards is provided by the North Anatolian Fault:

This fault is crossed in the Karadağ, a high mountain range north of Erzincan. Ideally pipelines are routed to avoid active fault zones but in Turkey many fault zones run east-west and cannot be avoided by the BTC Pipeline. The North Anatolian Fault zone is crossed twice. Since crossing is unavoidable the BTC Project emphasis was on detailed studies by international experts so that appropriate mitigation measures could be developed. Mitigation included the angle of crossing with respect to the fault configuration (this is critical to pipeline stability in the event of seismic movement), together with various design measures such as steel type pipe wall thickness, trench design and filling material. Another key measure, in the event of a pipe failure is the location of block valves to shut down oil flow either side of the fault zone, should such an intervention ever be needed.

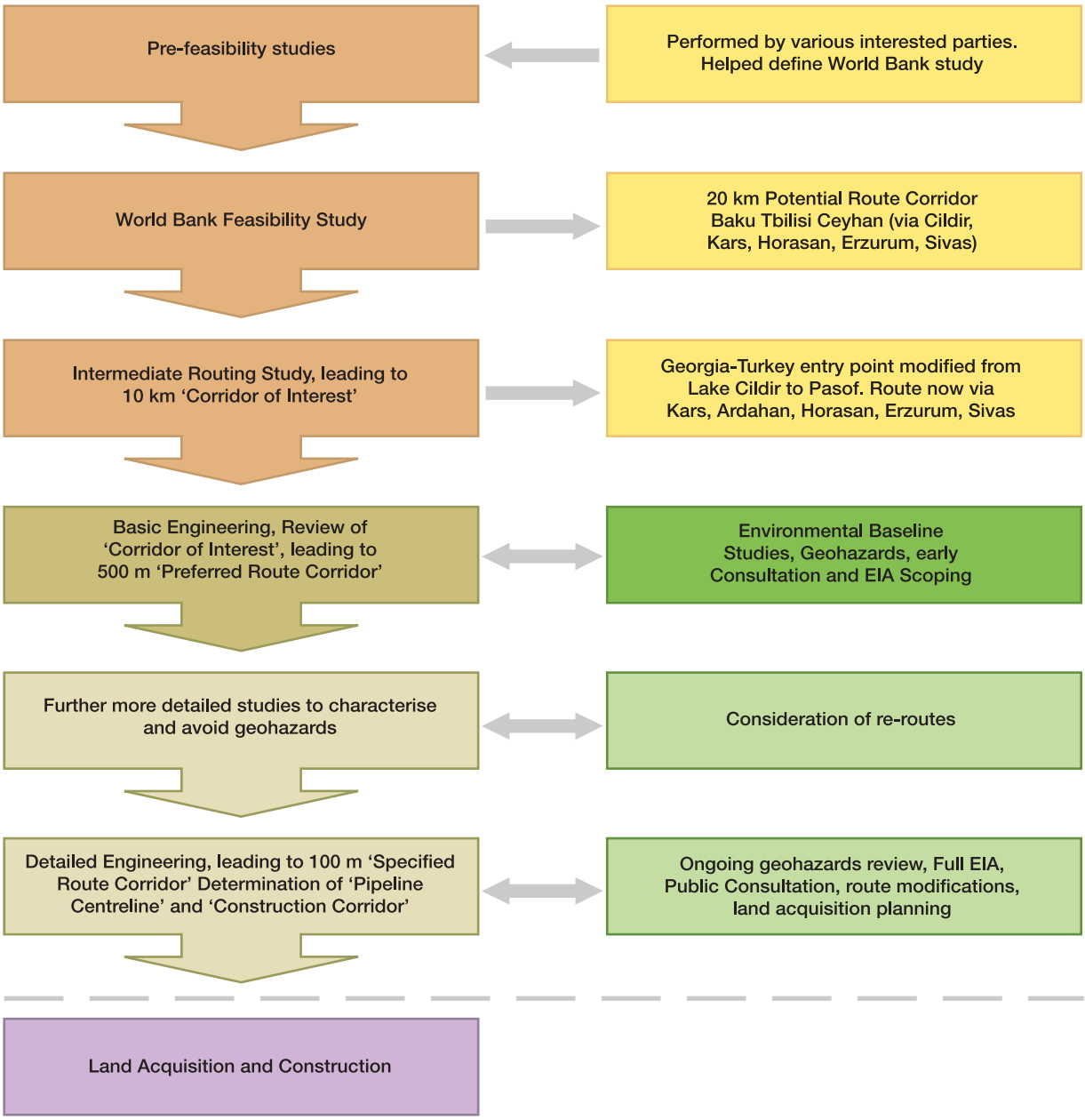
Engineering and route selection

North Anatolian Fault



Aerial view of the study area. Yellow arrows show the main trace of the North Anatolian Fault. Red arrows show the Gas Pipeline.

Figure 7. Outline of the Route Development Process



As mentioned above, EIA Scoping influenced the development of the 500 m route corridor. In the course of Detailed Design there have been 193 route changes (see table 1).

Engineering and route selection

Table 1. Summary of route changes

	Route Change Outside 28 m Corridor	Route Change Outside 100 m Corridor	Route Change Outside 500 m Corridor
Archaeology	1	34	-
Ecology	1	5	1
Social	3	7	1
Water Resources	1	14	4
Geohazards	12	16	11
Economy	-	4	-
Constructability	6	7	1
Design	5	6	3
Other Engineering Issues	-	49	1
Total Route Changes	29	142	22

(Route rev. m.)

As can be seen from table 1, route changes have occurred for a variety of reasons, many of them very site-specific. A sample of these is given below in box 8.

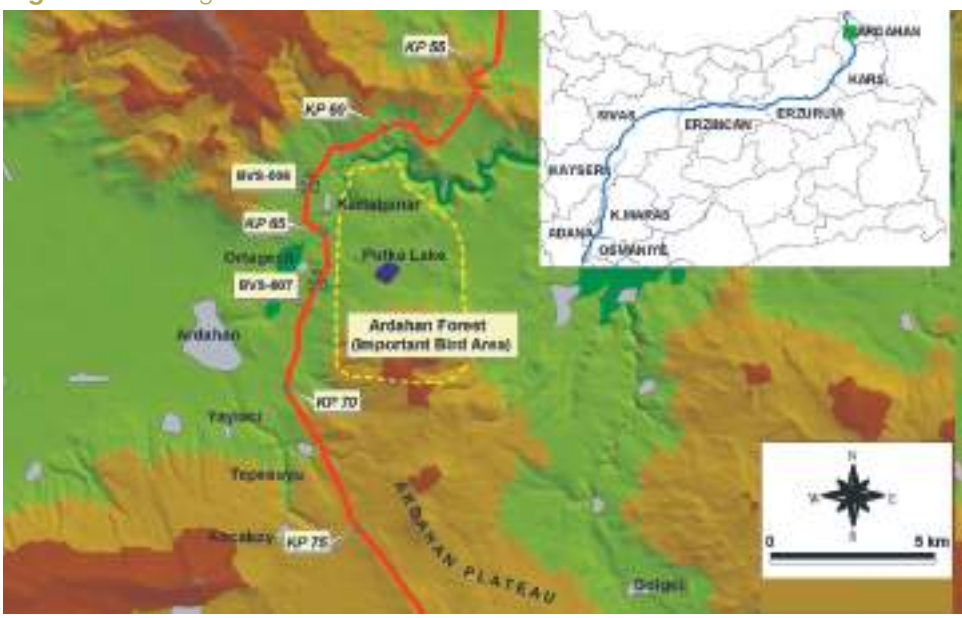
Box 8. Examples of route changes

- **Koprukoy village, Erzurum Province: the route was modified to avoid two presently unnamed archeological sites encountered during the cultural heritage field surveys**
- **Near the village of Akcatas, Erzurum Province, a river crossing was modified so that crossing at 90° could be achieved, an area containing trees could be avoided and the route could avoid an area of difficult topography**
- **Close to the village of Kurbancayir the opportunity was taken to shorten the original route, and in the process pass through more level topography and avoid eroded soils**
- **At Geben, Kahramanmaras Province, the original route passed close to the future Geben dam and in very close proximity to the nearest housing in the settlement (less than 15 m). The route was moved to provide a 250 m clearance and the working width was reduced to 22 m**
- **A similar re-route was undertaken at the village of Andirin, Kahramanmaras Province, to move further away from housing and adopt a narrower working width**

Through phased route development, in combination with modifications as new information came to light, a large number of potential impacts have been avoided through route selection. Other examples are provided elsewhere in this document (see figure 8).

The EIA and design engineering teams also worked closely together to identify and assess alternative locations for Above Ground Installations such as pump stations, the pressure reduction station and block valve stations, as well as the temporary construction camp locations and access roads.

Figure 8. Routing to avoid Ardahan Forest



Evaluation of options for the marine terminal site

In parallel to the pipeline route selection process, five alternative sites for the BTC Marine Terminal at the Gulf of Iskenderun were identified. These sites were assessed against a range of criteria including the minimisation of any negative environmental and social impact. The study concluded that the marine terminal should be constructed within the boundaries of the existing BOTAŞ terminal site near Ceyhan and that it would comprise a new facility, with its own dedicated jetty, constructed adjacent to the existing facilities.

Some of the project alternatives considered

Aside from route development and marine terminal site selection, a number of alternatives were considered during EIA and design. The main ones are summarised in table 2 below.

Table 2. Summary of Main Alternatives Considered

Alternatives considered	Selected option
Pipeline:	
Pressure reduction station locations: two on hillsides, one in wooded valley, one on level agricultural land	Level agricultural land site was selected for minimised land area required, landscape, reduced visual and ecological impacts
Pump drivers: Consideration of crude oil and gas fired engines and turbines	Gas-fired reciprocating engines were selected for highest efficiency, lowest carbon dioxide emissions and low nitrogen and sulphur oxides emissions
Block valve locations: basic requirements comprised maximum spacing intervals, either side of specified river crossings	Final positioning was based on environmental risk assessment that considered a range of sensitivities, including ecology, groundwater and surface water
Marine Terminal:	
Tanker loading at jetty versus offshore mooring buoy	Jetty selection was based on smaller operational footprints lower construction impacts and existing experience in BOTAŞ of jetty operations
Oil storage tanks: floating roofs versus fixed roofs	Significantly greater Volatile Organic Carbon (VOC) losses result during tank filling for fixed roofs as opposed to floating roofs, so the latter was chosen
VOC Emissions Control during Tanker Loading: ► condensation through refrigeration ► adsorption onto activated carbon ► absorption back into the crude oil ► oxidation via an elevated flare or an enclosed ground flare	Flaring was selected on the basis of significantly higher efficiency in combusting VOCs. Although this results in higher CO_2 emissions, the most viable alternative (absorption) would have local air quality impacts. Initially an elevated flare was the preferred option but this was subsequently rejected on the grounds of noise and visibility in favour of an enclosed ground flare.

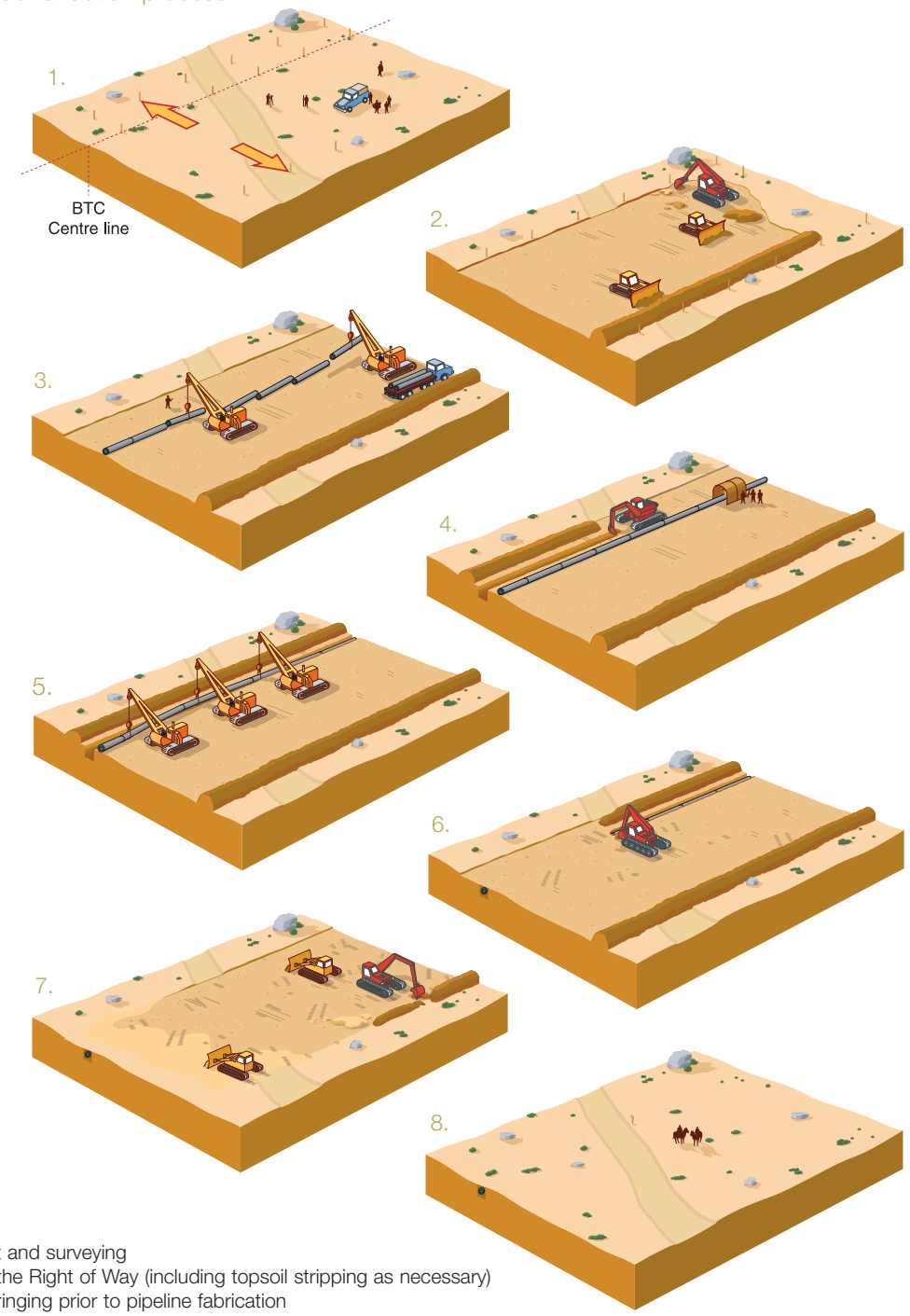
Construction

The pipeline and associated facilities are designed for a minimum lifetime of 40 years. Contractors experienced in major pipeline construction, will undertake construction of the pipeline, terminal and associated permanent facilities, working to the specifications developed by the BTC Project team.

Pipeline construction is a sequential process and comprises a number of distinct operations, undertaken by a large range of specialised and general plant (known as the construction spread, see figure 9). Pipeline construction will be achieved using a number of conventional construction spreads to accomplish pipeline installation, and additional special section crews to accomplish river crossings and other specialised pipe segment installations. Mobilisation and construction is estimated to last from autumn 2002 to late 2004. Should the start of the construction period force two winters' work, then the duration estimate would need to be adjusted since construction slows considerably during the winter months (as some areas of the route may not be accessible). The rate of progress of each sequential operation is dependent on the terrain and the nature of the activity. The direction of

construction will be at the construction contractors' discretion, in consultation with the appropriate authorities taking technical requirements into account. The construction of the pipeline will require a number of temporary facilities, which will include worker camps, pipe storage yards and temporary access roads.

Figure 9. Construction process



1. Setting out and surveying
2. Preparing the Right of Way (including topsoil stripping as necessary)
3. Pipeline stringing prior to pipeline fabrication
4. Excavating the trench (other methods may also be used where necessary)
5. Laying of pipeline in the trench (ditching)
6. Backfilling with subsoil
7. Reinstating the Right of Way (including replacing the topsoil)
8. After completion of reinstatement

Safe crossing points across the construction works taking place along the pipeline route will be provided at all times. Illustrations are for guidance only. Methods and equipment may vary from those shown above.

Hydrostatic Testing

The entire pipeline and tank facilities at Ceyhan will be subjected to hydrostatic pressure testing to prove the strength and integrity of the pipeline system. On completion of the construction of the BTC Pipeline, a hydrostatic test will be carried out to demonstrate fitness for purpose of the BTC Pipeline and the associated facilities in accordance with the relevant standards. Water abstraction sources will be selected to suit the geographical location of the pipeline and will be large enough to facilitate filling of the pipeline test sections without any detrimental effect to the surrounding environment and existing resource users. The displaced hydrotest water may be transferred to another section of pipe or discharged at a suitable location. Discharge locations, treatment and rates will be agreed in advance with the relevant authorities.

Commissioning

Commissioning of the pipeline, block valves and associated AGIs will ensure that the pipeline system has been constructed in accordance with the design and that the system is ready for operation. Commissioning will also ensure that there are no defects in the pipeline system, which could cause problems during start-up or during operation.

East Anatolian Natural Gas Pipeline reinstatement strategy

The BTC Pipeline will be constructed parallel to the recently constructed NGP for approximately 320 km of its length. Distances between the two laid pipes will be generally in the range of 12 to 18 m. In a number of areas the existing NGP has caused noticeable impacts in terms of land degradation (erosion, soil productivity and visual appearance) and damage to banks at some river crossings.

The BTC Project has developed a two-phase approach to reinstatement in the vicinity of the NGP. Phase I will entail the NGP construction contractor undertaking remedial reinstatement measures prior to the commencement of BTC Pipeline construction in order to remediate existing problems. Phase II will involve the BTC Contractor undertaking any additional mitigation measures in specific areas across the two parallel pipeline corridors.

Specific areas identified as requiring restoration measures prior to, or during, reinstatement of the BTC Pipeline, are as follows and will be fully addressed in accordance with the BTC Project Reinstatement Plan:

- general reinstatement (principally the reinstatement of the BTC corridor to pre-NGP conditions)
- adjacent agricultural land, eg in areas of poor topsoil management
- hill slope reinstatement, eg installation of slope breakers across entire parallel corridors
- erosion, eg in areas of rill and gully development
- river crossings, eg bank and bed erosion

Environmental and social issues

This section outlines some of the key baseline considerations, potential Project impacts, mitigation objectives and techniques, and the main residual impacts of various aspects such as soils, landscape, ecology, livelihoods, health and safety, and concludes with a summary of non-routine impacts and cumulative impacts.


Polygonal karst soils, *Xerochrepts*


Montane steppe interspersed with exposures of whitish underlying marl *

Soils

Soil is an important environmental resource intimately affected by pipeline construction and closely associated with the functioning of other resources such as landscape, ecology and of course agricultural land use.

Reinstatement of the BTC Pipeline has the objective of helping nature to preserve as much of the soil integrity as possible, by providing a basis for natural processes themselves to complete the process, ie to recover. The more successful reinstatement is, the more rapid recovery will be. Natural flora and fauna will then become re-established, agricultural productivity will return to its former level, and the disturbed landscape will regain the same appearance as its surroundings.

Conversely, where soils are fragile, sensitive to disturbance and difficult to reinstate, recovery processes will take longer. Where this happens, secondary impacts to ecology, agricultural land use and landscape/visual appearance may endure for years and be clearly perceptible. Fragility can derive from the nature of the soil itself, combined with other factors such as slope, topography and run-off characteristics.

Soils along the pipeline route vary considerably in terms of their character, the other resources they support and the existing pressures, such as erosion, they face. The BTC Project has addressed these challenges through a series of studies and close engagement between the environmental and design teams to develop the 'Reinstatement Plan'. The Plan is tailored to the variety of conditions that will be encountered once construction starts and is a fundamental part of the overall environmental management of the BTC Project.

The Reinstatement Plan specifies performance requirements to be met by the construction contractor. These are: to meet specific erosion performance criteria developed by leading experts and attain re-vegetation requirements within specified time constraints. The Plan provides for pre-construction surveys in order to gain an understanding of soil characteristics and flora that are specific to the actual working corridor. Subsequently, the Plan provides for separate stripping of topsoil and subsoil, segregated storage, monitoring and management of the resource during storage and finally its replacement. Provision is also made for slope stabilisation during construction and rapid stabilisation of the reinstated soil, through such means as planting, seeding, selective use of fertiliser and mechanical methods, including use of jute mats. The Reinstatement Plan also addresses related matters such as reinstatement in ecologically sensitive areas and at river crossings.

The BTC Project's planned approach to soil management and reinstatement will ensure that along the majority of the route, soils (and consequential impacts to other resources) will generally be of minor significance. Although soils will be disturbed, their recovery following reinstatement will be rapid. In addition, BOTAŞ has started a programme of remedial works along the route of the reinstated NGP that is addressing areas of erosion caused by the works associated with this Project. This programme is particularly addressing areas of soil erosion and water crossings.

In some areas along the route, however, impacts will potentially be significant. Examples of where this is the case are where the topsoil is thin and underlain by tuff and marl, (see box 9).

Box 9. Soil Types

Tuffaceous soils are derived from volcanic ash and have a low productivity. They are generally present in north-east Turkey and they are an important soil for coniferous woodland, shrubs and coarse grassland. They have less importance to agriculture but are important in the context of landscape amenity and nature conservation. They are thin and vulnerable to erosion. Their subsoil has effectively zero productivity meaning that any mixing of top and subsoil drastically reduces the already low productivity of the topsoil, with a knock-on effect on the vegetation it supports. The subsoil is also whitish in colour with the result that mixing also leads to a visible trace across the landscape.

Marl is a clay material present beneath thin topsoils on hills, plateaux and plateaux scarps and thicker topsoil layers on plains. Where topsoils are thin, agricultural use is usually limited to grazing, whereas on the plains it has an important function in rainfed agriculture. As with tuffaceous soils, mixing of the two leads to reduction in productivity and a visible trace across the landscape.

These are two typical soils that will require special attention during construction and reinstatement. Topsoil thickness will be established so that it can be stripped to a depth that minimises the degree of mixing with the unproductive subsoil. For tuff, shrubs and coarse grasses will be set aside for replanting. For marl, input on the most appropriate site specific measures to be employed will be obtained through expert and landowner (or land user) consultation. In all instances, and throughout the work, soils specialists will be included in the on-site environmental management team. Even with these measures there is still a degree of uncertainty over how such fragile soils will respond to construction disturbance and reinstatement, and how quickly they will recover. A post-reinstatement programme of monitoring and after care will be implemented so that any problems that arise can be rapidly remedied.

Landscape and visual amenity

The pipeline and its associated facilities will be constructed, and will operate, in a variety of landscapes, many of them with intrinsic aesthetic value. The pipeline will be buried throughout its length, apart from where it emerges at AGIs. While construction of the pipeline will be a clearly visible activity, it will also be temporary and is not viewed as having a significant potential for landscape or visual impact. In the longer term however, the visibility of the pipeline, and therefore its degree of impact will depend on the success of reinstatement and the speed of recovery.

For the majority of its length, where reinstatement will be relatively straightforward, and in areas of little or no landscape value, impacts will be minor. In time, there will be little or no evidence of the pipeline in the landscape. In certain areas, however, particularly where vulnerable soils have been disturbed (as discussed in Soils), the pipeline may cause more noticeable landscape impacts. Mitigating potential landscape impacts in such areas will mainly be achieved by the soil management practices described previously.

The main landscape and visual impacts due to the BTC Project will result from the pump stations, pressure reduction station and the marine terminal. The pump stations and pressure reduction station are located in landscapes of varying quality and their landscape and visual impacts will be of minor significance due to the implementation of landscape plan. To the extent practical, site selection for these facilities has considered landscape issues. For the pressure reduction station, for example, landscape and visual impact was a considerable factor in final site selection following provisional location of the facility in an area of high aesthetic value.

The marine terminal is the largest above ground component of the overall Project. Comprising seven large storage tanks, related facilities, accommodation, an enclosed flare, causeway and jetty it will be a prominent feature in the coastal landscape. The presence of large oil tankers at the jetty will add to the visual impact. However, the terrain and presence of the existing BOTAŞ Terminal will either screen some potential viewers or limit them to partial views. Landscaping and selection of appropriate colour schemes (especially for the tanks and buildings) will further reduce impacts. The coastal settlement at Sahil Sitesi, however, will have a complete view of the causeway, jetty and tanker loading activity. Current and future views of the marine terminal are shown below.

Surface water resources

Surface water resources were a key consideration in developing the pipeline route, ensuring that it avoided features such as lakes, reservoirs and future dam projects. The pipeline route will cross more than 150 rivers and streams, as well as ephemeral channels that dry up during the summer. These will all be crossed using an open-cut construction technique ie water flow is maintained at all times. The river crossings will be undertaken by specialist construction crews.


Posof River*


Aras River*


Sariz River*

The main impacts to surface water resources will arise from the physical disturbance of construction activity. Potentially this could lead to a number of impacts including:

- bank erosion
- sediment entering the watercourse from working areas
- localised changes to drainage in the catchment area
- consequential effects of the above on habitats and resource use by communities

Wherever possible, periods of low flow will be chosen for watercourse crossings resulting in a quicker deposition from the water column of any sediment released. This is possible because the construction crews have the flexibility to operate to a different schedule from the main pipeline construction crews. Low flow is also a desirable time of year to cross in terms of minimising impacts to fish and other ecological populations. All reasonable steps will be taken to minimise the length of bank and bed that are directly affected. This will be achieved through fencing off such areas and any vulnerable banks that may be susceptible to damage. Bankside vegetation will be kept in place for as long as possible to help reduce sediment run-off into rivers and streams. Each crossing has been examined individually in design so that the crossing will avoid significantly affecting the stability and long-term performance of riverbanks and flood defences. Once construction is completed, the crossings will be reinstated, ensuring watercourses and their banks are returned to their natural state.

Water resources are also susceptible to pollution from construction activities, eg from fuel oil storage and handling. All potential sources of pollution will be subject to strict storage and handling controls and equipment will be maintained on site to deal with possible spills. Wastewater at construction camps (including sewage and domestic waste water, water generated by subsidiary operations) will require disposal. A comprehensive scheme for water re-use, and treatment (to Turkish Legislation and World Bank guidelines and standards) prior to its disposal to soakaway or surface water will ensure that impacts are minor. The other major discharge during construction will result from testing of the pipe for leaks using water. To the maximum extent possible the water will be re-used in the next section of pipe, thus reducing both discharge and abstraction volumes. Where discharge does occur this will be treated to a standard that is acceptable to the authorities and at a location where effects will be minor.

During operation, wastewaters will arise at the pump stations, pressure reduction station and marine terminal. These will mainly comprise treated sewage and domestic effluent and treated surface run-off. All wastewaters will be treated to Turkish Legislation and international standards and disposed of at locations where there is no significant risk of impact to sensitive receptors.

Water abstraction for use by the BTC Project (during construction and operation) is also a potential source of impact. Water resources will be utilised on the basis that they provide a sustainable source for the BTC Project without conflict with settlements and ecological resources that currently rely on the resource.

Groundwater resources

Clearly the greatest risk to groundwater resources would be in the event of an operational oil spill at the terminal or along the pipeline. This issue is addressed later in the Non-Technical Summary.

The main potential impacts to groundwater during construction in unconfined aquifers will include:

- potential contamination from site drainage, discharges or accidental spills
- local reduction in groundwater levels due to abstraction for project use at construction camps or trench dewatering activities

In the first instance, in accordance with Turkish Law, there will be no abstractions or discharges within 50 m of wells and springs. Materials (eg fuel oils) will be stored and handled in a manner to avoid pollution. All solid wastes will be stored and handled in accordance with a detailed Waste Management Plan. Measures to protect surface water quality will also serve to reduce impacts to groundwater. Moderate, short-term, localised impacts to groundwater are predicted where the pipeline crosses the Pasinler Plain, elsewhere impacts will be minor.

During operation, the BTC Project will need to abstract groundwater for its own use and to discharge wastewaters that could potentially harm groundwater resources. All planned groundwater abstractions will be subject to a sustainability test. The amounts available, other users and the BTC Project's own requirements will all be examined closely to ensure that abstraction for the BTC Project will not reduce the volumes available to others. Some wastewaters may be discharged to soakaways. In addition, discharge locations will be selected well away from other users (including of course the BTC Project itself) and subject to a separate study. A Ground Water Protection Strategy will be developed during the construction period.

Dwarf Iris *(Iris reticulata)*

Ecology

In addition to Protected Areas and Protected Species, the BTC Project area contains a large number of threatened and endemic species. Endemic means they are strongly associated with, or only found in, a particular area – in this case Turkey itself. There are also strong seasonal variations in species behaviour leading to many fish, birds and mammals being more sensitive to disturbance at certain times of the year than at others. Routing and planning to construct a pipeline across the breadth of Turkey to a new facility on the Mediterranean coast, while at the same time seeking to minimise its effects on biodiversity, these factors have raised significant challenges for the BTC Project. The BTC Project has faced these challenges in a number of ways from baseline studies to understand the ecology of the BTC Project area through to the development of mitigation measures that are specific to a particular route section or even a single species.

From early in the development of the BTC Project, desk studies and field surveys have been carried out by Turkish and international ecological experts. Over time these have helped build up a picture of the ecology of the pipeline route and the marine terminal surroundings. The information collected was presented and stored on a Geographic Information System (or GIS). This allowed ecological sensitivities to be mapped so that their relationship to the pipeline route, AGIs, marine terminal and other facilities could be clearly appreciated. The involvement of expert ecologists also allowed distinctions to be made between the most important or sensitive sites and those that would be less vulnerable to a pipeline construction project or terminal development. Some surveys were of a general nature, establishing habitats for example, while others were species specific, for example looking at marine turtle use of the Gulf of Iskenderun.

Understanding ecological sensitivities (or constraints) and their locations were significant aids to route development. In the first instance, a pipeline route and sites for AGIs were selected to maximise avoidance of sensitive ecological features. This was a progressive activity so that in the early stages of route development the emphasis was on avoiding areas that are designated or protected in Turkey for nature conservation purposes. As the BTC Project moved on, and more was learned, routing decisions and other design factors were influenced by route/site-specific habitats and species.

Environmental and social issues

One important consideration in certain areas will be the actual timing and duration of the works. The EIA has established sensitive times of year including fish breeding and migration at river crossings, locations where sensitive birds and bats may breed, hibernation periods for Eurasian Brown Bear, and marine turtle use of nesting beaches, (see box 10). The BTC Project will avoid working in 'absolute constraint' areas at sensitive times. Where permitted, additional and special mitigation measures will be applied to allow works to proceed. Elsewhere, in several areas of sensitive and protected plant species, the approach will be to complete the work within a specified time period, while observing all the required management measures, so that natural recovery is made easier.

Eurasian Brown Bear

Nevertheless, disturbance of habitats and species will be unavoidable. Reinstatement will address this in terms of mitigating impacts to plant species and habitats in general. In some places reinstatement will also include species transplantation. The EIA and associated management plans also make provision for species-specific protection measures. Other specific measures will include narrowing the working corridor, especially in particularly sensitive areas and all forested areas. Environmental management during construction includes commitments to further surveys at some locations in order to resolve uncertainties over, for example, the precise locations of certain features, their spatial extent and site-specific reinstatement needs. The construction works themselves will involve supervision in sensitive areas by ecological experts and close monitoring of impacts and mitigation. Post-reinstatement surveys will be undertaken to monitor the progress of reinstated areas and so that if remedial action is required it can be undertaken quickly and effectively.

Box 10. Protected Species

Eurasian Brown Bear *(Ursus arctos)* can be found along the route at Posof, Ardahan and Sarikamis Forests. The greatest threats to the Turkish Brown Bear are hunting and deforestation. In terms of the BTC Project itself, bears would be most vulnerable to impact during the winter hibernation period, and to a lesser extent when the bears, often with newly born young, emerge for the peak spring feeding period. Bears range over very wide areas in search of food and tend to avoid contact with humans. The main Project mitigation measures will include: pre-construction surveys to ensure no dens are present on the Right of Way; avoiding construction during the hibernation period where dens are found; habitat reinstatement; specific measures (eg for waste management). In all three locations where bear habitat may be crossed the route has been modified to minimise the level of disruption.

Caucasian Black Grouse *(Tetrao mlokosiewiczi)* is a Globally Threatened species with a restricted range. Its preferred habitat is the high altitude conifer forest and the alpine meadows around its edge. Overgrazing and deforestation (ie habitat loss) and hunting are the main pressures on this bird. As with brown bears, the BTC Project has sought to minimise impacts through route selection (and narrowed working widths) in the bird's key forest habitats. Other key measures include no construction during the main breeding period of April to July. Pre-construction surveys by expert ornithologists and special attention will be given to habitat reinstatement.

Sub-alpine meadows are crossed by the pipeline in several locations towards its northern end. Surveys have determined that these meadows show high floral diversity, and include a number of species that are afforded protection and/or grow only in Turkey. The main mitigation measures for these areas will include the following: pre-construction surveys by expert botanists to finalise the reinstatement measures so that they are site-specific and to identify any particularly important species for which transplantation is a viable option; a three week target between topsoil stripping and reinstatement.

Environmental and social issues

Air quality

During construction of all the BTC facilities the main potential impacts to air quality will be from dust. Although there will be emissions from moving vehicles, fixed plant and generators these are unlikely to cause any ambient air quality problems. Regardless of this, all vehicles and plant will be maintained in good condition to ensure their efficiency and to minimise emissions to atmosphere.

Certain soils, during dry weather and strong winds, can be blown some distance from where they are disturbed, although most soil particles will settle within 250 m and less. Some communities have expressed concerns over dust settling on crops and potentially affecting yields near to the working areas. Dust is readily controllable and the BTC Project will implement measures when (during dry, windy weather) and where (near crops, dwellings and sensitive natural areas) they are required. These will focus on controlling dust at source by, for example, wetting surfaces and enforcing limits on vehicle speeds over dry surfaces.

During operation of the BTC Pipeline, gaseous emissions to atmosphere will be limited to the four pump stations and the marine terminal. The main pollutants of concern at the pump stations will be nitrogen and sulphur oxides (NO_X and SO_X). Since gas has been selected as the fuel for the pump drivers, sulphur oxide emissions will be low. The pump drivers have also been selected for high efficiency and good performance on nitrogen oxide emissions. Ground level concentrations of these pollutants will be well within Turkish and international air quality standards at all four pump stations.

The air quality issues for the marine terminal are quite different. The operation of loading an oil tanker displaces gases, called Volatile Organic Compounds (or VOCs) from the tanker. VOCs can have direct implications to human health. In addition, when mixed with nitrogen oxides typically generated from power stations, they can also lead to ozone formation at ground level. In high concentrations, ozone can also have human health implications and damage crops. As described earlier, VOCs generated during tanker loading will be collected and piped to an enclosed ground flare for efficient incineration. This is currently viewed as the most appropriate way to minimise potential local air quality impacts. Consequently, effects on ground level air quality due to emissions at the marine terminal will be well within accepted limits.

Noise and vibration

Construction is inevitably a noisy activity. Noise sources will comprise a variety of stationary and mobile construction plant along the working corridor. Especially noisy activity will include pile driving at the jetty, sheet piling at some locations, including crossings of railways and major roads. Where surface rock outcrops are encountered it may be necessary to use explosives to break up the material. Although on the face of it this may seem an activity with high noise potential, in reality charges will be buried and covered over. Blasting will be a very carefully managed activity, undertaken by specialist contractors, with full advance notification for nearby residents and communities. Blasting will not be undertaken at distances (usually less than 50 m) that could cause structural damage to buildings, including archeological features.

Although pipeline construction noise is inevitable it will also be a temporary activity. With the exception of the pump stations, pressure reduction station and some of the major crossings, noisy construction activity at any single location will rarely exceed four weeks. In addition, the noise levels will not be constant. At any single location, pipeline construction will comprise a sequence of activities moving past, each with differing noise characteristics.

Noise impacts have also been reduced to a significant extent during route selection, since one objective of routing was to ensure the widest possible margin between settlements and the route. Night-time working (22:00-06:00) will be avoided where possible.

Nevertheless, the pipeline route and its associated facilities will largely be built in quiet rural settings. Where construction activity is close to settlements and dwellings, mobile noise barriers will be used to further reduce noise levels. Noise at residences in such locations will be monitored so that additional measures can be adopted if problems are revealed. For especially noisy activities close to houses, residents will be notified in advance.

During operation, noise impacts will be much lower. The only substantial noise sources will be the pump stations and pressure reduction station. The pressure reduction station is sited well away from residential areas. Since the pump stations include accommodation areas, noisy machinery will be acoustically designed and enclosed to shield the accommodation from noise. Offsite impacts will therefore be minor and well within Turkish and International Standards.

Noise impacts due to construction and operation of the marine terminal will also be minor at most locations, mainly due to the separation distance of residential areas from noisy activity on the site, in combination with the application of good construction practice. The noisiest operational feature on the site will be the enclosed ground flare. Good acoustic performance was one of the criteria in selecting this option and further reductions will be sought in ongoing design.

Construction photos for illustration purposes only

Traffic and transport

The vast majority of traffic and transport related issues are associated with construction activity. Construction of the pipeline represents a considerable undertaking in terms of moving pipe, equipment, people and supplies from various locations to the points at which they will be used along the route. The BTC Project has therefore comprehensively examined logistics issues not only to minimise potential impacts but also to improve efficiency and potential cost savings.

As an example, the BTC Project has examined options for moving pipe from possible manufacturing locations and ports to the main sites where it will be stored for distribution along the route. Rail transport to these main distribution centres appears to offer distinct advantages over road transport and is being examined closely in terms of feasibility, cost and reliability.

Eventually pipe, equipment, personnel and materials will be transported to the working corridor itself and this will, in many areas, involve the use of small local roads. In some of the remoter areas along the route these roads are relatively little used, although important to local settlements. Project traffic movements along them will not reach levels that could cause congestion or air quality impacts, but could noticeably increase noise in very quiet areas and pose a community safety issue. Generation of dust from dry road surfaces can also be a significant problem with large vehicles. Road quality is a concern. Some roads are not designed for heavy vehicles and the BTC Project will improve them in advance of the works. There is a potential for Project traffic to damage road surfaces and the BTC Project is therefore committed to reinstating all the roads it uses to their pre-work condition as a minimum.

These are all issues that are amenable to management and the BTC Project has addressed them in two ways:

- general traffic and transport related issues are covered in the Traffic Management Plan
- community safety issues arising from vehicle movements are addressed in the Community Safety Management Plan


Cobandede medieval bridge, Erzurum


Alaouite cemetery, Sivas


Meryemcil castle, Kahramanmaras*

Cultural heritage

Cultural heritage resources, especially archaeology, were important considerations throughout the planning of the BTC Project. The cultural heritage of an area may be profoundly affected by a large-scale construction project, if it is not handled sensitively. Through careful management, however, it has been possible to plan the BTC Project to minimise the impact on cultural resources and, in addition, provide a substantial increase in the quantity of archeological information available for the BTC Project area (as described earlier in 'Project Setting').

The best way to manage impacts to archeological sites is to avoid them in the first place. As information was acquired on site locations this was fed into the route engineering development through all its phases so that definition of the 500 m, 100 m and working corridors have all taken account of the presence of archeological sites and the route has been modified on many occasions in response. It is possible that further important archeological remains will be encountered during construction. As part of the strategy to deal with archeological resources, further surveys (including trenching and geophysical surveys) will be undertaken prior to construction to reduce the potential for presently unknown resources to be damaged. Where appropriate, it may be necessary to conduct salvage excavations for newly identified archeological sites and significant archeological features that cannot be avoided by changes in the route. A Cultural Heritage Management Plan has been formulated which sets out procedures to be implemented and adhered to during construction for dealing with any archeological resources that are encountered.

There are, however, a small number of sites where moderate impacts to archeological resources are predicted. This is primarily because the route cannot avoid these sites due to the presence of other constraints such as terrain and occupied settlements. The extent of these sites will be investigated during further field surveys prior to construction to determine the need for detailed surface research and/or rescue excavations. Further surveys will also identify a 'minimum impact' route through these sites and other site-specific protection measures.

Overall, impacts to cultural heritage have been managed through avoidance and site investigations. Ways to reduce impacts further, both before and during construction, will be implemented through the Cultural Heritage Management Plan, (see box 11).

Box 11. Key features of the Cultural Heritage Management Plan include the following:

- a protocol has been signed with the Ministry of Culture governing the investigative works to be carried out along the route
- implementation of the Plan will be by suitably qualified archeological supervisors
- all topsoil stripping and, in some locations, trench excavations will be monitored in the form of a 'watching brief'
- should currently unknown archeological remains be encountered, work will be stopped and the appropriate authorities informed. Depending on the opinion of the authorities, an appropriate course of action will be identified and implemented. Depending on the extent and nature of the remains, this could involve a short cessation of activity at that site, the demarcation of a restricted working width, or for more significant finds, it may be necessary for the contractor to implement a 'move around' while archeological investigations are carried out
- exceptionally, if significant remains are discovered that cannot be recorded within the normal programme, it may become necessary, by instruction of the relevant Museum Directorate representative, for the contractor to provide protection of the deposits under the running track by provision of 'bog mats' or stone tracks over short distances

Livelihoods

Animal husbandry and subsistence agriculture are the two main forms of livelihood along the pipeline corridor. Settlements neighbouring the BTC Marine Terminal rely predominantly on fishing, agriculture and animal husbandry, with a small proportion involved in wage labour.

Along most of the pipeline corridor, the BTC Project will not have any significant impact on livelihoods. This is because the pipeline will be buried and most land used as part of the 28 m working width will be reinstated within a maximum period of four months (except at the AGIs where land take will be permanent).

There may be situations, however, where the BTC Project could affect livelihoods. For example, land expropriation will result in a reduction in the availability of grazing land at Pump Station 1. Also, the BTC Jetty and associated exclusion zones will impact on the livelihoods of fishermen from Golovasi and Sahil Sitesi (settlements near the marine terminal), as a result of decreased access to fishing areas.

The BTC Project has assessed these impacts and has developed a set of management and monitoring plans to address these and many other issues (see box 12). The strategy for land acquisition is based on compensation for loss of livelihoods, and follows guidelines set out by the World Bank and Turkish legislation. A procedure for compensation will be developed and targeted at fishermen who experience a loss of livelihood as a result of the construction operation of the BTC Marine Terminal.

It is expected that there will be economic benefits through potential employment opportunities and sourcing of goods and services resulting from the BTC Project, as discussed in the employment section.


Bee keeping activities


Cattle loading, Erzurum Province


Fishermen of Golovasi, Adana

Box 12. Bee Keeping Along the BTC Pipeline Route

During Consultation it was established that bee keeping is conducted in all provinces through which the pipeline passes. Initial consultation revealed it is an important economic activity in some central and southern provinces, namely in Sivas (Imranli district), Kayseri (Fettahdere village and Sariz district) and Kahramanmaras (Andirin and Goksun district centres). Consultation at the village level conducted during September – October 2001 revealed concerns regarding the potential impact of pipeline construction on bee keeping activities.

"The region around Fettahdere [Kahramanmaras] is famous for its diverse flora and therefore the honey produced is regarded as very valuable with bee keepers from outside the region competing for use of the flora. Bees fly over a distance of 4km to access flora for honey production. We are concerned that our bee keeping activities will be impacted by the construction of the pipeline, which will be approximately 1km from our village."

To address and investigate these concerns, a specific study was undertaken by an agricultural engineer specialising in bee keeping and honey production in Turkey. The study outlined the seasonality of bee keeping activities, the different bee keeping methods (stationary and mobile) that are applied in Turkey, the economic aspects of bee keeping and the potential impacts of construction on bee keeping. The recommendations for mitigation included the following measures:

- **Confirming of the presence of bee keeping activities and determining whether they are mobile or stationary apiaries**
- **The area for expropriation along the pipeline route will be marked at least two months before the beginning of the honey production season**
- **Sub-governors and Muhtars in all areas where bee keeping is carried out, will be notified with an official letter, that they should not give permission to mobile bee keepers to position their hives within 300 m of the pipeline route**
- **At least two months before the beginning of the production season, the BTC Project will inform sub-governors and Muhtars of the need to move stationary apiaries more than 300 m from the pipeline route**

Employment

Currently opportunities for paid employment along the pipeline corridor are low, particularly in rural areas. Employment is therefore considered to be the most important potential benefit that the BTC Project can bring to local residents.

The BTC Project aims to maximise the opportunities for employment for local residents and to Turkey as a whole, whilst recognising the varied skill sets necessary for the construction and operation of a project of this size and other limitations such as the project timetable, financial constraints and safety of the BTC Project.

It is estimated that a total of approximately 5,000 workers will be employed at the peak of the construction phase. This will include skilled, semi-skilled and unskilled workers. Many skilled and semi-skilled positions will be for the whole project construction period. For the pipeline component, most unskilled construction positions will be for two to four months duration as construction teams move along the pipeline route. Longer periods of unskilled construction employment will be available at the construction camps, the main AGIs, such as pump stations, pressure reduction station, etc, and the marine terminal.

Upon commissioning, it is anticipated that up to 150 people will operate the pipeline and its AGIs in Turkey, and about 200 people will operate the marine terminal. All workers will receive appropriate health and safety training and job specific training as required. Settlements directly affected by the BTC Project will be given employment priority, followed by residents of the districts and provinces traversed by the pipeline or within which the BTC Marine Terminal is located. Turkish nationals will be given priority over expatriates, who will only be used where their particular skills and experience cannot be supplied by Turkish nationals.

There is a high expectation of local project employment in the settlements along the route and those adjacent to the BTC Marine Terminal. However, when compared to the total population of the neighbouring settlements, the BTC Project will provide a limited number of employment opportunities. To address this, information on employment opportunities and the recruitment process will be detailed in an Employment Strategy (see box 13), that will be developed in conjunction with the Contractors, BOTAŞ and BTC Co and communicated to all settlements within the pipeline corridor and adjacent to the BTC Marine Terminal. Concern remains, however, that the inability on the part of the BTC Project to deliver on high employment expectations could impact on relations between the BTC Project and local settlements.

Box 13. Employment strategy

The Employment Strategy will assist in managing employment expectations and will ensure that all those eligible have access to the recruitment process. Its objectives will be to maximise local employment in skilled, semi-skilled and unskilled categories during construction and operation of the BTC Project, to provide a fair and transparent recruitment process and to enhance the local skills base through training provided by the BTC Project.

Examples of employment opportunities (for illustration purposes only)

Environmental and social issues

Supply chain and procurement

Construction will require the use of a variety of goods and services. Community expectations regarding the possibilities of providing goods and services to the BTC Project are high. As far as possible, the contractor will procure goods from local suppliers both through preferential letting of sub-contracts to local firms (subject to availability, quality and cost) and purchasing of goods from local retailers. This will have a positive impact on local livelihoods.

Pipeline passing beneath railway line

In-migration

A sudden influx of job-seekers as a result of the BTC Pipeline and Marine Terminal is considered unlikely. However, a more gradual influx of job seekers to the Iskenderun Gulf Area, as a result of on-going industrialisation is expected. A policy on preferential employment of local labour will be published and implemented to try and counter any influx of labour.

Infrastructure and services

As a result of the overall poor quality of infrastructure and services in project-affected settlements, local residents and local authorities along the pipeline route are sensitive to any temporary or permanent reduction in infrastructure or service provision. The BTC Project has therefore, been designed to be largely self-sufficient in terms of telecommunications, energy, water supplies, sewage treatment, waste disposal and medical services, although it will use local roads and will access some energy and water from existing local supplies (see box 14).

Box 14. Mitigation of impacts on infrastructure and services

In order to mitigate against any negative impacts on infrastructure or service provision, the BTC Project will implement a number of key mitigation measures. These include:

- **use of appropriate construction techniques**
- **prior identification of features to be protected and/or reinstated**
- **working only within specific working areas**
- **identification of potential disruption in advance and where these have significant impacts, develop alternatives**
- **communication of all planned disruptions to the affected settlements at least three days in advance of the disruption**
- **restoration of all infrastructure to their pre-construction condition**
- **maintenance of flow in all irrigation channels, wherever possible**
- **implementation of a complaints and compensation procedure**

In a Project of this size it is likely that there will be some instances (largely unforeseen or unplanned) when infrastructure or services, including irrigation networks, are disrupted without notice or prior planning. A complaints procedure will be publicised at settlements along the route and in the vicinity of Ceyhan to ensure that a mechanism exists for anyone with a grievance to inform the BTC Project of their concern. All concerns will be investigated by the BTC Project management.

Satellite communication system

Pipeline avoiding existing infrastructure

For illustration purposes only

Environmental and social issues

Resource ownership and use

With regards to the BTC Pipeline, the major impacts on resource ownership and resource use will result from temporary and permanent expropriation of land required for construction of the pipeline and associated facilities, most importantly the four pump stations, the pressure reduction station, the 52 block valve stations, pipe storage areas and construction camps. With regards to the BTC Marine Terminal, the major impacts are likely to result from the construction of the BTC Jetty and the associated decrease in access to fishing grounds currently used by fishermen from Golovasi and Sahil Sitesi.

Some concern exists among surveyed households over the level of compensation that they will be awarded, and the length of time it will take to obtain compensation. A detailed strategy for land acquisition is currently being prepared in accordance with international standards. This study will ensure that affected persons are fairly and equitably compensated for their land and assisted in restoring their livelihoods (see box 15).

Box 15. Land Acquisition

The BTC Project has been carefully planned to completely avoid residential areas, therefore it will not require any physical resettlement. Land will however be required to construct the pipeline and all associated facilities. For most of the pipeline route, this land will only be required on a temporary basis, until construction is complete.

Approximately 3,000 ha of land along the pipeline corridor will be acquired, which will involve the permanent expropriation of an 8 m wide corridor and land for AGIs, including the temporary expropriation of a 28 m corridor (22 m corridor in forest areas) for pipeline construction. This accounts for a small portion of some 12,000 parcels of land, affecting approximately 29,000 landowners or users for a period of time.

A Resettlement Action Plan (RAP) is currently being prepared to address land acquisition and compensation issues. The RAP process involves the identification of landowners and users. In accordance with the recently revised Turkish Law and international best practice guidelines, an agreement on compensation will be reached with all landowners and users on the price of the land as well as for physical assets (trees, fences, water wells, etc.), and any crops on it. The value of these assets will be determined by the BTC land evaluation commission and will be made in accordance with fair market value. Compensation will be discussed between the landowner and a member of a negotiation team prior to the land being acquired. No construction will commence until agreed compensation has been paid.

Concern also exists over potential injury to livestock, potential reduction in fishing activities downstream of river crossings, and potential impact on bee keeping. The BTC Project has committed to ensuring safe movement and undisrupted access for livestock across the Right of Way; to prevent impacts on fisheries immediately downstream of pipeline crossings; and to preventing unnecessary disturbance of apiaries.

Community health and safety

Potential health impacts associated with the BTC Project (eg an increase in communicable diseases) is expected to be effectively controlled as a result of obligatory health screening for all successful applicants and the implementation of a Disease Awareness and Prevention Strategy, to be targeted at the BTC workforce and all settlements close to construction camps. A residual benefit of the BTC Project is thus improved health awareness among local residents and the workforce.

Safety risks as a result of construction work and associated activity will be of a low intensity and for the majority of settlements will be restricted to approximately two to four months duration of pipeline construction activity at any one particular location. Safety of the workforce and neighbouring communities is, however, a project priority. The BTC Project is therefore committed to preventing injury to local residents, the workforce and livestock, as a result of construction activities. The hazards posed by construction activities will be mitigated through a combination of communication with local residents and by implementing good working practices.

Increased traffic loads on neighbouring roads will present the greatest safety hazard for the BTC Project. To mitigate against this, traffic awareness training will be provided at local schools and at community meetings, and controls will be put in place to ensure that all construction traffic will travel at least 10 km/h below the legal speed limit.

Social disturbance

Settlements within close proximity to the construction camps (ie accessible by foot) or within driving distance could potentially experience disturbance from construction workers. However, all construction workers will have to abide by a Workers Code of Conduct that will include disciplinary measures for those that break Code requirements. It will cover such issues as having respect for local settlements and customs, not allowing any fishing, hunting or unauthorised gathering of natural products by construction workers, or illegal sale or purchase of alcohol or drugs.

Community relations

A Community Relations Programme has been designed in order to mitigate impacts from construction workers; minimise the potential for conflicts to arise; rapidly resolve any potential areas of friction; and look for ways in which the BTC Project can benefit local residents. As part of this Programme, the Construction Contractor will be required to develop a Community Relations Plan which will emphasise that workers conduct themselves as guests in the BTC Project area, and that any problems arising are rapidly resolved. The BTC Project will also appoint a Community Relations Team to monitor satisfactory implementation on effectiveness of all community relations procedures during both construction and operation of the pipeline. Cultural awareness will be included in the induction training for all workers.

Regular community meetings and open channels of communication will be actively promoted by the BTC Project. Should these measures prove ineffective, all settlements will be provided with contact details and all complaints will be dealt with promptly.

Risk assessment, oil spill prevention and response

An extensive programme of Environmental Risk Assessment (ERA) was undertaken for both the pipeline and the marine terminal. The BTC Pipeline ERA enabled the number and location of block valves, for isolating sections of the pipeline in the event of a leak, to be optimised. It additionally provided the basis for rational judgement and decision-making regarding such matters as the adequacy of key design measures, such as burial depth and pipeline wall thickness. It will also allow the detailed development of the Oil Spill Response Plan, including determining the oil spill response equipment to be made available at particular locations.

An ERA of oil spills impacting the marine/coastal environment has been undertaken. The risk assessment comprised the following elements:

- Technical Risk Assessment (TRA) with quantification of the frequency of accidental oil spills to the marine environment. The TRA is limited to the tank farm, the transport pipelines from the tank farm to the jetty, the jetty, the loading arm and to accidental events with the tankers within the operational zone of the terminal
- Oil drift modelling based on scenarios defined in the TRA
- Description of environmental conditions relevant for the risk assessment and establishment of Valuable Ecosystem Components (VEC), which will act as risk indicators. These were: fish and fisheries; salt marshes; waterfowl; sea turtles; and sea mammals
- Assessment of consequences of the VEC, based on the results of the oil drift modelling and effects of oil on the actual VEC
- Assessment of risk as a combination of frequency of an oil spill and its consequences to the VEC

The results show that the frequency and consequence values for the salt marsh (Valuable Ecosystem Components - VECs) is higher than for the other VECs. This signifies that the salt marshes in Yumurtalik lagoon have the highest environmental consequence due to operation of the BTC Marine Terminal. The Yumurtalik lagoon is also important for the waterfowl VEC and partly for the fish and fishery VEC. This acknowledges that the Yumurtalik lagoon is very sensitive and vulnerable to an oil spill from the oil export terminal. The dominating wind direction in the winter half-year makes oil drift south-southwest and possibly into the lagoon. In contrast, the predominating winds in the summer half-year, tends to press the oil further in to the Gulf of Iskenderun and there is therefore a lower probability of oiling the sensitive areas of Yumurtalik lagoon.

The second highest environmental risk is to the sea turtles, which are particularly sensitive during their breeding season from May until the end of September when the newborn sea turtles leave their nest.

The results of the risk assessment work will be used in developing the Oil Spill Response Plan. To minimise the local and long range impacts of such spills, prompt response is required as set out in the Oil Spill Response Plan. This will be supplemented by the Coastal Sensitivity and Shoreline Protection Plan and Containment Manuals.

Cumulative impacts

An assessment has been made of potential cumulative (combined) impacts of the BTC Project with present and anticipated future third party projects. This has been undertaken at the global, regional, national and local level.

At the global level, the BTC Project's contribution to greenhouse gas emissions will occur primarily during operation, when the BTC Project in Turkey will contribute approximately 0.0016% of global anthropogenic emissions of CO_2-e.

Sugozu Power Plant

At a regional level, the BTC Project, together with the Azeri, Chirag and Gunashli (ACG) and the Shah Deniz oil and gas projects, will provide significant developmental benefits to the economies of Azerbaijan, Georgia and Turkey.

At the national and local level, cumulative impacts are likely to occur due to the parallel development of the proposed BTC Pipeline, the proposed South Caucasus Pipeline (referred to in Turkey as the Shah Deniz Pipeline) and other planned infrastructure projects, including the proposed Koroglu Dam, and the Sugozu Power Plant (currently under construction) and the Sanko Holdings Petrochemical Plant. At a national level, considerable socio-economic benefits are expected from the inward investment and potential revenues associated with these developments, whilst the application of Turkish environmental and planning control legislation are viewed as providing appropriate mechanisms for mitigating and monitoring any potential negative impacts that might accrue.

At the local (route) level, there exists significant potential for cumulative impacts to arise at specific locations where BTC construction activities are scheduled to take place in close proximity to construction of the Shah Deniz Pipeline. Joint working arrangements are being discussed between these two projects, should their respective construction programmes indicate parallel or overlapping timetables.

The Iskenderun Gulf area has been identified as an industrial zone. There are three existing jetties and three planned jetties within the Gulf, each of which will have an associated marine exclusion zone. Other developments will also require land. Therefore, as development increases, the size of the fishing grounds available to local fishermen and land available for agriculture will continue to decrease. Although jobs will increase as a result of industrialisation, local residents, especially among the older generation, do not necessarily have the skills needed to gain employment. Without the necessary skills, local residents may have difficulty replacing lost sources of livelihood.

The BTC Project is committed to assisting in training local residents for transferable job skills thereby maximising the potential for local people to secure employment within the wider project area. However, such efforts will fall short of addressing all the cumulative impacts of industrialisation in the Iskenderun Gulf area, which is clearly not the full or sole responsibility of the BTC Project.

BTC Co. are committed to the implementation of a programme of sustainable community investments that are directed at settlements affected by the BTC Project. This programme will go some way towards bringing additional direct benefits to these settlements.

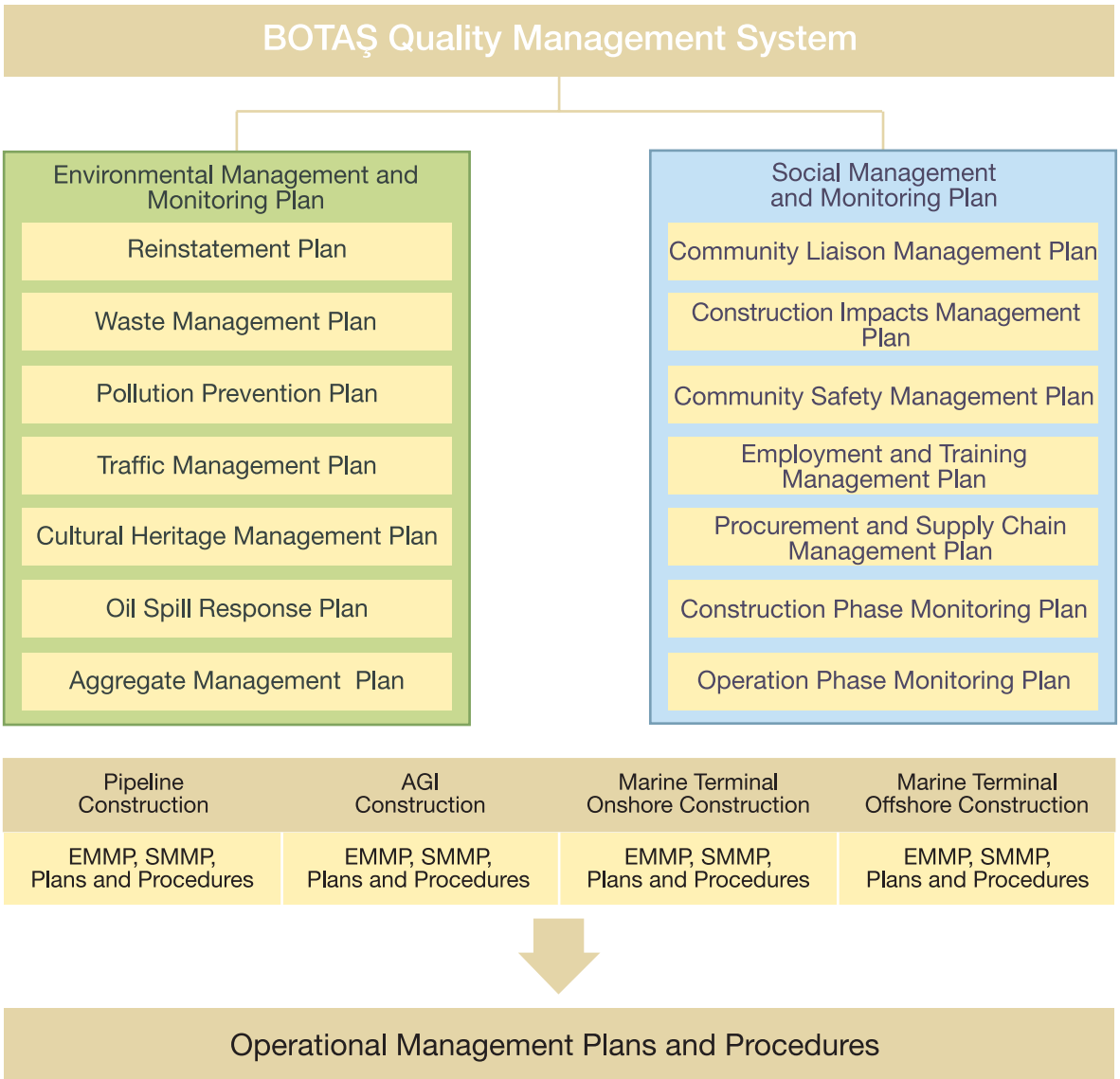
Implementation and management

This EIA has identified a large number of measures that will be implemented to minimise and mitigate the various potential environmental and social impacts from the BTC Project. There are two broad categories of mitigation measures:

- good practice measures specific to the nature of the intended activities that will ensure the facilities are built and operated to standards of international best practice
- site-specific measures, the implementation of which will be mandatory in order to validate the basis (and hence conclusions) of the EIA

While the EIA report (and this Non-Technical Summary) presents the findings and commitments resulting from the EIA process, the integration of environmental and social considerations into the implementation phases of the BTC Project will be an ongoing and dynamic management activity. A key vehicle for the delivery of environmental and social management scrutiny and control is the suite of management plans listed in figure 10.

Figure 10 Overview of Environmental and Social Management



Implementation and management

BOTAŞ is BTC Co.'s managing Contractor for the BTC Pipeline Project. The BTC Co. are committed to the full integration of environmental and social management requirements within the overall Project Management System to be applied to the construction, operation and eventual decommissioning of the BTC Project. Currently BOTAŞ Quality Management System is providing the overall framework for managing the design and construction of the BTC Project in Turkey. Within this, BOTAŞ has developed an Environmental Management System, in accordance with the international standard ISO 14001, for which they were accredited during the Basic Engineering phase of the BTC Project.

The management plans provide the mechanism for implementation of each and every mitigation measure and commitment identified by the EIA process. These plans also provide important information to a range of individuals from the BTC Project Directorate down to site personnel and from BTC Co. and BOTAŞ through to Construction Contractors and sub-contractors. The Construction Contractors are required to adopt the suite of management plans described above, and to develop these further in an iterative process according to the specific requirements of the activities they will be engaged in. This process has been initiated by including the requirements in the Invitation to Tender documents issued to prospective contractors. The development of these plans will be subject to BOTAŞ' and BTC Co.'s review and approval.

The current management plans will be integrated in to the construction environmental management system to be implemented by BOTAŞ on behalf of BTC Co. Commitments made in the EIA will also be embraced by the operating management system.

As public documents, the management plans, as detailed in the EIA, also provide a point of reference for regulators, communities and other interested parties who would like to understand the specific management activities to be implemented by the BTC Project as well as the allocation of responsibilities between the different parties involved. These management plans will also provide a basis for assessing the environmental and social performance of the BTC Project through external monitoring and will facilitate public scrutiny of the actions of the BTC Project.

The principal stages in the implementation of environmental and social management provisions are outlined in table 3.

Table 3. Steps in Implementation of Environmental and Social Management

Environmental and social management and monitoring plans	Description
Responsibilities	BOTAŞ are responsible for implementing the provisions of the EMMP and the SMMP and supporting plans. Contractors will be responsible for the implementation of, and adherence to, all the mitigation measures outlined in the EIA the EMMP and the SMMP. BTC Co. will ensure that the management plans are implemented
Inspection, Monitoring, and Auditing	BOTAŞ and its contractors will be required to demonstrate how the requirements of the EMMP, SMMP and EIA Report are being complied with. Site inspections and more formal audits by BOTAŞ will be undertaken on a regular basis. Contractors will also be required to implement a programme of internal inspections and audits. BTC Co. will act in a assurance role
Complaints Procedure and Resolution of Problems	BOTAŞ, in coordination with its various contractors, will set up a complaints procedure that will enable any complaint to be made direct to the Contractor Community Liaison Officer. Each complaint will be investigated by a BOTAŞ or Contractor Community Liaison Officer and action taken where necessary. BTC Co. will monitor the process and intervene if required
Training	BOTAŞ and its contractors will develop and implement an appropriately focused training programme that addresses the environmental and social management issues raised by the BTC Project. BTC Co. will ensure that the requisite training is provided to all personnel
Reporting and Review	BOTAŞ will develop and implement a programme of environmental and social reporting throughout all stages of the BTC Project. The reporting programme will form the basis of a programme of regular performance reviews of both contractor and BOTAŞ performance. These reviews will be used to identify areas and strategies for improvement in environmental and social performance. BTC Co. will monitor performance and intervene as necessary

Although the EMMP, SMMP and supporting environmental and social management plans are primarily aimed at the construction and commissioning phases of the BTC Project, the standards, general requirements and principles outlined in these documents will also apply throughout the operational phase of the BTC Project.

Investment programmes

The Management and Monitoring Plans described above concern the specific project commitments and mitigation measures upon which the EIA is predicated.

Outside of the EIA Process, however, BTC Co. are committed to designing and implementing Environmental and Community Investment Programmes. These programmes are not mitigation measures but are being developed to achieve positive lasting benefits to both the environment and communities. Additionally, respect for the environment, promoting safety of personnel and contributing towards community development are among the strategic aims identified by BOTAŞ General Management in the scope of their Integrated Management System.

Environmental investment programme

Background

Whilst significant efforts have been taken to avoid areas of high biodiversity, largely through route selection and careful siting of above ground facilities, it is recognised that there are residual impacts on natural habitats. Direct mitigation measures and reinstatement practices will ensure that effects on natural habitats are minimized. Furthermore, to meet the requirements of the World Bank Group Policy on Natural Habitats (Operational Policy 4.04, June 2001), an Environmental Investment Programme (EIP) will be established. The aim of the EIP will be, where possible, to enhance biodiversity either directly in the area of potential impact, or indirectly through offset projects.

Objectives of Environmental Investments

The primary focus of the EIP will be on Protected Areas (either designated or proposed) and protected species. In addition, areas of high ecological significance outside the protected areas system or other key species will be considered.

Environmental Investment Principles

The EIP is in the process of development. This is being undertaken through consultation with stakeholders to gain an understanding of issues/areas of concern where input would be most valuable. The intention is that potential schemes are developed and implemented in conjunction with relevant stakeholder bodies and the identification of potential partners is underway.

Community investment programme

Background

BTC Co. are committed to designing and implementing a Community Investment Programme (CIP) in the areas most affected by the construction activities.

Objective of Community Investment

The objective of the CIP is to have a positive impact on communities most affected by construction activities by providing direct benefits, and by engaging with and adding value to local communities in a sustainable way. Currently BTC Co. intends to implement two types of community investment projects:

- **Local Community Projects:** these projects are relatively small in scale and duration but respond to an immediate felt need at the community level. Ideas for potential projects will be based on consultation undertaken during the EIA process, which identified both household and village level needs. In addition, BTC Co. will consult with locally active NGOs to vet these potential ideas, gain from the experience of NGOs in the region, and identify potential NGO implementation partners.

- **Sustainable Development Projects:** These projects will form the bulk of the community investment programme. It is anticipated that they will be much larger in scale and longer term and will aim to provide sustainable development benefits. These projects will take place primarily in communities that are directly affected by pipeline activities, but may be extended to nearby towns or groups of villages. Ideas for potential projects will be drawn from village level consultations. This will require substantial discussion with active NGOs, international development agencies and government in order to ensure that BTC Co. is neither duplicating effort nor assuming the responsibilities of local or national authorities, but instead is adding value and/or filling needed gaps.

Contact details

The EIA for the Turkish section of the BTC Pipeline Project has been more than two years in preparation. The Draft EIA and this summary document – the NTS – were produced in order to gain feedback from all interested parties during the 'Disclosure Period.' This was a 60-day period during which the draft EIA Report was made available for comment. Following the receipt of comments the EIA was finalised and submitted to the Ministry of Environment of the Turkish Government for approval.

For further information on the BTC Project, please refer to the following web-sites:

Web site: www.caspiandevelopmentandexport.com, where you can make comments on the BTC Project

Web site: www.btc.com.tr (BOTAŞ web site linked to www.caspiandevelopmentandexport.com)

For comments directed to the BOTAŞ Community Relations Team please call the following number:

Free Phone: 0800 314 1001 (answering machine outside of normal working hours)

For comments directed to BOTAŞ:

Environment Department
BOTAŞ Baku-Tbilisi-Ceyhan Crude Oil Pipeline Directorate
Sogutozu Mahallesi, Sogutozu Caddesi No: 31
Sogutozu / ANKARA
Phone : (0312) 285 44 55
Fax : (0312) 284 11 34

For comments directed to BP – representing the BTC Co.:

BP Exploration (Caspian Sea) Ltd
Sogutozu Mahallesi, Sogutozu Caddesi No: 31
Kat: 7
Sogutozu / ANKARA
Phone : (0312) 287 12 34
Fax : (0312) 287 20 04

* Photographs by Philip J. Edwards (including bottom insert photograph on cover page)

www.caspian**development**and**export**.com

ERM

Consultants Disclaimer

ERM has prepared this report for the sole use of the Client and for the intended purposes as stated in the agreement between the Client and ERM under which this work was completed. The report may not be relied upon by any other party without the express written agreement of ERM.

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Every effort has been made to ensure the quality of translation is technically correct. However, where discrepancies between the various translated texts occur, the English version is to be relied upon as the original and formal version.

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For and on behalf of
Environmental Resources Management

Approved by: DONALD MAC INTYRE

Signed: 

Position: DIRECTOR

Date: 17 SEPTEMBER, 2002

Acknowledgements

The key parties involved in the preparation of the EIA are listed below.

List of principal participants and contributors

SPECIALIST CONSULTANTS	PROJECT ROLE
ERM	Environmental Impact Assessment, Social Impact Assessment, and overall EIA reporting
ENVY	Environmental baseline data collection and Environmental Impact Assessment
KORA	Social baseline data collection and Social Impact Assessment
Veri Arastirma	Social baseline data collection and baseline field surveys

However, many other Turkish experts and consulting bodies were also involved in the EIA process. The major institutions involved are summarized below. A full list is given in Appendix E to this report.

Summary of Turkish Institutions Consulted

INSTITUTIONS	PROJECT ROLE
Ministry of Environment	Environmental baseline data collection
Ministry of Culture	Environmental baseline data collection and consultation on impact minimization for route narrowing works
General Directorate of Mineral Research and Exploration (MTA)	Environmental baseline data collection and consultation on impact minimization for route narrowing works
Middle East Technical University, Erdemli Marine Science Institute	Environmental baseline data collection and baseline field surveys
Ankara University, Department of Archaeology	Environmental baseline data collection and baseline field surveys
Middle East Technical University, TACDAM	Environmental baseline data collection and baseline field surveys
Ege University, Department of Biology	Environmental baseline data collection and baseline field surveys

In addition to the above-mentioned institutions, local residents, interest groups and Non Governmental Oragnisations and the relevant authorities (including regional and/or provincial directorates of government agencies) of the ten provincial governorships, through which the BTC Pipeline route traverses, were consulted.

GLOSSARY

A

AAQC	Ambient Air Quality Criteria
Abiotic	Relating to the non-biological components of the environment.
AC	Alternating Current
ACG	Azeri Chirag and the Deepwater Portion of the Gunashli Field
AGI	Above Ground Installation (such as a block valve or pump station location)
AGT	Azerbaijan Georgia Turkey pipelines project - BTC and SCP combined
AI	Asset Index
AIOC	Azerbaijan International Operating Company
ALARP	As Low As Reasonably Practicable
Alluvial	Relating to or consisting of any material that has been carried or deposited by running water.
Alluvial fan	An outspread, relatively flat or gently sloping, fan or cone shaped mass of loose material that is deposited by a stream or river at points where the flow is slowed, as when it descends onto a plain or where it joins with the main stream.
Alluvial plain	A flat or gently sloping tract of land alongside a periodically overflowing river that is produced by the deposition of alluvium. Also, wash plain, waste plain
Alluvium	Clay, mud, sand, silt, gravel, and other unconsolidated detritus matter that is carried along and deposited by flowing water
Ambient noise	Ambient noise is the “totally encompassing sound in a given situation in a given time. Usually composed of sound from many sources near and far” (ISO 1996-1)
Amphibian	A cold-blooded vertebrate, typically living on land but breeding in water (eg frogs, newts).
AMSL	Above Mean Sea Level
ANSI	American National Standards Institute
Anti-scour devices	Impermeable barriers built around uphill and downhill pipeline sections to prevent erosion
Anthropogenic	Man-made or arising from man’s activities.
API	American Petroleum Institute
Aquifer	A permeable body of rock or other geologic structure that contains and conducts quantities of groundwater.
asl	Above sea level
ASME	American Society of Mechanical Engineers
Asset Index	Index developed for the Project to aid in the measurement of wealth amongst households.
Assets	Property owned by a person or company, regarded as having value and available to meet debts, commitment, or legacies.

Auger Boring	Sampling or drill using a cork-skrew bore.
Averaging time	The period of time over which measurements are averaged
A-weighting	This is a frequency weighting devised to attempt to take into account the fact that human response to sound is not equally sensitive to all frequencies. A-weighting most closely matches the sensitivity of the human ear to sound

B

Backhoes	Excavators
BACT	Best Available Control Technology
Ballast	Course Stone.
Barg	Bar Gauge – a unit of pressure. Zero barg is equivalent to 1 atmosphere pressure.
Basalt	A common dark volcanic rock.
Baseline	Existing conditions. See also 'Baseline studies'
Baseline studies	Studies conducted to establish the actual conditions at a specific period in time, to enable predictive and comparative studies to be conducted in the future in order to determine whether there is a predicted impact. The baseline studies in this report are primarily Environmental and Socio-Economic
Bathymetry	The science of measuring the depths of oceans and other large bodies of water.
BATNEEC	Best Available Techniques Not Entailing Excessive Cost
BCM	Billion Cubic Metres (10^9). Standard temperature and pressure are 0ºC and 1atmexpand to atmosphere, respectively
BE	Basic Engineering
Benthic	Pertaining to the biological component of a system.
Benthos	Used to describe those organisms associated with the seabed.
Berm	An engineered (earth) bank forming secondary containment around tanks or a screen mound or stockpile
Biological diversity (biodiversity)	Variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part (Convention on Biological Diversity 1992)
Biotic	Pertaining to the biological component of a system.
Bivalves	Two-shelled shellfish such as clams, mussels, oysters and scallops.
BV	Block Valve
Block Valve Station	A valve for isolating the pipeline into distinct sections
Biochemical Oxygen Demand (BOD)	Measure of how much of the oxygen is used up by organisms in the water. BOD is the most important general indicator of pollution for most streams

BOD_5	BOD_5 is a most commonly used test where BOD is determined by measuring the dissolved oxygen (DO) level of a water sample after 5 days and comparing it to the original DO level. The test is generally used to identify the level of pollution in waters
Borrow pit	A pit created to provide fill material for another location usually involving construction activities
BOTAŞ	Boru Hatlari ile Petrol Taşima A.Ş. (Petroleum Pipeline Corporation established by the Turkish Petroleum Corporation)
BP	British Petroleum. International energy group currently leading work on the BTC and SCP projects
BPEO	Best Practicable Environmental Option
BPM	Best Practicable Means.
Bray-Curtis Measure	A measure of the similarity between two or more ecological communities.
Breasting Dolphins	Structure that takes the impact of a vessel when it berths and holds the vessel against the berth.
Breccias	Rock type consisting of angular fragments embedded in a concreted finer matrix
Bronze Age	Technological stage between the Stone and Iron Ages, beginning in the Middle East about 4,500 BC and lasting in Europe from 2,000-500 BC
Bryzoans	Small sessile aquatic animals, generally forming mat-like encrusting colonies on hard submerged objects (rocks, stones, shells etc).
BS	British Standard
BSI	British Standard Institute
BTC	Baku-Tbilisi-Ceyhan Crude Oil Pipeline, alternatively known as the Main Export Pipeline (MEP)
BTC Co	BTC Pipeline Company (operating company to be formed in due course)
BTC Owners	The companies sponsors of the BTC Project (listed in Section 1 and the PCDP)
BTEX	Benzene, Toluene, Ethyl benzene and Xylene
BU	Business Unit
Bunding	A form of secondary containment, around tanks
BVS	Block Valve Station

C

C2+/C4/C5+	Hydrocarbons with more than two/four/more than 5 carbon atoms
CAII	Composite Asset Income Index
Calcarenite	Cemented calcareous particulate substrate.
Catchment	The area of land bounded by watersheds draining into a river, basin or reservoir.

Cathodic protection (CP)	Anti-corrosion system based on physical principle of ion exchange.
Causeway	A raised path or road crossing water.
CCME	Canadian Council of Ministers of the Environment
CEMS	Continuous Emissions Monitoring System
Cetacean	A class of marine mammals that includes whales, dolphins and porpoises
Cenozoic	Geological time period: see Geological Time Scale at the end of glossary
CEP	Caspian Environment Programme
CH_4	Methane
Chlorophyll-a	The main green pigment in plants, responsible for photosynthetic activity and used as an indicator of algal abundance in aquatic environments
CHMP	Cultural Heritage Management Plan
Chrysophyte	A group of marine predominantly microscopic algae, characterised by yellow/brown pigmentation.
CIMMP	Community Impacts Management and Monitoring Plan
CITES	Convention on International Trade in Endangered Species
Cladocerans	Water fleas; a group of small aquatic crustaceans that are an important component of the zooplankton.
Clastic	Describing a rock that have been transported from their places of origin.
CLO(s)	Community Liaison Officer (s)
CMT	Ceyhan Marine Terminal.
Cnidarians	The group of soft-bodied radially symmetrical animals, including sea anemones, corals and jellyfish.
CO	Carbon monoxide
CO_2	Carbon dioxide
COD	Chemical Oxygen Demand is a test for assessing the quality of effluents and wastewaters prior to discharge. The COD test predicts the oxygen requirement of the effluent and is used for the monitoring and control of discharges, and for assessing treatment plant performance
Composite Asset Income Index	Also referred to as CAII, an index developed for the Project to measure wealth of households in terms of assets and income levels.
CONCAWE	Conservation of Clean Air and Water in Europe – the oil companies' European organization for environment, health and safety
Continental shelf	The sea bottom from the shore out to a depth of 200m; a zone adjacent to a continent or around an island, and extending from the low water line to the depth at which there is usually a marked increase of slope to greater depth; the edge of the continent that is submerged in relatively shallow ocean water.
Consequences	A result or effect of an action or impact.

Copepods	The major group of small crustaceans; some are free-swimming, while others are parasitic.
Coralligene	A typically Mediterranean marine habitat characterised by specialised red algae that secrete coral-like skeletons.
CP	Cathodic Protection. The protection of a metallic material from corrosion, effected either by coupling such material with a less noble metal or by impressing a current
Cp	Centipoise (a unit of dynamic viscosity)
CPC	Caspian Pipeline Consortium
Cretaceous	The final period of the Mesozoic era (after the Jurassic and before the Tertiary period of the Cenozoic era), covering the span of time between 135 and 65 million years ago
Crustaceans	A highly diverse group of animals with a hard outer skeleton. Though the group is predominantly aquatic, it comprises such animals as woodlice, water fleas, barnacles, crabs, lobsters and shrimps.
CSR	Corporate Social Responsibility
Cumulative Impacts	"Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project" (EC, 1999)
Cuvette	Straight sided container for out planting
Cyanophyte	A primitive plant with blue-green pigments, more closely related to bacteria than true plants.

D

DE	Detailed Engineering
Decapod	A type of crustacean with five pairs of walking limbs; generally a collective term used to describe crabs, lobsters and shrimps.
Decibel (Db)	Sound can be defined as any pressure variation that the human ear can detect, such that the decibel is the unit of measurement of that pressure variation
DB(A)	A measurement on the decibel scale with A-weighting (see 'Decibel')
Delta	A nearly level, often triangular alluvial plain occurring between diverging branches of the mouth of a river (adj. *Deltaic*)
Demarcated	The limit of the boundary.
Demersal	Associated with, but not living on, the seabed. This term is often used to describe fish that feed near the seabed such as cod.
Diatom	A microscopic unicellur alga having a cell wall impregnated with silica. Usually the dominant plant in the plankton.
Dinoflagellate	A widespread group of unicellular organisms, with characteristics of both plants and animals, common in the plankton. Some species are toxic.
Directional drilling	Drilling to deviate from the vertical in order to bypass obstacles
Diurnal	Active during the day.

DO	Dissolved Oxygen – represented either as a % or as mg/l
DPT	State Planning Organisation
DSA	Designated State Authority
DSI	State Hydraulic Affairs
Dual carriageway	A road of width sufficient for the passage of traffic in both directions at a time, but with a physical barrier between opposing directions; there are therefore two separate road surfaces (carriageways), one for each direction. The number of lanes can vary, but would rarely exceed four in any one direction, and can be as low as one
Duration	The length of time that something lasts or continues.
Dwt	Deadweight ton

E

EA	Environmental Assessment
EAGQ or EA	European Air Quality Guidelines
EAL	Environmental Assessment Level
EAP	Environmental Action Plan
EA-UK	Environment Agency – United Kingdom
EBRD	The European Bank of Reconstruction and Development
EC	European Community, now known as the European Union
ECA	Export Credit Agency
Echinoderms	A group of radially symmetrical animals possessing a hard outer covering, that includes starfish and sea-urchins.
Ecosystem	A system involving the interactions between a community and its non-living environment.
Effect	Something produced either positive or negative by a cause or agent.
EIA	Environmental Impact Assessment – the process of collecting data, consulting with interested parties, assessing significant environmental impacts (positive and negative) and defining mitigation measures
EIP	Environmental Investment Programme
EMP	Environmental Management Plan
EMMP	Environmental Management and Monitoring Plan.
EMS	Environmental Management System
EN	“Endangered” according to IUCN Red List categories
Endemic	Present within a localised area.
Environmental Appraisal	A structured environmental audit or assessment which is reported outside of the formal EIA approvals process.

Eocene	An epoch of the early Tertiary period, after the Palaeocene and before the Oligocene corresponding to the period 53 to 37 million years ago
Eolian	Pertaining to wind deposited sediments
Ephemeral	A short lived organisms.
Epibenthos	Organisms living on the surface of the bed of a body of water, or encrusting on submerged objects.
Epicentre	The point on the earth's surface directly above the focus of an earthquake.
Epifauna	The animal component of the epibenthos.
Epoch	A unit of geologic time, longer than an age and representing a subdivision of a period during which the rocks of a particular series were formed
EQO	Environmental Quality Objectives
EQS	Environmental Quality Standards
Era	A unit of geologic time that includes two or more periods grouped together
ERA	Environmental Risk Assessment
ERC	Emergency Release Coupling.
ERM	The company Environmental Resources Management Ltd
ERS	Emergency Release System.
ERT	Emergency Response Team
ES	Environmental Statement
ESA	Ecologically Sensitive Area.
ESD	The Emergency Shutdown System
ET	Event Tree. In risk assessment, a sequence of events that lead to an incident
EU	European Union formerly known as the European Community
Extent	The range over which something extends.

F

Fault	A rock fracture along which movement or displacement in the plane of the fracture has taken place
Fauna	Animal life.
FBE	Fusion Bonded Epoxy – a pipe coating system (internal or external) for corrosion protection
FEA	Finite Element Analysis.
FEED	Front End Engineering and Design
Fender	A cushion like device hung on the side of vessel to reduce damage resulting from collision.

Fetch	The distance of the sea over which a wind blows which largely determines the height of waves.
Flagging	Demarcation of site/ services of particular interest or sensitivity
Flare	A process system for burning gas, either waste gas or vented for emergency relief
Flysch	A graded, thinly-bedded, poorly fossiliferous sequence of marls, sandy to calcareous shales interbedded with coarser sandstones, conglomerates and greywackes
Fold	A bend or buckle in bedded sedimentary rock or other planar structures, usually produced by deformation
Forb	A term for any herb plant that is not a grass
FRT	Emergency Repare Team
FTZ	Free Trade Zone
Fugitives (emissions)	Discontinuous, diffuse, usually accidental, emissions to atmosphere

G

Gabion	A stone / earth filled open wire mesh container used to strengthen river banks, steep slopes and foundations
GAD	South Eastern Anatolian Project
Gale	A gale is labeled as a scale 8 wind on the Beaufort Scale and is defined by the World Meteorological Organization (WMO) as a wind traveling between 34-40 knots (17-20m/s)
Gauging pig	A device which can be passed through a pipe to assess its dimensions
GC	Gas Chromatography
GCM	General Circulation Models
GC-PID	Perkin-Elmer Voyager Gas Chromatograph-Photoionisation Detector
GDP	Gross Domestic Product
GDP Real Growth Rate	Growth in GDP measured at constant prices ie after price changes have been eliminated
GHG	Greenhouse Gases
GIS	Geographical Information System – a digital process of mapping data in layers related to a geo-referenced base
GNP	Gross National Product
GPS	Global Positioning System
Ground surface temperature	The temperature of/at the ground surface (as opposed to the temperature beneath the surface)
GT	Gas Turbine
GWP	Global Warming Potential

H

HCFC	Hydro-chlorofluorocarbons
HDR	Human Development Report (UNDP)
HFC	Hydro-fluorocarbon
HGA	Host Government Agreement
HH	Household
HIV	Human Immunodeficiency Virus. Responsible for the illness Acquired Immune Deficiency Syndrome
HP	High Pressure
HSE	Health, Safety and Environment
HVAC	Heating, Ventilation and Air Conditioning
Hydrotest	A process of testing the pressure integrity of a pipeline using water at an elevated pressure for an extended period defined by the relevant API pipeline code
Hydrotest fluids	Fluids used in hydrostatic testing (eg water, possibly with biocides, oxygen scavengers, antifreeze, corrosion inhibitors and dyes)

I

IFC	International Finance Corporation, a member of the World Bank Group
IFI	International Finance Institution
IGA	Inter-Government Agreement
IGE	The Institute of Gas Engineers
ILO	International Labour Organization
IMF	International Monetary Fund
IMO	İnternational Maritime Organisation
Imam	Religious Leader (head of the mosque)
Impact (social)	"The consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs and generally cope as members or society. The term also includes cultural impacts involving changes to the norms, values, and beliefs that guide and rationalize their cognition of themselves and their society" (US Department of Commerce, May 1994)
Incident	A definite occurrence or event
Inspection crew	1) The crew who check the pipeline design and pipeline codes; or 2) The crew who radiographically or ultrasonically inspects the condition of the pipeline and welds prior to pipe wrapping
IP	The Institute of Petroleum
IPT1	Pressure Reduction Station

Iron Age	Technological time following the Bronze Age (cf Bronze Age)
ISO	International Standards Organization
IŞKUR	Turkish Employment Agency
Issue	An element requiring consideration and assessment for which a policy or a specific mitigation strategy may need to be defined.
ITT	Invitation To Tender
IUCN	International Union for the Conservation of Nature

J

Jandarma	Local security force

K

KJ	Kilo-joule
Kg/m^3	Kilo-grams per cubic metre
Koy	Central core of a settlement
KORA METU	Centre for Black Sea and Central Asia Studies (KORA), a centre for research within the Middle East Technical University (METU) (national social consultants).
KP	Kilometre Point
Kpa	Kilopascal
KPIs	Key Performance Indicators
Kura	The Turkish/Azeri name for the Mtkvari River
Kv	Kilovolt
Kw	Kilowatt

L

$L_A$eq, $_T$ (Db)	A measure of “average” sound pressure level (over a specified time period, T). The constant level of noise that would have provided the same acoustic energy as the actual fluctuating sound during the same period.
$L_{AN, T}$	The percentile level, ie the sound pressure level in Db_A which is exceeded for *N*% of the time interval *T*. eg L_{10} and L_{90}
L_P	Sound Pressure Level – the fluctuations in air pressure created by sound and described using the decibel scale rather than as pascals
L_W	Sound Power Level – the sound energy radiated per unit time by a sound source described using the decibel scale rather than as Watts

M

M	Metre/s

m. AMSL	Metres above mean sea level
MAOP	Maximum Allowable Operating Pressure
Mb	Millibar
Mbd	Million barrels per day
MBOPD	Thousand barrels of oil produced per day
MPT	Magnetic Particle Testing
MCR	Maximum Continuous Rating
Measurement time interval – T_m	The total time over which measurements are taken (eg this may consist of the sum of a number of non-contiguous, short-term measurement time intervals)
Medieval period	An archaeological time period lasting approximately 800 AD to 1,500 AD
MENR	Ministry of Energy and Natural Resources
MEP	Main Export Pipeline. An earlier alternative name for the Baku – Tbilisi-Ceyhan (BTC) oil pipeline
MEPP	Main Export Pipeline Participants
Mercaptan	The odoriser that is added to natural gas to make it easier to detect in case of a leak
Mesolithic	The archaeological period between the Palaeolithic and the Neolithic (12,000-9,000 BC)
Mesozoic	Geological era from 64/65 – 225 million BC.
Mezra	Hamlet
Mg/eq	Milligrams-equivalent (measure of water hardness)
Mg/l	Milligram per litre
Miocene	A geological epoch in the Cenozoic era between 7 – 26 million BC.
MJ	Mega joule
MLAs	Multilateral Lending Agencies
MMBOPD	Million barrels of oil produced per day
MMSCF/D	Million Standard Cubic Feet per Day
MMscmd	Million Standard Cubic Metres per Day
MMSCM/H	Million Standard Cubic Meters of Gas per Hour
MMSCM/D	Million Standard Cubic Meters of Gas per Day
Mole	The mole is the standard method in chemistry for communicating how much of a substance is present. In one mole, there are 6.022×10^{23} atoms.
MPN	Most Probable Number – used for microbiological analysis of water and wastewater
MoC	Ministry of Culture
MoE	Ministry of Environment
MoH	Ministry of Health
MPI	Magnetic Particle Testing/Inspection

MS	Mass Spectrometry
MSDS	Material Safety Data Sheets
MSS	Manufacture Standardization Society
MSSOP	Maximum Steady State Operating Pressure
MT	Million tonnes
MT/A	Million tonnes per annum
Muhtar	Settlement Head
MW	Megawatt

N

NCR	Noise Control Regulation
NEAP	National Environmental Action Plan
Neocene	Geological time period
Neolithic	Geological time period
NGP	East Anatolian Natural Gas Pipeline (also referred to as East Anatolian NGP)
NO_2	Nitrogen dioxide
NDT	Non-Destructive Testing
NFPA	National Fire Prevention Association
NORM	Naturally Occurring Radioactive Material (eg radium)
NO_x	Nitrogen Oxides
NREP	Northern Route Export Pipeline
NSPS	New Source Performance Standards (of the US EPA)

O

O_2	Oxygen
O_3	Ozone
OECD	Organization for Economic Co-operation and Development
OLAP	Overview of the Land Acquisition Process
Oligocene	An epoch of the early Tertiary period, after the Eocene and before the Miocene; corresponding worldwide series of rocks (37 to 23 million years ago)
Open cut crossing	Standard trenching technique for crossing a water body
OPIC	Overseas Private Investment Corporation
Orogenic	Mountain building process, or relating to the process by which great, elongate chains of mountains are formed
OSRP	Oil Spill Response Plan
OWS	Oil/Water Separator
Oxygen scavengers	Chemicals that convert available oxygen into an unreactive form

P

P&ID	Process and Instrumentation Drawings
PAH	Polynuclear Aromatic Hydrocarbons
Palaeocene	Geological epoch in the Palaeogene period of the Cenozoic era, from 53/54 – 64/65 million BC.
Paleocene	See “Palaeocene”
Palaeogene	Geological time period comprising the Oligocene, Eocene and Paleocene epochs from 26 to 64/65 million BC.
Pascal	A unit of pressure equal to $1N/m^2$
PCDP	Public Consultation and Disclosure Plan
Pelagic	Free-swimming. The term *Epipelagic* describes organisms swimming in the upper water column, while Bathypelagic describes free swimming deep water animals.
PERCS	Property, Engineering, Referencing and Consultation System
PFD	Process Flow Diagram
PH	Measure of acidity/alkalinity
Phytogeographic	Plant or vegetation of geographical location.
Phytoplankton	The plant component of the plankton, usually comprising unicellular algae and dominated by diatoms.
P&ID	Process and Instrumentation diagram
Pig	A generic term to describe a device that travels inside the pipeline (Pipeline Integrity Gauge). ‘Pigs’ can be used for a number of purposes including cleaning, gauging and measuring the condition within the pipeline
Pigging	The process of cleaning or measuring internally the pipeline whereby a ‘pig’ is sent though the line to clean/ measure the inside of the pipeline
Pipe dump	The area used to store pipes on a dockside or prior to being transported to the spread.
Pipe jacking	Construction method used on large diameter pipelines and involves the carrier pipe being installed behind a protective shield using a combination of normal mining techniques and hydraulic jacks to drive the pipe forward, with the excavated material being removed via the exposed end of the pipe
Pipe padding	A layer of material placed under the pipeline used to protect the pipeline surface
Pipe yard	The area used for the temporary storage of pipe prior to spread
Piscivorous	Fish Eating
Plankton	Organisms that live in the water column, but are generally transported by water movements as opposed to their own locomotory powers.
Pleistocene	Geological epoch in the Quaternary period of the Cenozoic era from 1.5 million BC.

PM	Particulate Matter
PM_{10}	Particulate Matter of less than 10µm aerodynamic diameter
Polychaetes	Marine bristleworms. Generally a very important component of marine invertebrate communities.
PPAH	Pollution Prevention and Abatement Handbook (World Bank publication)
ppb	Parts per billion (10^9)
PPE	Personal Protective Equipment
ppm	Parts per million (10^6)
ppmv:	Parts per million by volume
PPP	Pollution Prevention Plan
PRS	**Pressure Reduction Station**
PRO	Public Relations Organisation
PSA	Production Sharing Agreement
PT	**Pump Station**

Q

QA	Quality Assurance
QRA	Quantified Risk Assessment
Quaternary	Geological time period comprising the Holocene and Pleistocene epochs in the Cenozoic era (less than 1.5 million BC)
Qualitative	Involving or relating to distinctions based on quality or quantities.

R

Radiography	The production of an image on a specially sensitised photographic paper, using x-rays or gamma rays.
RAP	Resettlement Action Plan
Raptor	Bird of Prey
RCWP	Regulation on Control of Water Pollution
Reference time interval - T_r	The specified interval over which an equivalent continuous A-weighted SPL is determined
Re-instatement	The process of restoring the area to its prior state after pipeline laying (includes replacement of topsoil, vegetation, fences, etc to all disturbed areas associated with the construction of the pipeline or pipeline facilities after their installation)
Reinstatement crew	The crew that implements reinstatement
Relict	A term used to describe a feature (or population) persisting in time and representing the surviving remnants of a formerly more widespread feature.
Reptiles	A croup of cold blooded vertebrates, including snakes, lizards and turtles.

Residual impact	The impact that remains after the application of mitigation and management measures
Restoration	The process of restoring the area to its prior state after pipeline laying
RH	Relative Humidity
Richter Scale	A logarithmic scale ranging from one to nine that expresses the magnitude (Richter magnitude) of an earthquake based on a measurement of the amount of energy dispersed during the event (named for Charles F. *Richter*).
Riparian	Inhabiting, or situated on the bank of a river.
Rip-rap	Large stones blocks from a quarry and which are placed on a riverbank to prevent erosion. The stones are sometimes embedded in concrete
RPAQ	Preservation of Air Quality
RoW	The corridor area required for the construction and installation of the pipeline See also “FCI ROW”
RoW	Right of Way
RTU	Remote Test Unit/remote telemetry unit

S

SA	Slightly Acidic
SB	Slightly Basic
Safety Factor	A multiplier that is used to ensure that the maximum design load or capacity falls below the maximum value that could be sustained by a pipeline system component or structure without failure
SCADA	Supervisory Control and Data Acquisition
Scoping	The process of identifying the key environmental and social issues in the development of a project and seeking agreement with interested parties in how these are to be addressed in the EIA and SIA process.
SCP	South Caucasus Gas Pipeline (previously termed Shah Deniz Gas Pipeline)
SCP Co	The companies who sponsor the SCP project (listed in the PCDP)
SCP Owners	See PCDP
Scraper	Also known as a ‘pig’, it is released periodically during pipeline operations to scrape the sides of the pipeline free of wax which is inherent in the crude being transferred and is continually deposited on the internal walls of the pipe.
SCREEN3	US EPA’s regulatory screening model for various air permitting applications
SCS	Station Control System
SDGP	Shah Deniz Gas Pipeline (see also SCP)

Sensitivity	1) The ability of a device or organism to respond to external stimuli; or 2) The degree to which a device or organism is affected by a particular stimulus
Shah Deniz Group	The group of partners generally based upon the partners in the Shah Deniz PSA, brought together to accomplish the export of Shah Deniz gas to Turkey in fulfilment of the agreement between SOCAR and BOTAS
SIA	Social Impact Assessment - the process of collecting data, consulting with interested parties, assessing significant social impacts and defining mitigation measures
SIS	State Institute of Statistics
Sm^3	Standard cubic metre
SMMP	Social Management Monitoring Plan
SO_2	Sulphur dioxide
SOCAR	State Oil Company of the Azerbaijan Republic
Source	The point or place from which something originates
Special sections	Discrete pipeline sections where additional safety/ environmental protection/construction techniques are required
SpC	Specific Conductance – a measure of how well water can conduct an electrical current. Measured in ohms or, more recently, siemens per unit of length
Specific noise level - $L_{aeq,Tr}$	The equivalent continuous A-weighted SPL in dB at the measurement position produced by the specific noise source over a given reference time interval, in integer units
Specific noise source	The noise source under investigation for assessing the likelihood of complaints (usually measured as $L_{Aeq, T}$) Defined in ISO 1996-1 as “a component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source”
Spent catalyst	Waste catalyst in which the active component has been fully consumed
SPL	Sound Pressure Level
SPM	Suspended Particulate Matters
Spoil	Any type of material removed during excavation that is typically stored temporarily before replacement or disposal
Spot backfilling	Replacing the excavated material as soon as practicable
Spread	1) All the personnel and equipment necessary to carry construction; or 2) The area covered for a given length by construction operations
Spread technique	The technique employed for pipeline construction whereby several different sequential construction phases may be in process at one time along the pipeline length
SSC	Suspended Sediment Concentration. Measured in mg/L
SSL	Suspended Sediment Load. Measured in %.

SSI	Social Security Institution
SPSS	Statistical Package for the Social Science
Stakeholder	Stakeholders are “those people who are directly and indirectly affected by a project and other interested parties who have the ability to influence a project’s outcome, positively or negatively” (IFC, 1998)
STD	Sexually Transmitted Disease
Steady noise	Noise that gives fluctuations over a range not more than 5dB on a sound level meter set to frequency weighting “A” and time weighting ‘S’
STP	Sewage Treatment Package
Stringing crew	The crew that brings pipe sections from the pipe yard and lays them out along the Right Of Way ready for welding
Sv	Sievert – measure of radiation. 1 Sv = 1J/kg
SVOC	Semi Volatile Organic Compounds
Subsoil	The part of the soil that lies below the topsoil. Also referred to as “undersoil”. Also see “topsoil”.
Survey crew	The crew that undertakes the initial topographical and alignment surveys of the pipeline route
Suspended solids	The amount of solid material held in suspension by the energy of water in a stream, river or discharge

T

TDS	Total Dissolved Solids. Measured in mg/l
Temperature	The level of heat energy of the atmosphere as measured by a thermometer and expressed on a given temperature scale, usually Celsius or Fahrenheit
Tertiary	The geologic sub-era or period of the Cenozoic era extending from the end of the Mesozoic era to the beginning of the Quaternary period, extending from 63 million to 1.6 million years ago
TKV	Development Foundation of Turkey
Tl	Turkish Lira
TMP	Traffic Management Plan
Topsoil	1) The top portion of agricultural soil, usually richer in organic matter than the subsoil (Agronomy); 2) The surface layer of any soil (Geology)
TPH	Total Petroleum Hydrocarbons
Transboundary impact	Transboundary impact is “any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party [to this Convention] caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party” (Convention on EIA in a Transboundary Context, 1991)
Transformer rectifiers	Equipment to transform high voltage AC to lower voltage DC

Trenching	The process of excavating the trench for the pipeline
Trenching crew	The crew that implements trenching
TSS	Total Suspended Solids
True vapour pressure	Crude vapour pressure at pipeline input temperature
Turbidity	Turbidity is a unit of measurement quantifying the degree to which light travelling through a water column is scattered by the suspended organic (including algae) and inorganic particles. From environmental point of view, the series of turbidity-induced changes that can occur in a water body may change the composition of an aquatic community. Turbidity of measured in Nephelometric Turbidity Units (NTU) or Jackson Turbidity Units (JTU)

U

UHC	Unburned Hydrocarbons
UK	United Kingdom
UKAS	United Kingdom Accreditation Service
Ullage	Loss of liquid by evaporation or leakage
UN	United Nations
UNAIDS	Joint United Nations programme on AIDS/HIV
UNDHR	United Nations Declaration of Human Rights
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissionaire for Refugees
UNICEF	United Nations International Children's Emergency Fund
UPS	Uninterrupted Power Supply
USA	United States of America
USD	United States Dollar
US EPA	United States Environmental Protection Agency
US Ex Im	United States Export Import Bank

V

Vapour pressure	The pressure at which a liquid turns to a gas
VDI	Verein Deutscher Ingenieure
VHF radios	Very High Frequency radios
VLCC	Very Large Crude Carriers
VOC	Volatile Organic Compounds

W

WBG	World Bank Group
Welding crew	The crew that welds the pipeline sections together
WHO	World Health Organization.

WMP	Waste Management Plan
Working width	The area within which the pipeline installation takes place, including topsoil and subsoil storage
Wrapping crew	The crew that wraps the pipeline (normally at joints) with anti-corrosion tape, FBE epoxy or other surface coating prior to testing and acceptance
WREP	The existing Western Route Export Pipeline operated by AIOC between Baku, Azerbaijan and Supsa, Georgia
WREPG	The Georgian section of the WREP
WWF	World Wide Fund for Nature

1 INTRODUCTION

1.1 BACKGROUND

The proposed Baku-Tbilisi-Ceyhan (BTC) Project comprises a pipeline to transport crude oil from the oil fields of the Caspian Sea region via the Republics of Azerbaijan, Georgia and Turkey to a crude oil storage and export terminal to be constructed at Ceyhan on the Mediterranean coast of Turkey.

The pipeline route is depicted in Figure 1.1.

Figure 1.1 Baku-Tbilisi-Ceyhan Crude Oil Pipeline Route

An Environmental Impact Assessment (EIA)[1], which is in conformance with international practice, has been undertaken for the BTC Pipeline Project. The aim of the EIA has been to ensure that all potential impacts of the Project on the physical, biological and human environment are fully investigated, reported and, where necessary, managed. This Report presents the findings of the EIA process undertaken for the Turkish section of the BTC Project. EIA Reports have also been prepared for the Azerbaijan and Georgia sections of the BTC Pipeline.

Carrying out the many studies required for a comprehensive EIA and reporting of the EIA findings has been an independent process. With regard to the Turkish section of the BTC

1 A thorough assessment of environmental as well as social impacts has been undertaken for the entire BTC Project. In keeping with Turkish legislation and protocols, the process of assessing environmental and social impacts is designated an Environmental Impact Assessment (EIA) and the document presenting the findings of the EIA process is termed the EIA Report. For Azerbaijan and Georgia the process has been designated an 'Environmental and Social Impact Assessment (ESIA)' and the associated findings are presented in the 'ESIA Report' for each country. Despite this difference in terminology, a consistent approach to international standards of impact assessment has been adopted across the three countries concerned.

Project, independent EIA assessment and reporting has been undertaken by the international consulting company, Environmental Resources Management (ERM), together with specialist Turkish partners, Energy and Environment Investments Inc (ENVY) and Centre for Black Sea and Central Asia Studies (KORA) which is established under the auspices of the Middle East Technical University (METU).

1.2 THE BTC PIPELINE COMPANY (BTC CO)

The proposed BTC Project is being developed by a group of petroleum companies, hereinafter referred to as BTC Pipeline Company (BTC Co) formed in July 2002, (termed Main Export Pipeline Participants, MEPP, in the Host Government Agreement, HGA, which was signed in October 2000). This sponsor group comprises Turkiye Petrolleri (TPAO), the State Oil Company of the Azerbaijan Republic (SOCAR), BP Exploration (Caspian Sea) Ltd, Statoil BTC Caspian AS, Unocal BTC Pipeline Ltd, Itochu Oil Exploration (Azerbaijan) Inc, Delta Hess (BTC) Limited and ENI (see Figure 1.2). BP Exploration (Caspian Sea) Ltd (BP) is coordinating this stage of project development on behalf of the BTC Co. BTC Co is responsible for construction and operation of the proposed pipeline.

Figure 1.2 The BTC Co Sponsor Group

With regard to those components of the BTC Project that are located within the territorial boundaries of the Republic of Turkey (the Turkish section), BTC Co have contracted BOTAŞ, the state owned Turkish Petroleum Pipeline Corporation, to be the Turnkey Contractor responsible for performing all work and services required for design, engineering, procurement, construction, inspection, start-up, demonstration and testing of the facilities, in compliance with the Project Agreements (see Section 1.5) and applicable health, safety, social and environmental standards. The Government of Turkey (Ministry of Energy and Natural Resources) has appointed a BOTAŞ affiliate company (to be known as BOTAŞ) to operate the facilities that comprise the Turkish section of the BTC Project.

As both Turnkey Contractor and Designated Operator, BOTAŞ is responsible during Project implementation and operation respectively for all environmental planning, mitigation, management and monitoring in Turkey. This is an ongoing process and will not stop with the approval of the EIA Report by the Ministry of Environment (MoE). Rather, as the Turnkey

Contractor and (subsequently) Designated Operator, BOTAŞ is (and will remain) responsible for delivery of all commitments made in this EIA Report and for the development and implementation of the various outline Management and Monitoring Plans presented in Appendix C to this EIA report to the satisfaction of BTC Co and the Turkish regulators.

1.3 PROJECT RATIONALE

The exploitation of the hydrocarbon reserves of the Caspian States of the former Soviet Union is widely recognised as necessary for the future development and long-term political and socio-economic stability of the region. Since local and regional energy demand within the greater South Caucasus and Central Asia region is, and is anticipated to remain, insufficient to warrant the level of extraction of petroleum resources necessary to drive this economic uplift, it will be necessary to export the hydrocarbons to wider geographical markets.

The Republic of Azerbaijan is in particular need of efficient and expanded exportation means in advance of 2005 when production from the Azeri, Chirag and Gunashli (ACG) fields is scheduled to commence. The current capacity to export oil (via the Baku-Supsa (so-called Western Route Export Pipeline) or the Baku-Novorossiysk (so-called Northern Route Export Pipeline) pipelines and thence to international markets via the Black Sea and the Turkish Straits) is inadequate to meet demand from the new fields coming on stream. Azerbaijan will rely on revenue from these (and other hydrocarbon reserves) for a large part of its planned future economic development.

Similarly, the proposed BTC Project will play a significant role in securing the future prosperity of the Republic of Turkey. Unlike Azerbaijan, Turkey has limited resources of oil and natural gas and is currently dependent on imports for 64% of its energy requirements. This dependency is expected to rise drastically over the next 20 years, as domestic production decreases and demand increases, reaching 72% of anticipated energy requirements in 2010 and up to 76% in 2020. Realisation of the BTC Project will provide Turkey with a new long term and strategically secure source of crude oil.

Turkey (and Azerbaijan and Georgia) will receive substantial transit tariffs from operation of the BTC Project. For Turkey alone, this will amount to an anticipated USD 200 million per annum upon start-up in 2005, rising to USD 290 million per annum in 2022. It is anticipated that between 36%-46% of this tariff will be recovered as taxes for the Turkish exchequer, with the remaining revenue being invested in operations and maintenance of the pipeline and associated facilities. TPAO's shareholding in the BTC Company ensures that Turkey will also benefit from a share of the profits associated with operation of the Pipeline.

Besides the direct revenue and employment opportunities that will accrue from operation and maintenance of the BTC Project, there will also be indirect employment, revenues and other benefits. The turnkey contract for the design and construction of the Turkish section of the BTC Project is worth USD 1,308 million over a five-year period. It is the aim of the Project that the majority of the labour resources, and a significant proportion of materials, will be sourced from within Turkey.

Realisation of the BTC Project will also enhance Turkey's strategic position in the geopolitical context of a future east-west energy corridor. In this regard it is anticipated that Ceyhan will become recognised as one of the world's major oil marketing centres.

1.4 PROJECT DESCRIPTION

1.4.1 The proposed pipeline route

The proposed BTC Pipeline will originate at the existing Sangachal Terminal near Baku in Azerbaijan and will be approximately 1,760km long. The Turkish section of the BTC Pipeline will be approximately 1,076km in length (excluding the approximately 6 km from the tank farm to the jetty at the BTC Marine Terminal), stretching from Turkgozu on the Georgian-Turkish border to Ceyhan on the Gulf of Iskenderun on the coast of the Mediterranean Sea. From the border with Georgia, the pipeline will cross the provinces of Ardahan, Kars, Erzurum, Erzincan, Gumushane, Sivas, Kayseri, Kahramanmaras, Osmaniye and Adana. It will terminate at a new storage and export terminal (the BTC Marine Terminal), which will be an integral part of the BTC Project. The route of the proposed pipeline within Turkey is depicted in Figure 1.3 and the location of the proposed BTC Marine Terminal is shown in Figure 1.4.

Detailed pipeline routing and engineering design is an iterative and ongoing process and whilst this EIA Report is based on an advanced level of Project definition, as the design develops, more information will become available and will be subject to ongoing environmental and social review.

1.4.2 The schedule for implementation of the Project

Preliminary feasibility and environmental studies for the BTC Project commenced in 1997. The Intergovernmental Agreement (IGA), which established the international commitment to the Project, was signed in November 1999 and the Host Government Agreement (HGA), which established the legal basis for the Project within Turkey, was signed in October 2000. Basic Engineering and initial Environmental Scoping was completed in June 2001 and Detailed Engineering, which is currently underway, is scheduled for completion in August-September 2002. Pre-construction field work is scheduled to commence in October 2002 with earthworks starting in December 2002. Operation of the pipeline is due to commence in early 2005.

The pipeline is designed to be in operation for a period of 40 years i.e. until 2045. A Decommissioning and Abandonment Plan will be developed in anticipation of the actions that the BTC Co will follow upon cessation of the pipeline operations.

1.4.3 The Pipeline

The Turkish section of the proposed BTC Pipeline will be buried along its entire length, except where the pipework emerges at the Above Ground Installations (AGIs, see Section 1.4.4). The pipeline will be equipped with current technology for monitoring operations, including control and leak detection systems, to immediately identify operational problems and to minimise the potential for environmental incidents to arise. Specific design details at each location along the route, such as coating systems, wall thickness, cathodic protection, burial depth and certain other aspects, are being determined during the current Detailed Engineering phase of the Project. Special designs will be implemented where appropriate, such as at river and fault crossings and in areas of potential land instability, thereby ensuring that all prudent and internationally recognised technological measures are implemented at all sensitive locations to protect the pipeline and the surrounding environment.

The pipeline will be operated continuously and will only be out of service during maintenance periods. Further details concerning the pipeline are presented in Section 4 of this EIA Report.

Figure 1.3 The BTC Pipeline Route in Turkey

Figure 1.4 The Location for the BTC Marine Terminal at Ceyhan

1.4.4 Above Ground Installations (AGIs)

The key AGIs associated with the Turkish section of the proposed BTC Pipeline are:

- a custody metering station located after the pipeline enters Turkish territory to monitor the quality and measure the quantity of crude oil flowing into the Turkish section of the pipeline;
- four pump stations located at intervals along the route to facilitate the controlled flow of oil through the pipeline;
- a pressure reduction station / pigging facility, located prior to arrival at Ceyhan, to reduce pipeline pressure and thereby further facilitate the controlled flow of oil through the pipeline;
- 52 block valve stations installed at strategic locations along the pipeline to enable sections of the pipeline to be isolated in the event of non-standard operating conditions and to facilitate maintenance;
- facilities for monitoring and maintaining the internal integrity of the pipeline and for preventing the build-up of wax that might otherwise deposit on the internal walls of the pipeline.

The locations, of these key AGIs are depicted in Figure 1.3.

Further details concerning the Above Ground Installations are presented in Section 4 of this EIA Report.

1.4.5 BTC Marine Terminal

As an integral component of the Turkish section of the proposed BTC Project, a new marine export terminal will be constructed at Ceyhan, where crude oil will be stored prior to loading on to tankers. The BTC Marine Terminal will be built adjacent to the existing BOTAŞ storage and marine facilities at Ceyhan. The BTC Marine Terminal will include the following facilities:

- seven floating roof, crude oil storage tanks, each with a holding capacity of 150,800 m^3;
- a custody metering station located between the tank farm and the marine loading facilities for fiscal metering of crude oil exports;
- marine berthing and loading facilities designed for ships between 80,000 and 300,000 tonnes (dead weight tonnage, DWT);
- a backup control room for monitoring and control of the entire BTC Pipeline system.

Further details concerning the marine terminal are given in Section 9 of this EIA Report.

1.5 LEGAL FRAMEWORK FOR UNDERTAKING THE EIA

1.5.1 Primary agreements

There are three primary Agreements which facilitate realisation of the Turkish section of the BTC Pipeline Project and which govern the way in which the Project is implemented. These are the Intergovernmental Agreement, the Host Government Agreement and the Turnkey Agreement. These agreements, summarised below, as well as applicable provisions of Turkish and international law, are discussed in detail in Appendix D.

- The Intergovernmental Agreement (IGA) between the Governments of the Republic of Turkey, Georgia and the Republic of Azerbaijan was signed on 18 November 1999. The Agreement establishes the basis for the transport of petroleum from the Caspian Sea, through the territories of Azerbaijan, Georgia and Turkey, through realisation of an export pipeline. It confers on the legal and commercial terms of the Project the status of international law.
- The Host Government Agreement (HGA) between the Government of the Republic of Turkey and the Main Export Pipeline Participants (MEPP) was signed on 19 October 2000 (analogous Agreements have been concluded between MEPP and the Governments of Azerbaijan Republic and Georgia respectively). This Agreement establishes the legal basis within Turkey for implementation, operation and decommissioning of the Turkish section of the BTC Pipeline. With regard to environmental, social, health and safety (ESHS) protection commitments and safeguards, the Agreement establishes the following requirements and standards:
  - the standards and practices generally prevailing in the international petroleum pipeline industry for comparable projects will apply to the Project;
  - a number of specified ESHS studies are required to be undertaken, including an environmental baseline study, environmental impact assessment (EIA), social impact assessment (SIA) and oil spill response plan (OSRP);
  - the EIA is required to be undertaken in accordance with the principles of the European Commission (EC) Directives on environmental assessment;
  - the environmental baseline study, EIA and OSRP are each subject to the Turkish Government's approval;
  - the EIA process will incorporate public consultation and the EIA report is subject to public review and comment prior to Government approval.

  The HGA supersedes all other standards and practices applicable within Turkey for petroleum pipeline projects, to the extent such standards are inconsistent with the terms of the Agreement. In this regard, the Turkish Environmental Impact Assessment Regulation of 27 June 1997 applies to the EIA of the Turkish section of the BTC Project insofar as it is consistent with the related provisions in the HGA.
- The Turnkey Agreement between the MEPP and BOTAŞ was signed on 19 October 2000. This Agreement establishes the obligations of BOTAŞ to design, procure, construct and commission the Turkish section of the BTC Project in accordance with the provisions of the HGA. With regard to environmental, social, health and safety (ESHS) protection standards and safeguards, the Agreement identifies the following requirements:

- the Project components are required to constitute a 'highly reliable and operationally efficient' system which must include a leak detection system capable of 'identifying and shutting down the pipeline system within several minutes of a major leak occurring anywhere on the pipeline system';
- the environmental strategy employed must be in accordance with the standards and practices prevailing in the international petroleum pipeline industry;
- the EIA is required to fulfil World Bank requirements and (by implication) International Finance Corporation (IFC) and other international financial institution (IFI) guidelines and is to be in accordance with the principles of EC Directives on environmental assessment.

This EIA has taken full cognisance of these three Agreements and the requirements therein and is therefore compliant with the applicable provisions of the following:

- Host Government Agreement (HGA);
- the principles of EC Directive 85/337/EEC (as amended by EC Directive 97/11/EC) regarding environmental assessment;
- the requirements of the World Bank and other international financial institutions;
- Turkish laws, regulations, standards and guidelines insofar as these are not inconsistent with related provisions in the HGA;
- BP and BTC Co. Health; Safety; Environmental and Social Policies;
- BOTAŞ' Environmental Policy.

The provisions and obligations of these instruments are discussed in detail in Appendix D: Policy, Legal and Administrative Framework for the EIA.

1.6 THE EIA PROCESS

1.6.1 Scope of the EIA

1.6.1.1 Extent

This EIA covers all the components of the BTC Project that are located within the territorial boundaries of the Republic of Turkey. This comprises the pipeline and all associated facilities, located between the Georgia-Turkey border and the pipeline terminus in Ceyhan, including the BTC Marine Terminal.

The EIA assesses the impacts of all phases of the BTC Project development, from the start of construction, through commissioning, operation and eventual abandonment of the facilities.

1.6.1.2 Project phasing

This EIA Report describes the impacts that the proposed BTC Project will have upon the existing environmental and social conditions along the pipeline corridor in Turkey, and how these impacts will be mitigated. However, as fully described in Section 2.3, environmental and social assessment have been incorporated into each previous stage of the project design process, thereby significantly influencing how the Project has been developed to-date. The early integration of environmental and social considerations in the planning of the proposed pipeline

has ensured that many potential impacts of the Project will never be realised as steps have already been taken to avoid or design out the impact potential.

1.6.1.3 Development of Pipeline Route

It is pertinent to note that the high level of interface between the basic/detailed engineering and EIA programmes has led to the situation where this EIA Report now describes and assesses a near defined route rather than (as is usually the case in EIA) a broad route corridor. While this route is still subject to ongoing design and assessment (and hence route change) there is significantly more certainty concerning the route and the likely level of the associated impacts than is normal when disclosing Pipeline EIA Reports for public review.

1.6.2 Objectives of the EIA

The overall objective of the EIA process has been to ensure that all potential adverse environmental or social impacts arising from pipeline construction, operation and decommissioning are identified, and where feasible eliminated or minimised through implementation of appropriate design measures.

Where it has not been possible to eliminate or minimise impact through design, the EIA process identifies those environmental and social mitigation measures that have been developed in conjunction with the engineering team and stakeholders and which will be implemented by BOTAŞ as the Designated Operator.

Where residual impacts or significant uncertainties remain, additional mitigation measures have been formulated to minimise such impacts, supported, where necessary, by specification of additional studies and by more extensive monitoring. In addition, it is pertinent to note that the BTC Co and BOTAŞ are both committed to implementation of discrete Environmental and Community Investment Programmes which will be directed primarily at the project–affected settlements along the route.

1.6.3 Stages in the EIA Process

The EIA process that has been adopted for the Turkish section of the BTC Project is described in detail in Section 3. In summary, it comprises a number of ongoing and overlapping activities as follows:

- **Defining the Project:** This has involved the evaluation of project alternatives with regard to: the project concept; pipeline routing options; site selection for the AGIs and the marine terminal; process technologies; and mitigation options.

- **Scoping:** This activity has continued throughout the EIA process and has involved a number of discrete elements including stakeholder identification and preliminary consultation, the development of an environmental and socio-economic context for the Project and preliminary identification of impacts.

- **Consultation:** This has included both the distribution of project information to key stakeholders (eg authorities, NGOs, and the Press at both the local and national level) and further identification of potential impacts through face-to-face meetings and workshops. Consultation and dialogue is an important activity, which will continue throughout construction and operation.

- **Baseline Data Collection:** This involved the identification of environmental and socio-economic baseline conditions and attitudes towards the Project through review of existing data and undertaking of environment and settlement surveys.

- **Assessment:** This has involved the identification and subsequent assessment of all potential construction and operational impacts and an evaluation of their significance. It has included the investigation and development of measures to mitigate all potential negative impacts and enhance benefits associated with the proposed development.

- **Disclosure:** Public disclosure was initiated via the publication of the draft EIA Report for Disclosure and a range of other disclosure material, including community pamphlets, Non Technical Summary, web-site etc. Over the 60-day disclosure period, meetings were arranged with a wide range of stakeholders. The aim of the disclosure process was twofold:

  - To provide information necessary to facilitate a full understanding of the environmental and social impacts of the proposed Project and the associated mitigation measures that will be implemented.

  - To encourage discussion and invite comments on the proposed mitigation measures. The comments received during the disclosure process have been reviewed and where necessary incorporated into this EIA Report.

Whilst this EIA Report presents the findings and recommendations of the EIA process up to and including the disclosure period, the inclusion of environmental and social considerations into the implementation phases of the proposed Project will be an ongoing and dynamic management activity. A key vehicle for the delivery of environmental management scrutiny and control is the suite of Management and Monitoring Plans, which comprise an integral part of this EIA Report as Appendix C.

The Management and Monitoring Plans present the technical basis for development and implementation of a focused Environmental Management System to manage all relevant activities during construction and operation of the Project. As such, the Management and Monitoring Plans will evolve and be further developed as implementation of the pipeline and its associated facilities is progressed.

1.6.4 Current status of the EIA

This document is the Final EIA Report which been prepared for the Turkish Government Ministry of Environment for approval determination.

1.7 STRUCTURE OF THE EIA REPORT

This EIA Report comprises four volumes supported by a (fifth) volume of Appendices (incorporating technical appendices, environmental and social reports and management and monitoring plans).

The structure of this EIA Report has been developed in order to comply with the international financing institution (IFI) requirements, the Turkish Government requirements as defined in the Host Government Agreement (HGA) and to provide alignment with ISO standards for Environmental Management Systems (EMS).

The EIA Report is prefaced by a Non Technical Summary (NTS) and is organised into 18 sections; the content of each of these sections is outlined in Table 1.1 below.

Table 1.1 EIA Report Structure

Volume 1: Introduction

Section Number	Section Title	Description
1	Introduction	This section outlines the Project, the need for the development, the international and national legislative framework and policy context and the EIA process.
2	Project Development and the Evaluation of Alternatives	This section reports on the consideration of alternatives during the planning and design development of the Pipeline route, the Above Ground Installations (AGIs) and the BTC Marine Terminal.
3	Approach and Methodology	This section outlines the methodology that has been adopted in undertaking the EIA including scoping, consultation, interactions with detailed design, baseline data collection and impact prediction. It also presents the criteria used for assessing significance.

Volume 2: Pipeline

Section Number	Section Title	Description
4	BTC Pipeline - Project Description	This section presents a detailed description of the pipeline and its associated Above Ground Installations (AGIs), from the Georgian-Turkish border to the upstream boundary of the BTC Marine Terminal.
5	BTC Pipeline - Baseline Conditions	The environmental and socio-economic baseline along the pipeline route is presented in this section.
6	BTC Pipeline – Construction Impacts and Mitigation	This section describes generic impacts and mitigation along the pipeline anticipated during the Construction Phase. The Construction Phase Environmental and Social Impact Tables (which form a supplement to Volume 2) are described.
7	BTC Pipeline – Routine Operational Impacts and Mitigation	This section describes identified impacts and mitigation measures associated with normal operation of the pipeline and its associated Above Ground Installations (AGIs).
8	BTC Pipeline –Accidental Operational Events and Incidents	This section presents an environmental risk assessment of possible accidental events arising from operation of the pipeline and its associated Above Ground Installations. (AGIs)
Volume 2: Supplements		Supplements to Volume 2 comprise separately bound tables and maps to be read in conjunction with this volume (particularly in Section 6). • Supplement 1: Construction Phase Environmental and Social Impact 'Walkdown' tables for the entire route. • Supplement 2: Environmental and Social Constraints maps for the entire route.

Volume 3: Terminal

Section Number	Section Title	Description
9	BTC Marine Terminal - Project Description	This section presents a detailed description of the facilities to be incorporated within the BTC Marine Terminal.
10	BTC Marine Terminal – Onshore Baseline Conditions	This section describes the terrestrial environmental and socio-economic baseline for the BTC Marine Terminal.
11	BTC Marine Terminal – Marine Baseline Conditions	This section describes the marine environmental and socio-economic baseline for the BTC Marine Terminal.
12	BTC Marine Terminal – Onshore Impacts and Mitigation	This section describes the identified terrestrial impacts and mitigation measures associated with construction and operation of the BTC Marine Terminal.
13	BTC Marine Terminal - Marine Impacts and Mitigation	This section describes the identified marine impacts and mitigation measures associated with construction and operation of the BTC Marine Terminal.
14	BTC Marine Terminal - Accidental Events and Incidents	This section presents the findings of an environmental risk assessment of possible accidental events arising from operation at the BTC Marine Terminal and associated shipping movements.

Volume 4: Summary

Section Number	Section Title	Description
15	Summary of Key Residual Impacts	This section summarises the residual impacts that are predicted to occur following the implementation of recommended mitigation measures.
16	Cumulative Impacts	This section summarises potential interactions with other planned developments and resultant cumulative impacts.
17	Management and Implementation	This section presents an overview of how identified environmental and social issues will be managed during Project construction and operation.
18	Overall Project Assessment	This section presents the key conclusions of the EIA Process.

As indicated above, this EIA Report is supported by a series of appendices. These are listed in Table 1.2 below.

Table 1.2 Appendices to EIA Report

Appendix A	**Disclosure and Consultation Materials**
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Appendix A2	PCDP Materials - Stakeholder Lists
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Appendix B	**EIA Supporting Information**
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Appendix C	**Environmental Management Plans**
Appendix C1	Environmental Management and Monitoring Plan (EMMP)
Appendix C2	Reinstatement Plan (RP)
Appendix C3	Waste Management Plan (WMP)
Appendix C4	Pollution Prevention Plan (PPP)
Appendix C5	Traffic Management Plan (TMP)
Appendix C6	Oil Spill Response Plan (OSRP)
Appendix C7	Cultural Heritage Management Plan (CHMP)
Appendix C8	Social Management and Monitoring Plan (SMMP)
Appendix C9	Overview of Land Acquisition Process
Appendix C10	Aggregates Management Plan
Appendix D	**Policy, Legal and Administrative Framework**
Appendix E	**EIA Contributors**

To the extent practicable, the structure of this Report has been developed in such a way as to allow direct comparison with the EIA reports produced for the Georgia and Azerbaijan sections of the BTC Project. In this regard, a number of the report sections are common for the EIAs of all three countries. Also, to the extent feasible, common impact identification and assessment methodology has been applied across the three countries. Nevertheless, there are differences in the presentation of information, which reflect differences in the facilities planned and differences in environment sensitivities within the territorial boundaries of each country.

The EIA process has drawn upon a wide range of published and unpublished sources and full referencing of these sources is provided at the end of each section of the EIA Report. The EIA has synthesised and collated all relevant information, such that the EIA Report and its supporting Appendices are presented as a comprehensive stand-alone set of documents. There are, however, a number of key ancillary reports and materials that may be of interest to parties who wish to examine specific issues in greater detail. These key reference reports are listed in Box 1.1 and are available for view by prior appointment at the following address:

BOTAŞ Petroleum Pipeline Corporation
Sogutozu Mahallesi
Sogutozu Caddesi No 31
Ankara
TURKEY
Tel. +90 312 285 4455
Fax. +90 312 284 1134
www.botas.gov.tr

Box 1.1 Referenced Reports Available at BOTAŞ' Offices

Referenced Reports Available at BOTAŞ' Office
The following reports are either largely summarised in the EIA Report or contain maps which are considered to depict (military) sensitive information and which cannot therefore be publicly distributed. For these reasons, these reports are made publicly available at the BOTAŞ office only for interested parties to view.

- *Phase II Habitat Survey Report (January 2002)*
- *Bird Survey Report (December 2001)*
- *Ecological and Archaeological Route Narrowing Report (September 2001)*
- *Summary of Archaeological Studies Conducted to Date (September 2001)*
- *TACDAM Archaeology Report (February 2002)*
- *Environmental Scoping Report (June 2001)*
- *Social Scoping Report (July 2001)*
- *Basic Engineering Baseline Report (May 2001)*
- *Ceyhan Marine Terminal Feasibility Study (March1999)*
- *Soil Quality Report (including sampling methodology) (December 2001)*
- *Air quality Report (including sampling methodology) (January 2002)*
- *Noise Report (including sampling methodology) (January 2002)*
- *Water Quality Report (including sampling methodology)(January 2002)*
- *Marine Ecology surveys (winter and spring terms) (January 2002)*
- *Sea Turtle report (November 2001)*
- *Detailed Engineering Pipeline Risk Assessment Report (April 2002)*
- *Environmental Risk Assessment of Ceyhan Marine Terminal (September 2001)*
- *Environmental Risk Assessment of Ceyhan Marine Terminal (Marine) (May 2002)*
- *Report for Chemical Analysis of the Tank Farm Soil Samples (April 2001)*
- *Notes on Brown Bears (January2002)*
- *Detailed Engineering Geohazard Reports (December 2001 – May 2002)*
- *Water Crossing Impact Tables (March 2002)*
- *Turkish Marine Research Foundation, September 2002. Impact Assessment on Fishing Activities at Ceyhan Marine Terminal Area, Adana.*
- *Public consultation tracking database*

1.8 BTC EIA REPORTS

The assessment of the environmental and social issues associated with each of the three sections of the BTC Project are addressed in three separate sets of EIA Reports, as detailed below:

- BTC ESIA Azerbaijan – 442km of pipeline, from the Sangachal Terminal to the Azerbaijan-Georgian border;
- BTC ESIA Georgia – 248km from the Azerbaijan-Georgia border to the Georgia-Turkish border;

- BTC EIA Turkey – 1,076km from the Georgian-Turkish border to the site fence of the BTC Marine Terminal. The loading lines for the Marine Terminal comprise a further 6km (this document).

A Grand Executive Summary has also been produced to summarise all three EIA/ESIAs in a single document.

Separate EIA Reports have been produced, or are in preparation, for the following related projects:

- Shah Deniz Gas Field Development and Production (offshore development, sub-sea pipeline and onshore terminal);
- South Caucasus Pipeline (SCP) gas export project in Azerbaijan;
- South Caucasus Pipeline (SCP) gas export project in Georgia;
- ACG Phase 1 Upstream Oil Project (offshore development, sub-sea pipeline and onshore terminal).

Finally, a regional assessment entitled “Environmental, Social and Economic Review of ACG Full Field Development and Export in a Regional Context” has been prepared for the IFC.

2 PROJECT DEVELOPMENT AND EVALUATION OF ALTERNATIVES

2.1 INTRODUCTION

The proposed BTC Project represents the results of several years of feasibility work followed by approximately 18 months of detailed assessment of technical options for the export of crude oil from the Azerbaijan sector of the Caspian oil fields.

The option evaluation process took into account issues such as safety, technical feasibility, environmental implications, capital and operating expenditure, schedule, operability, reputation and Government agreements.

This section of the EIA Report describes the planning and development of the BTC Project to date and, in particular, describes how the route has evolved and the alternatives that have been assessed as part of the design process:

- Strategic alternatives (including the 'No Development Option'), with consideration of different means of export and aspects of routing the whole pipeline from Baku to Ceyhan;

- Project alternatives comprising:
  - pipeline routing and design, with consideration of such matters as the pipeline route in Turkey, logistics, AGI locations and operational regime;
  - marine terminal, with consideration of such matters as location, design and layout.

The development and evaluation of each of these alternatives are described in the subsections that follow.

2.2 STRATEGIC ALTERNATIVES

2.2.1 Introduction

The proposed BTC Crude Oil Pipeline is part of the wider development of the Azeri, Chirag and Gunashli (ACG) oil fields in the Caspian Sea. This includes the expansion of the existing crude oil terminal in Sangachal in Azerbaijan and the provision of crude oil handling facilities at the Turkish port of Ceyhan. The Turkish section of the BTC Pipeline, together with the loading terminal at Ceyhan, is a critical part of the overall development of the Caspian Sea oil fields.

During the identification and development of the optimal means of export (in this case a broad pipeline route corridor), a number of alternatives were considered by BTC Co. At a strategic level, a number of key issues required resolution:

- Is the no-development option (or 'Do Nothing Scenario') a viable alternative given the ongoing development of the ACG fields?

- Given that crude oil from the ACG fields is to be delivered to world markets, what are the feasible transportation methods currently available?

- In transporting crude oil from the ACG fields, what are the broad regional routing options that are considered practicable, feasible and appropriate?

The resolution of these key strategic alternatives has been wide ranging and has profoundly influenced the development and planning of the overall scheme.

2.2.2 The no-development option

The 1990s witnessed an expansion in the exploration and development of the Caspian oil fields, of which the ACG fields are a part. The world demand for oil continues to drive the exploitation of viable resources and as these resources come on-stream, delivery to world markets becomes a key focus.

Under these scenarios, the development of an optimal transportation method offers both greater scrutiny and control in the management of oil transportation risks (including environmental, social, security of supply and technical risks) and improved cost management opportunities.

Whilst the non-development of the BTC Project would remove all potential environmental and social impacts (both positive and negative) associated with the construction and operation of the pipeline, the implication of not optimising oil transportation methods would be significant and wide-ranging.

For example, a number of potential positive effects would not be realised should the Project not proceed, including the financial benefits to Turkey arising from the transit of oil. The no-development option would also mean that specific environmental and social benefits that may accrue as a result of the BTC Project, such as increased employment opportunities, infrastructure upgrades and other community benefits would not occur.

If the BTC Project were not to be realised, different export options would need to be found. In addition, the development of the ACG oil fields in the Caspian Sea would not be viable with wide ranging negative impacts on the economy of Azerbaijan and neighbouring countries.

If the BTC Pipeline were not developed this would increase the demand for alternative export solutions from the Caspian and may lead to other projects being proposed that entail a greater degree of environmental risk, for example proposals that require:

- shipping of oil through the Turkish Straits;
- alternative pipeline routes through areas of higher risk (terrain and security);
- an *ad hoc* and non-optimal combination of road, rail and shipped transportation.

The lack of benefits and potential risks associated with the no-development option were considered unacceptable by the project proponents on financial, environmental and social grounds, and the decision was made to identify the most suitable export option for oil from the ACG fields in the Caspian Sea.

2.2.3 Transportation method

Once it had been determined that it was appropriate to assess optimised methods for exporting Azerbaijani oil to world markets the primary transportation options were identified and evaluated. The transportation options considered comprised:

- road;
- rail;
- pipeline;
- shipping;
- a combination of the above.

Rail and road transportation options were discounted, as part of an earlier screening study, in part owing to high relative spill risk, and in part due to the logistical difficulties and social and environmental impacts in transporting the large volumes required by these methods.

Pipelines are universally considered to be the safest, most cost effective and environmentally acceptable method of transporting hydrocarbons.

2.2.4 Regional routing options

As outlined above, a pipeline option would enable Caspian ACG crude volumes to be exported from the land-locked Caspian Sea, to open market, without an incremental increase in volumes shipped through the Turkish Straits. Turkey was selected as the most suitable export destination, as it is the nearest country to Azerbaijan with access to the Mediterranean Sea, which provides the nearest open market point of delivery.

As Azerbaijan does not share a common border with Turkey, the routing options from Azerbaijan to Turkey comprised transiting via Iran, Armenia or Georgia.

When considering the use of Armenia as a possible transit country, the political sensitivities of Azerbaijan, the BTC primary Host Government, BTC partner and owner of the ACG oil fields have to be respected. Despite the ceasefire with Armenia in 1994, it has still not been possible for Azerbaijan and Armenia to reach settlement over the Nagorno Karabach issue. Therefore, due to the ongoing political uncertainty over this issue, allied with the terrain and engineering constraints that this route would pose, it was decided not to pursue the possibility of routing the pipeline through Armenia.

Political sensitivities also critically influenced the evaluation of Iran as a pipeline transit country. In particular, the relations between Iran and the USA, and the involvement of US investors and partners (in the ACG Production Sharing Agreement (PSA) and BTC Project), precluded the use of Iran as a transit country.

Available and practicable routes and final destinations for both the Russian and Georgian transportation options were assessed. Two key environmental studies were carried out to investigate the relative environmental risks and benefits of each of these options:

1. An analysis of key environmental issues associated with exporting ACG volumes from the Caspian was completed in 1997. This desktop report examined and summarised the major environmental sensitivities along each of the potential export routes.

2. The second study, a semi-quantitative Environmental Risk Assessment (ERA), evaluated the relative risk of oil spills associated with bulk transportation by pipeline and shipping, for the following options, to a common point in the Mediterranean:

    - Baku to Supsa pipeline and onward shipping by tanker;

- Baku to Supsa with a pipeline by-pass of the Turkish Straits;
- Baku to Novorossiysk pipeline and onward shipping by tanker;
- Baku to Novorossiysk with a pipeline by-pass of the Turkish Straits; and
- Baku-Tbilisi-Ceyhan pipeline.

The study concluded that Baku-Tbilisi-Ceyhan route represented the lowest environmental risk option.

As a contingency, a study was also commissioned that examined export options to enable 450–500mbd (thousand barrels per day) of oil to be exported from the Caspian Sea by the end of 2004, thereby securing an export route for at least the early ACG Phase 1 development volumes.

The options considered in the latter study included various scenarios for the expansion of the existing oil export lines from the Azerbaijan sector of the Caspian, the WREP and NREP. Screening of all potential expansion options identified three that were subject to more detailed assessment:

- expansion of the existing northern route pipeline through upgrade of the pump stations to 200 mbd capacity;
- expansion of the northern route pipeline to 350 mbd through upgrade of the pump stations and addition of a looped 700mm (28”) line from the Sangachal Terminal; and
- expansion of the western route pipeline to 300 mbd by means of a new pipeline within Azerbaijan and upgrade of the pump stations in Georgia.

Environmental and social assessments (including baseline studies and risk assessments) were conducted for all of these expansion options. These highlighted that while feasible they all involved onward transportation of oil through the Turkish Straits from Supsa (WREP) or Novorossiysk (NREP). Each of the options for expansion were also limited in terms of the volumes that could be transported and therefore did not represent long term export solutions.

Development of a new pipeline, from Baku to Ceyhan was therefore considered the most acceptable transportation method for the Azerbaijani oil as it has the lowest environmental risk associated with it.

2.3 PIPELINE ROUTING IN TURKEY

2.3.1 Introduction and overview

Pipeline route selection is the process of defining an optimised connection between two or more points to be linked with each other via a pipeline transportation system. The route optimisation is performed as an iterative process that weighs and balances several different influences that are encountered on a route, causing either deviations of the initial line or the need for the implementation of specific construction or design methods.

The starting point for every pipeline route selection process is a straight connection between a defined start and end point, between which a certain product has to be transported. For the BTC Pipeline the start point was defined as the Caspian Sea coast near to Baku and the end point as the Mediterranean Sea coast. In order to provide a single endpoint on the Mediterranean coast, a nominal location for an international marine terminal was identified in the Ceyhan area on the Gulf of Iskenderun. The primary reasons for selecting this endpoint comprised the following:

- the Ceyhan area offers the shortest route for the pipeline from the Georgia border to the Mediterranean Sea;

- in-shore conditions in Ceyhan provide access to deep water suitable for large and very large crude oil tankers; and

- the Ceyhan area contains a number of coastal industries, including an existing BOTAŞ Marine Terminal exporting crude oil.

Section 2.4 discusses the site selection exercise for the BTC Marine Terminal at Ceyhan in more detail.

Once the start and end points have been determined, 'pass points' are then identified. Pass points represent locations or areas through which the pipeline must pass and, as such, they divert the pipeline routing from the initial straight-line concept. Pass points may be points of strategic interest for the operation of the pipeline transportation system. For the BTC Pipeline, the entry point from Georgia into Turkey can be defined as a pass point in order to ensure that the pipeline does not enter Armenian territory.

Following the identification of pass points, the main exclusion zones or areas of severe constraint along the broad routing concept are identified and mapped. These severe constraints may be caused by topographic features, such as mountains and lakes, environmentally sensitive or protected areas, main settlement or development areas, areas of social or political instability or any other area that is to be avoided by the pipeline route.

After the definition of the pass points and exclusion zones for the pipeline, one or more potential, large-scale pipeline route corridors are established. Where more than one corridor is considered as being feasible, they are subject to comparative evaluation according to defined and accepted scoring methods and techniques.

For the BTC Project, the route identification, evaluation and selection process was undertaken during several phases; this process is illustrated in Figure 2.1.

In general, a 'route narrowing' methodology was adopted. This was based on the concept of identifying the relevant constraints inside the investigated corridor (initially on a desktop basis, but progressively involving a greater intensity of field survey work) and the establishment of an inspection centreline around these constraints. A weighted approach to environmental and engineering issues in the areas of identified constraints was also employed, where appropriate.

After the inspection centreline had been verified, adjusted and confirmed in the field, the corridor centred on this line was narrowed and subjected to a new desktop study (at a greater level of detail) and a subsequent field confirmation of the next level inspection centreline. The whole route-narrowing concept was based on a refinement and weighted approach for the identification and consideration of constraints inside the investigated corridor and a reduction of the corridor sizes until the final pipeline centreline was defined.

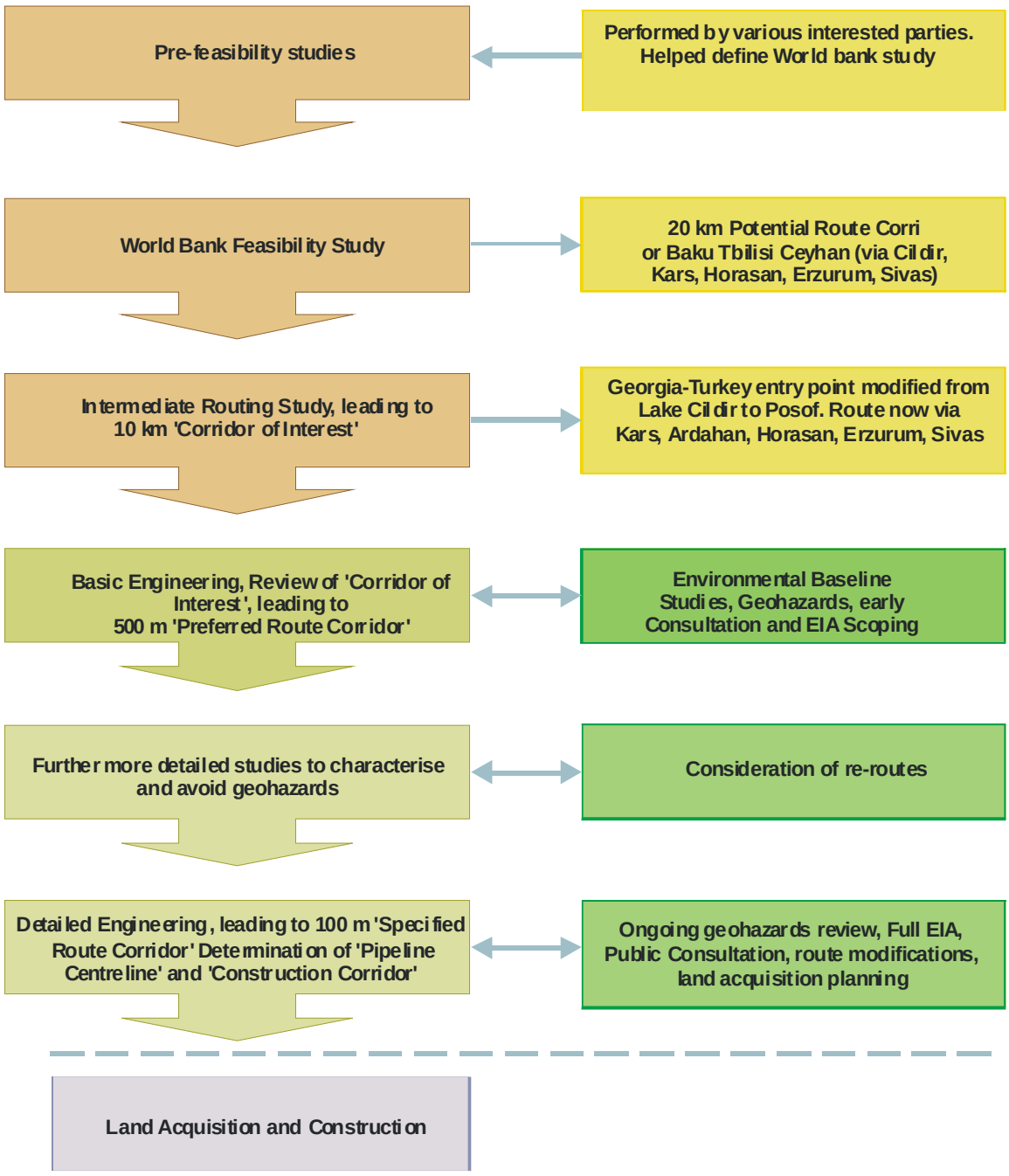


Figure 2.1 Overview of the Route Development Process

For example, it may not be possible, logistically, to identify all third party installations inside a 10km wide corridor, while relevant inquiries for a 500m wide corridor would provide essential information for further route and cost optimisation. On the other hand large-scale potential geohazards, such as landslides and fault zones, need to be identified in the earliest stages of the route corridor narrowing process in order to utilise the full width of the (still) large corridor for route optimisation and possible avoidance of hazardous areas without the necessity for implementation of specific and potential costly design measures.

In parallel, and as a critical component of the overall route selection process, the results and outcome of public consultation programmes and environmental studies were fed back to the routing process. The process is described in more detail in the following subsections.

2.3.2 The pre-feasibility studies

Pre-feasibility studies for the crude oil pipeline transportation system were performed by various interested parties in the region. These studies assisted in the definition of the overall project and led to the World Bank commissioning a formal Feasibility Study.

2.3.3 The feasibility study

In April 1999, the World Bank identified the requirement for a formal feasibility study of the BTC Pipeline.

A two-step method was applied to identify the pipeline route.

1. The first step consisted of selecting potential route corridors within a width of 100km to the level of detail permitted by maps with a scale of 1:2,000,000 and 1:500,000.

2. The second step entailed the plotting of potential route corridors of a width of 20km on the basis of maps with a scale of 1:200,000.

A Geographic Information System (GIS) was used to spatially represent and process data during the identification of potential route corridors.

The locations of environmental features were also plotted, including:

- protected areas;
- wetlands;
- forests;
- geomorphological landforms;
- zones of seismic risk;
- zones prone to flash-flooding;
- geo-technical classifications;
- cultural heritage sites.

Taking into consideration the main features listed above (together with other factors such as engineering feasibility, route length etc), a single corridor was identified from Baku (Azerbaijan), via Tbilisi (Georgia) to Horasan (Turkey). From Horasan to the delivery point at Ceyhan, four alternative route corridors were assessed by a comparative scoring model, which also took into consideration the environmental features listed above.

Following detailed analysis, the route corridor NR1T via Kars, Erzurum and Sivas (see Figure 2.2) was selected since it possessed distinct advantages in terms of constructibility and fewer environmental constraints than the other investigated alternatives.

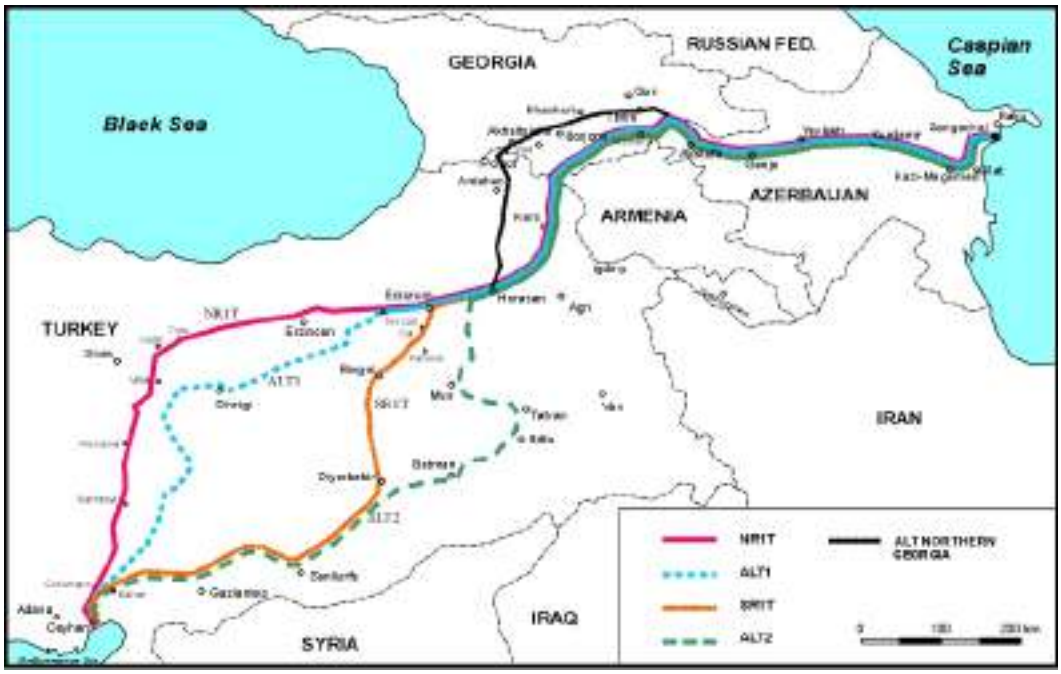


Figure 2.2 The Route Corridors Analysed during the Feasibility Study

In recognition of the positive findings of the feasibility study, the Inter Governmental Agreement (IGA), between the Azerbaijan Republic, Georgia and the Republic of Turkey was signed (see Appendix D).

2.3.4 Intermediate routing studies

Several routes were considered in Georgia. While a more eastern route ('The Eastern Corridor') presented some potential advantages in terms of the physical terrain available for engineering and construction and fewer environmental constraints between Lake Tsalka and the Turkish border, the presence of the Russian Federation military facilities in the district of Akhalkalaki raised serious security concerns. Additionally, the Akhalkalaki District, like other areas throughout Georgia, is extremely poorly served by transportation and other infrastructure linking it to the rest of the country. When combined with the foregoing security concerns, these issues would have presented significant constraints to any efforts by Government and Project personnel to implement effective risk mitigation and emergency response efforts. On this basis, and supported by the Government of Georgia, the military facilities within the district of Akhalkalaki were considered to present unacceptable HSE and other risks for pipeline routing. Consequently, the proposed entry point to Turkey was changed from northeast of Lake Cildir to the currently proposed location northeast of Posof.

As a consequence, a major alteration to the route corridor established during the feasibility study, was necessitated on both the Georgian and Turkish sides of the new border crossing. On the Turkish side, this required the identification, evaluation and selection of route options from the border crossing to the town of Horasan, which is located on the original route corridor

identified in the Feasibility Study. Four possible route alignments were identified and after an initial desktop assessment it was decided to perform an initial route investigation as the basis of a comparative evaluation of alternatives II and III against the original Feasibility Study route (see Figure 2.3).

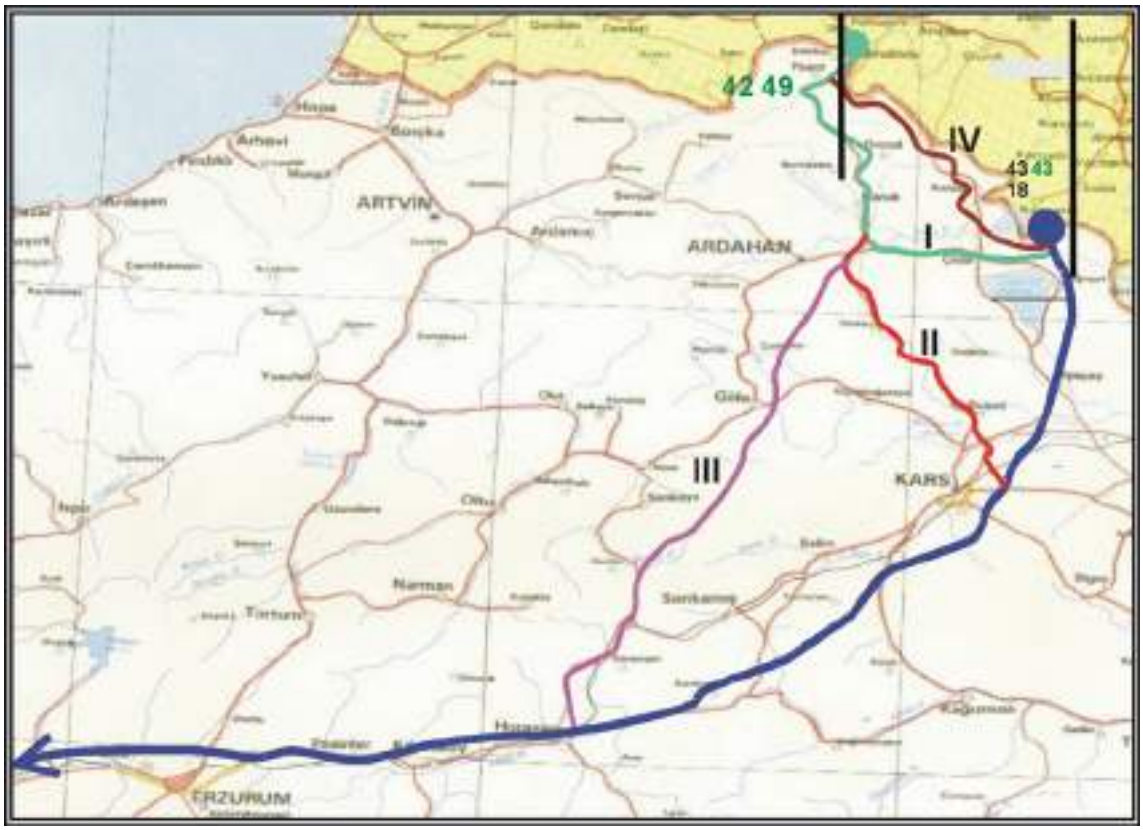


Figure 2.3 The Route Corridors Analysed after Changing of the Point of Entry

In Figure 2.3, the blue line represents the 'base route' identified in the feasibility study and other lines show the indicative Point of Entry route alternative as:

(I) Posof- Cildir Lake route;
(II) Posof-Susuz/Kars route;
(III) Posof-Horasan route;
(IV) Posof-Georgian Border route.

The route investigation was undertaken in July 2000 and the results of the investigation led to the selection of alternative III as the new 'Corridor of Interest' between the Point of Entry and the town of Horasan. This new section comprised a length of approximately 220km, adding an additional 16km to the overall line length.

According to the project agreements, this corridor was then designated as the 'Corridor of Interest' (10km wide), which formed the basis of the Basic Engineering phase of the Turkish section of the BTC Project (see Figure 2.4).

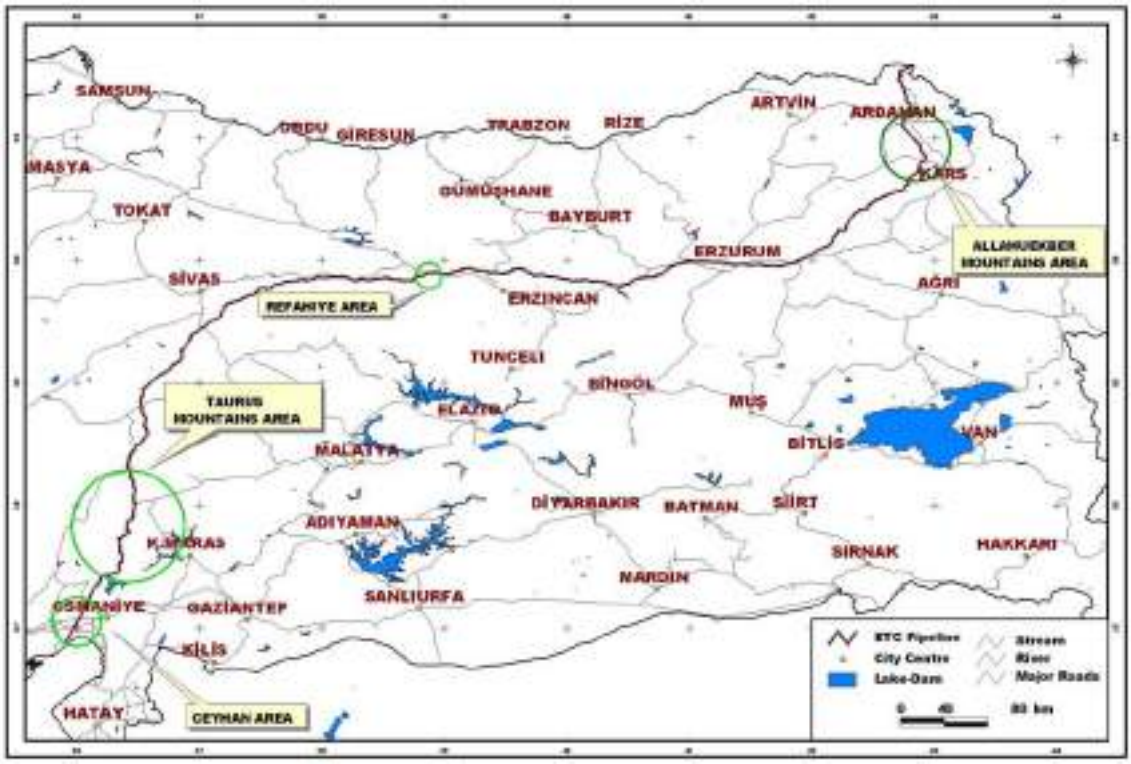


Figure 2.4 The 'Corridor of Interest' (Turkish Section)

2.3.5 The Basic Engineering phase: to determine the 'Preferred Route Corridor' (500m)

2.3.5.1 Review of the 'Corridor of Interest'

During the Basic Engineering (BE) phase, the previously established 'Corridor of Interest' was subject to confirmation and refinement, in order to consolidate the corridor for the selection of environmental baseline data and subsequent narrowing to the 500m wide 'Preferred Route Corridor'.

However, as the BE phase was scheduled to begin in November 2000, a pre-work programme of routing investigations was launched in order to utilise the suitable seasonal weather conditions in September and October 2000.

Within the process of reviewing the initial 'Corridor of Interest', various authorities (including Ministries, General Directorates and Governorships of the Republic of Turkey) were contacted and provided with the 'Corridor of Interest' and requested to identify relevant project permits, application procedures, crossing requirements and any known constraint that would impact the selection of the pipeline route.

The review of the 'Corridor of Interest' led to two major route alterations and a subsequent re-definition of the corridor in the following areas:

1. Allahuekber mountains: During discussions with the Turkish authorities, the route 'Corridor of Interest' was moved eastwards for reasons of national security. The

alteration was carried out for a length of approximately 75km between the towns of Ardahan and Gaziler and added approximately 8km of line length.

2. Taurus Mountains: the route was moved approximately 40km to the east, starting from Yesilkent to the town of Karakayali. The alteration occurred due to constructability and accessibility problems on the initial route alignment through the Taurus Mountains. The initial length of this section was approximately 150km and the alteration added approximately 16km to the overall line length.

In addition, changes in the area of Refahiye (for geo-technical reasons) were executed and documented at the end of the BE phase and subsequently transferred to the Detailed Engineering (DE) phase for final implementation.

Figure 2.5 shows the 'Corridor of Interest' as submitted to the State Authorities for planning approval during the BE phase of the Project.

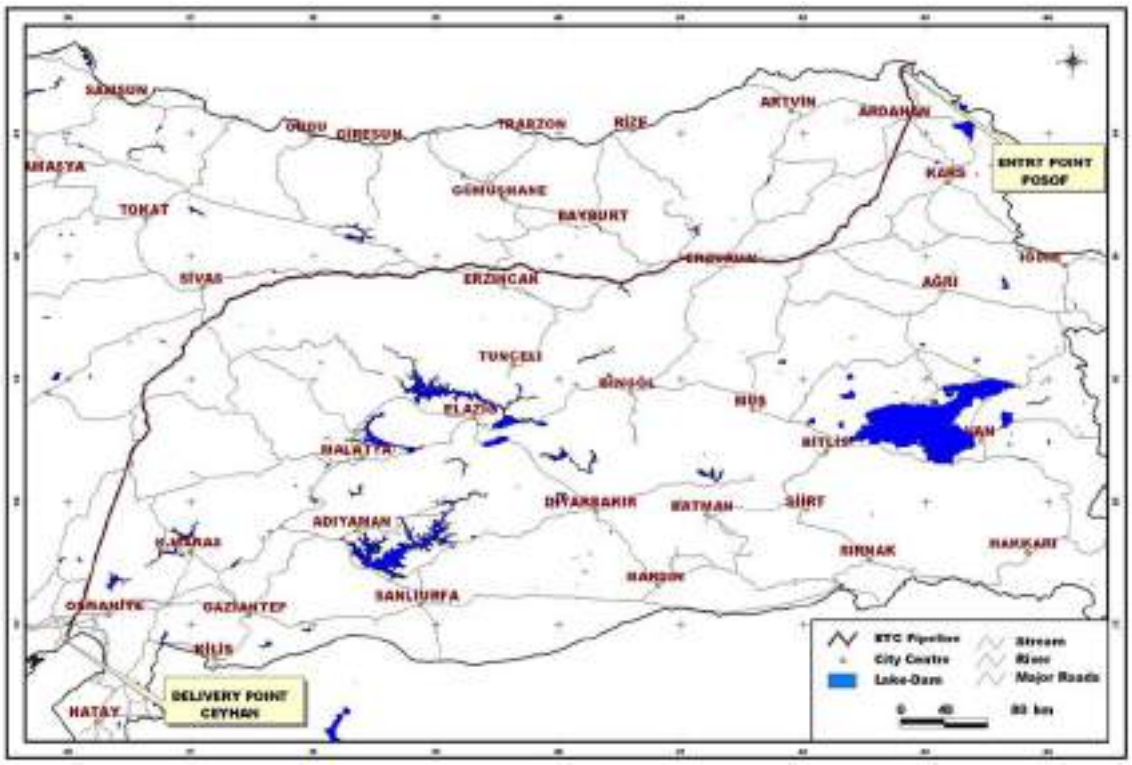


Figure 2.5 The Approved 'Corridor of Interest'

2.3.5.2 Determining the 'Preferred Route Corridor'

In addition to the overall verification of the initial 'Corridor of Interest' discussed above, the primary objective of the BE phase was the narrowing of the 10km wide corridor to a 'Preferred Route Corridor' of 500m width.

The route narrowing process was carried out in an iterative process with inputs from various disciplines. The final result, the 'Preferred Route Corridor' was established inside the investigated 'Corridor of Interest'. The following main criteria were considered during this route narrowing process:

- topography (eg elevations, slopes etc);
- ecological considerations (eg protected or sensitive areas);
- social sensitivities (eg avoiding settlements, schools, cemeteries);
- land slide and karst areas;
- faults and areas of potential liquefaction;
- archaeological sites;
- hydrology;
- meteorology;
- technical considerations (eg constructability);
- Third Party and Authority Requirements (eg infrastructure planning and development).

Desktop exercises were undertaken and relevant constraints were laid onto constraint maps (using GIS) in order to help establish an inspection centreline, which was then verified in the field by relevant discipline experts.

Important environmental constraints considered during BE include the following areas:

- ***Posof (Wildlife Protection Area).*** The Posof Wildlife Protection Area was primarily established to conserve the Caucasian Black Grouse (*Tetrao mlokosiewiczi*), a globally threatened species classified by IUCN as Data Deficient (Hilton-Taylor 2000). For reasons explained in Section 2.3.4, the Point of Entry in Turkey is fixed and lies near the boundary of the Posof Wildlife Protection Area. The area cannot be avoided and following consultations with the official staff of the Erzurum Regional Directorate of Forestry responsible for the protection of the Posof area, construction work will be allowed within the area providing necessary precautions are taken to avoid disturbance to the Grouse and damage to their habitats. Detailed studies undertaken to develop an acceptable route through these habitats are detailed in Section 6.

- ***Sarikamis Forest (Natural Site Area).*** This forest area is designated as a Natural Site for its important Scot's Pine forest communities. Alternative routes were considered. A route to the west of the current corridor would have proved difficult due to constructability and geohazard reasons. A route to the east would have traversed a greater linear distance across the Sarikamis Forest. The current route corridor traverses the fringes of the forest area and utilises a natural tree break as the pipeline corridor. By virtue of its pronouncement No 1233, dated 10 May 2002, the Directorate of Protection of Cultural and Natural Assets in Erzurum has issued its approval for the BTC Pipeline to follow the proposed route through the forest area.

- ***Alacorak/Ulas Lakes (Potential Sites for Ramsar Designation).*** The lakes are important because they support a diverse bird fauna including globally near-threatened species. The route through this area was constrained by the existence of gypsum karst to the north and limestone karst to the south. The delineated protection boundaries for Alacorak and Ulas lakes are 1.27km and 0.93km from the pipeline centre line, respectively (see case study attached).

ULAS & ALACORAK LAKES

The **Ulas and Alacorak Lakes**, a collection of lakes located south of Sivas. The five lakes are being considered by the Ministry of Environment for designation as Internationally Important Wetlands under the Ramsar Convention.

The lakes support, the globally-threatened White-headed Duck (*Oxyura leucocephala*), classified as an endangered species, and the globally near-threatened Ferruginous Duck (*Aythya nyroca*). In addition, 13 nationally threatened species were identified during the ornithology surveys conducted in May 2001, these comprise: Red-necked Grebe; Great Egret; Common Shelduck; Teal; Garganey; Shoveler; Pochard; Marsh Harrier; Common Crane; Black Tern; Citrine Wagtail; Whinchat; and Whitewinged Black Terns.

FERRUGINOUS DUCK

WHITE-HEADED DUCK

No aboveground construction facilities will be located between KP 720 and the Ulas Railway Line. The lakes will be subject to restricted access for construction personnel and appropriate mitigation measures will be implemented as follows:

- any threatened plant species will be identified during the pre-construction surveys
- narrowing the RoW
- top soils and sub-soils segregation to protect the top soil and subsequent replacement
- the removal of any turf containing threatened plants and nurture until replacement, this will be supervised at all times by an ecological adviser.

Eight globally-threatened plant species (*Dianthus zederbaueri, Achillea goniocephala, Astragalus listoniae, Astragalus cymbibracteatus, Astragalus ulashensis, Glaucium acutidentatum, Centaurea sivasica* and *Cerastium saccardoanum*) occur between KP 728.4 - 730.4. Two more species (*Campanula strigillosa* and *Onobrychis argyrea ssp. argyrea*) occur just east of the corridor between the same points. Ecologically-sensitive Area (ESA) 33 is identified for these species.

ALACORAK LAKE

ULAS LAKE

ENV, 2002

During this phase, geohazard areas were identified for additional investigations in order to assess the potential risks to the integrity of the pipeline system, and to collect relevant base data for pipeline design. The areas of perceived risk comprised:

- landslide areas;
- karstic areas;
- liquefaction and associated lateral spreading due to seismic effects;
- fault zones (primary, Class A faults such as the North Anatolian Fault).

Due to seasonal constraints it was decided to initiate a separate geohazard review prior to the start of the DE phase.

Integrating with the route selection and narrowing works, a series of environmental studies were undertaken; these are summarised in the following sections.

2.3.5.3 Overview of the Basic Engineering phase Environmental Baseline Studies (EBS)

A range of desk studies and field surveys were undertaken during the BE phase. The field survey methodologies used during the geological, ecological, environmental and archaeological modules of the EBS works are explained in the subsequent paragraphs.

Prior to the field surveys, the EBS teams conducted preliminary desktop studies in order to evaluate the 'Corridor of Interest'. The objectives of the desktop study were twofold:

(i) to compose 'constraints maps' by overlaying environmental sensitivities described in available literature data and other sources onto topographical maps;

(ii) to identify a preferred (from an environmental perspective) 500m route corridor, by identifying and screening all the apparent physical, geological and environmental constraints.

Following the desktop studies, three 'Route Narrowing Teams' undertook field surveys in order to validate the preferred route corridor. In other words, prior to the detailed surveys made by the EBS teams, a preferred route corridor of 500m width was developed in conjunction with the engineering team.

Subsequently, the major goal of the EBS works was a closer scrutiny of the 500m wide 'Preferred Route Corridor' in terms of geological, ecological, environmental and archaeological features. Environmental baseline surveys were carried out concurrently by two teams: one studying the northern section from the Georgian-Turkish border to the provincial border between Sivas and Erzincan; the other studying the southern section from the Sivas-Erzincan provincial border to Ceyhan. In the course of these detailed surveys, the EBS teams proposed route adjustments or changes as more refined data were collected on geological, environmental, ecological and/or archaeological sensitivities and constraints. The general methodologies used in the BE phase EBS work are summarised in Box 2.1. This was known as the Pre-Works programme and was undertaken prior to the official start of Basic Engineering to ensure field data could be gathered before the onset of winter.

Box 2.1 Summary of BE Phase Environmental Baseline Studies

General Environmental Conditions
During preliminary desktop studies, environmental experts collated and reviewed all available literature (as well as previous field data) that was relevant to characterising the existing conditions along the corridor of interest. For the field surveys, the team evaluated the general environmental conditions of the study area following typical 'rapid assessment' type procedures.

In this regard, emphasis was put on the macro character of the surrounding landscape; proximity of the key receptors of potential impacts; ground and soil conditions (drainage capacity and land-use capability); surface and sub-surface water resources; atmospheric and meteorological characteristics; existing monitoring stations; and the pressures on the natural environment in terms of existing pollution levels and pollution sources. The work also addressed existing and planned development projects (eg roads, dams, raw water and sewerage systems etc), environmental constraints (eg protection areas such as national and natural parks) and social constraints (eg schools, houses, cemeteries) that could be pertinent to the routing of the pipeline.

In addition to desk studies and in-situ observations, team members also arranged appointments with relevant governmental agencies and locally active NGO's. In this regard, particular attention was paid to protected areas including national parks, natural reserves and archaeological sites as well as areas subject to development restrictions and/or special planning laws.

Geological Surveys
Prior to surveys, the geologists superimposed available data onto 1:25,000 scaled topographical maps. During the surveys, the geologists measured the slope, direction and thickness of the different geological formations along the route, and made observations and annotations to prepare a surface geology map of the preferred route corridor and the cross-sectional geology map of the centreline.

Ecology Surveys
Prior to surveys, the ecologists conducted a desktop study and contacted various governmental and non-governmental agencies for biological data. In the course of the actual field surveys, the team made an evaluation of the habitats present along the route as a basis for predicting the overall habitat value, together with the likely occurrence of protected and/or sensitive species that would require special mitigation measures. In general, the team followed the widely used "Phase-I Habitat Assessment" approach. Uncomplicated, but effective survey and census techniques were applied for important species. Similarly, systematic (ie sample plots and transects) and non-systematic sampling of individual species was also made for specimen identification and cataloguing purposes.

Cultural Heritage Surveys
The two key objectives of the cultural heritage surveys was to identify and map the known and registered historical and archaeological features and/or sites along the corridor and to identify (as far as practicable) those locations and areas where a high probability exists of discovering unrecorded historical and archaeological remains during the construction phase.

During the field studies, the primary emphasis was on expert judgment based on field-name evidence and surface footprints (eg remains, artefacts, mounds or tumuli) as well as consideration of the local surface geology. Furthermore, consultations with relevant local museums and local residents constituted an important element of the archaeological surveys.

In addition to faults, the main geological constraints were landslides: for example, in the Posof area to the north of Erzincan and in the vicinity of Altinyayla sub-district. Ecological constraints

comprised ecologically important areas with a high potential for biodiversity, such as near Tutmac Settlement in Sivas (see Section 5.7, Appendix C1 and the Environmental and Social Tables in Section 6), and areas important for rare, endemic, vulnerable, migratory or endangered species. Social and cultural heritage constraints comprised houses, schools, cemeteries, highly productive privately owned land and above ground or buried archaeological and historical features. In addition, proposed development projects such as dams (eg the Koroglu Dam Project) were also contributing factors that influenced route selection.

As a result of the EBS, a total of 28 route changes were recommended. Consequently, it was possible to propose a 500m corridor that although still contained geological, environmental, social, ecological and archaeological constraints, it was considered feasible to find a pipeline route within the corridor.

2.3.5.4 End of Basic Engineering geohazards review

In May 2001, a combined team of local and international experts, specialising in the previously established geohazard categories, conducted a review of the pipeline route and the specifically classified geohazard areas.

Satellite imagery and aerial photography were initially used to map features. Helicopter surveillance was undertaken in order to provide three-dimensional views of the pipeline corridor and to allow a fast, initial assessment of the route. Approximately 785km of the 500m corridor was visually inspected by helicopter over-flight (representing approximately 75% of the total route), concentrating on areas identified in desk-based interpretations.

Subsequently, approximately 535km of the 500m corridor was inspected by one or more of the specialist teams by drive over and walk-over method (representing approximately 50% of the total route).

The investigation provided valuable base data and recommendations for the further route engineering and pipeline design. For approximately 50km of the investigated 'Preferred Route Corridor' a relocation of the corridor inside the previously established 'Corridor of Interest' was suggested in order to minimise potential risks to the pipeline.

For a length of approximately 200km, recommendations based on the geohazard reviews were given for the definition of the centreline inside the investigated 'Preferred Route Corridor'. Further data on geohazards were collected throughout DE by site-specific investigation to feed into routing and design development.

2.3.6 Detailed Engineering phase

2.3.6.1 Introduction

In June 2001, following identification of the 500m wide 'Preferred Route Corridor' the Project moved into the Detailed Engineering (DE) phase. The key objectives of DE included the identification of the 100m wide 'Specified Route Corridor', followed by the 'Pipeline Centreline' and the 'Consultation Corridor'.

Routing during DE was undertaken in close collaboration with the EIA, especially in regard to ecology and archaeology. This collaboration was applied both to the route narrowing itself and to potential environmental and socio-economic implications of reroutes driven by geohazard considerations.

During this phase continued priority was given to geohazards.

2.3.6.2 Geohazards review

General considerations

Before describing the route narrowing process it is worth briefly discussing geohazards and how they have critically influenced routing. Design considerations for geohazards are discussed in Section 4 and the results of the baseline investigations are summarised in Section 5. The main geohazards for the BTC Pipeline in Turkey are landslides, seismic/faults, karstic zones and liquefaction. These are summarised below.

Landslide investigation programme

Landslides present a considerable threat to the long-term integrity of the pipeline. Avoidance of landslides was therefore considered to be the best approach.

In the process of narrowing the 500m wide corridor to the 100m corridor, geological, geomorphological and geotechnical surface field investigations were conducted. The aim was to establish a 'Specified Corridor,' which avoided landslide hazards. Most of the findings required only slight modifications of the centre line within the corridor, but some required re-routings outside the 500m corridor.

After the initial narrowing phase, landslide experts carried out additional investigations on landslides resulting in 21 route change requests outside the 500m corridor and a number of route modifications within the corridor. These areas were then considered in detail by a programme of field investigations, including core drillings, trial pits and geomorphological mapping. In addition to the field investigations, laboratory tests were carried out on collected samples. From this work a detailed understanding of landslide risk was developed.

Some examples of areas that were suspected of being at risk due to the landslide potential and were subsequently re-routed or re-designed, are as follows:

- ***Ceyhan Marine Terminal***: The audit stated minor reservations about the proposed routing of the pipeline because of the presence of a widespread thin mantle of landslide debris on the slopes at the edge of the plateau. Although the pipeline would be buried in the bedrock beneath the landslide debris, concerns were raised about the stability of cut slopes in these materials. Minor amendments to the route were made, minimising the need to cut into the landslide debris.

- ***Pasakoy (Kp 744+841 – 746+558)***: The route rises up a steep scarp slope with extensive active landsliding. Earlier investigations [Ref 2] confirmed that the proposed route crossed close to some unstable areas. Further field investigations indicated that the proposed route crossed an active landslide unit. Minor amendments to the route were implemented, which avoid the landslide unit.

- ***Tuzla River (Kp 669+076 – 670+279):*** Review of the proposed route in this area raised concern as it appeared to cross the toe area of an extensive earthflow/landslide complex on the north side of the valley. Further investigation confirmed that the pipeline would

be buried beneath the bed of an incised gully that cuts through the earthflow/landslide lobes and exposes bedrock in its bed and the lateral depth of burial would extend the distance over which the pipe was buried to the equivalent elevation of the gully bed.

- ***Cukuryurt (Kp 597+143 – 597+638):*** Field investigations confirmed that the original route running parallel to the NGP crossed an unstable area. The route was subsequently modified to pass outside the potential mudslide area [Ref 2].

- ***Gulluce (Kp 451+570 – 451+770):*** The original proposed route crossed the toe area of a major deep-seated earthflow and debris slide complex that occupied the valley floor and extended upslope. In order to overcome the uncertainties over the landslide risk at this site, it was concluded that the pipe would either need to be buried beneath the base of the displaced material (probably around 20m below ground level at the centre of the valley crossing) on the existing alignment or be re-routed downslope to avoid what was considered to be the toe area of the slide. The latter approach was implemented.

Further landslide investigations are being carried out at a number of locations [Ref 2].

Fault investigation programme

The Turkish section of the BTC Pipeline is situated in one of the most active seismic regions in the world. The existence of 42 fault zones was confirmed during the geohazard investigations. The general trend of major faults within Turkey is broadly orientated in an east-west direction and therefore crossing these faults was unavoidable. Additional field studies were undertaken during DE in order to clearly delineate fault locations and displacements.

From the initial list of investigated structures only four faults or fault zones were determined to be Holocene active and, as such, represent faults that would require attention in routing and design. All other features either showed no indication for activity or proved to have no tectonic lineament. The active faults and fault zones comprised the following:

1. Erzurum fault segments;
2. North-Anatolian fault;
3. Deliler fault;
4. Cokak fault zone;
5. Yumurtalik fault (BTC Marine Terminal Design);
6. Kizilouk fault.

The stress and deformation analyses of the Kiziloluk fault crossing indicate that the oil pipeline can withstand design displacements in this area without reaching the allowable tensile and compressive strain criteria subject to the implementation of recommended design measures. Further rerouting of the pipeline layout for the Kiziloluk fault was deemed not to be necessary [Ref 3].

Each fault was addressed specifically in terms of route alignment. The alignment was confirmed using non-linear finite element analysis to look at compressive stress/buckling forces during a seismic event. From this, the optimal alignment necessary to keep the pipe in tension was developed. Since the optimal alignment must be maintained for 250-300m either side of the fault, it can be a significant route-determining factor.

Karst hazard analyses investigation programme

The route passes through a highly karstic zone between 598.5km and 690.6km known as the Sivas Gypsum Karst. Karst characteristics vary along the route with five models of differing Karst formation identified. Field and desk investigations indicated that three of the five models could constitute a major hazard to the proposed pipeline during both the construction and operation phases. The potential hazard is due to the development of sinkholes and the collapse of large caves, with the possibility of sinkholes or collapse features up to 40m across formed in a single event.

For a total of 22km a greater risk was confirmed and additional geophysical measurements were carried out during the DE phase. The site-specific field surveys included geophysical measurements and drilling of the subsurface structure in order to: gain a fuller understanding of the karst; the relationship between sinkholes and dolines; and the different models present; and their locations with respect to the proposed route. Probabilities of ground failure were also assessed. The above considerations were instrumental in determining a route through the Sivas Gypsum Karst area that allowed ground hazard threats to the pipeline to be minimised.

Liquefaction and associated lateral spreading

Liquefaction can impose severe stresses on the pipeline that could potentially lead to a failure or rupture of the pipeline. Initially, significant lengths of the pipeline route were classified as 'potentially liquefiable'. Subsequent field investigations and the development of geomorphological models (see Figure 2.6) determined that areas of potential liquefaction were only confined to the flood plains of the rivers. River terraces and the majority of the broad valleys traversed by the pipeline, contained sufficiently consolidated sediments to ensure that liquefaction was not a real concern for the pipeline.

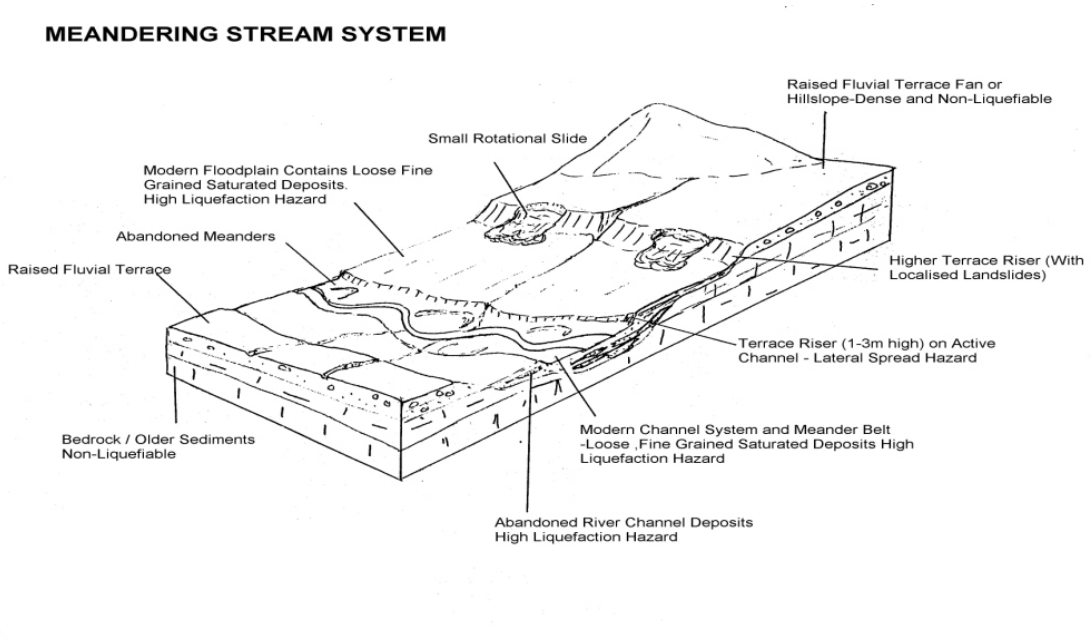


Figure 2.6 Liquefaction Potential Model for a Meandering Stream

2.3.6.3 Review of the Preferred Route Corridor

At the onset of the DE phase the 'Preferred Route Corridor' was reviewed and altered whenever necessary to include the recommendations of the geohazard review.

Due to the criticality of the routing and pipeline design in geohazard areas, the detailed design engineer was independently audited on the implementation of the geohazard review comments.

As stated above, for all fault zones, detailed geological mapping was performed, identifying potential maximum displacements and related displacement types as a basis for the subsequent design calculations. In karstic regions geophysical measurements were performed in order to determine existing subsurface voids and to determine necessary re-routes in order to avoid unstable ground conditions. In the areas of potential liquefaction Standard Penetration Tests (SPT) were performed in order to collect the relevant base data necessary to elaborate the necessary detailed design measures.

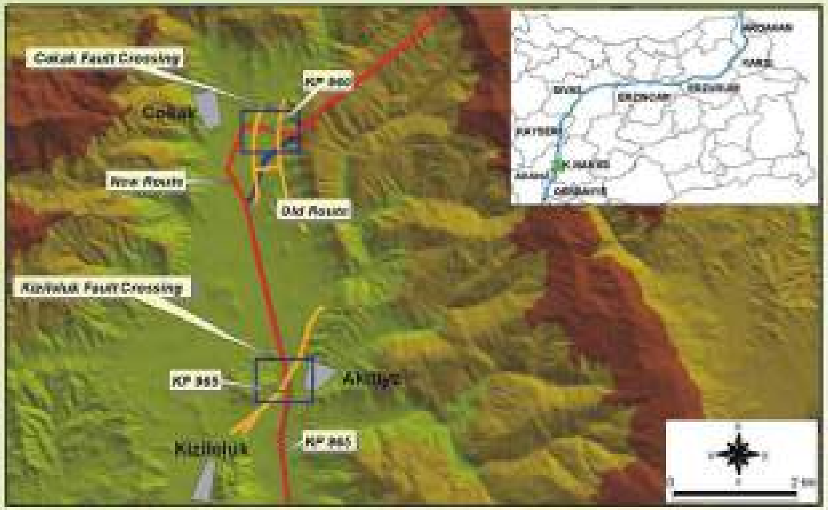
Case study examples of route modifications are presented as follows:

- Cokak fault (geohazard);
- Pasakoy landslide area (geohazard).

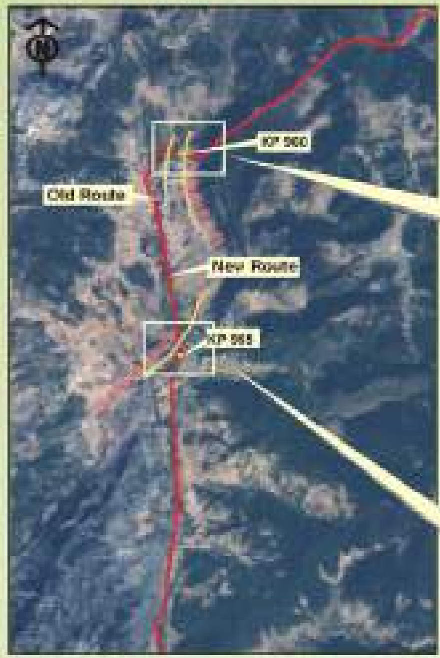
Other examples are presented in Section 6.

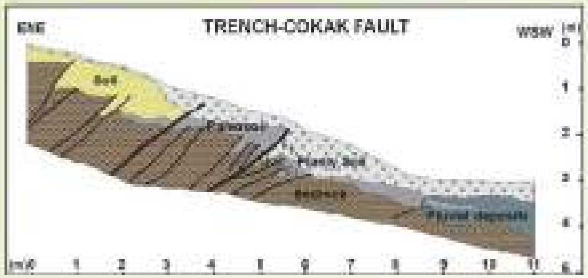
COKAK FAULT

The **Cokak Fault** forms the eastern boundary of the Cokak plain, which is primarily underlain by Tertiary clastic sediments. The fault classified as a major fault (i.e. a fault with indications of Holocene activity; with possible and probable displacements ranging from centimetres to metres). The **Cokak Fault** forms part of a complex and partially understood system of faults within the Taurus Mountains. This fault is approximately 3 km long, and is thought to be connected to the **Kizilolsk Fault**, therefore, forming a fault structure of approximately 15 - 20 km. The main fault comprises of 14 planes distributed over a zone 8 m. wide with four subsidary splays identified across an area of 700 m.



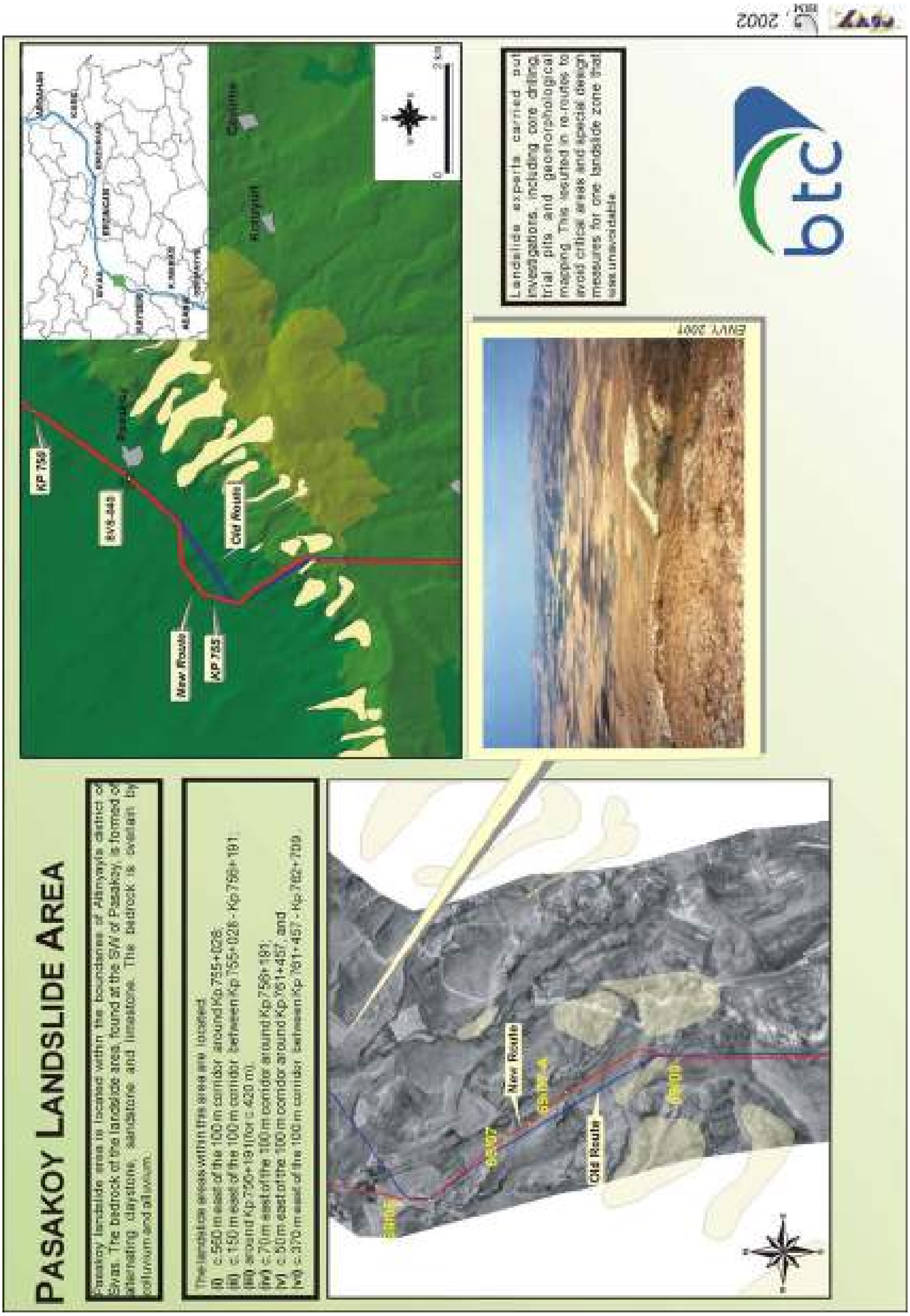
Trench works indicate that Cokak Fault is a wide fault zone which has at least 14 splays in about 700 m wide zone. The fault planes, which were observed on the trench walls, show reverse slip with indicators of right-lateral component and shear zones.





The fault crossing will be supervised by an experienced geologist during the pipeline construction activities in order to confirm the location, width and style of deformation of the fault at the crossing point. The geologist will recommend modifications to the pipeline trench excavation during construction, if observations indicate a difference in the width of the fault zone other than that predicted.

2002


PASAKOY LANDSLIDE AREA
Pasakoy landslide area is located within the boundaries of Altinyayla district of Sivas. The bedrock of the landslide area, found at the SW of Pasakoy, is formed of alternating claystone, sandstone and limestone. The bedrock is overlain by colluvium and alluvium.
The landslide areas within this area are located:
(i) c.560 m east of the 100 m corridor around Kp 755+026;
(ii) c.150 m east of the 100 m corridor between Kp 755+026 - Kp 756+191;
(iii) around Kp 756+191(for c.420 m);
(iv) c.70 m east of the 100 m corridor around Kp 756+191;
(v) c.50 m east of the 100 m corridor around Kp 761+457, and
(vi) c.370 m east of the 100 m corridor between Kp 761+457 - Kp 762+709.
Landslide experts carried out investigations, including core drilling, trial pits and geomorphological mapping. This resulted in re-routes to avoid critical areas and special design measures for one landslide zone that was unavoidable.
KP 750
SVS-040
Pasakoy
New Route
KP 755
Old Route
Kutuyurt
New Route
Old Route
ENVY 2001
btc
2002

2.3.6.4 Determination of the Specified Corridor

By October 2001, the 100m wide 'Specified Corridor' was determined and subsequently 161 adjustments to this corridor were recorded based on thorough social, environmental and technical reviews of the route. In particular, approximately 30km of route sections were adjusted in order to minimise or exclude the potential cultural heritage impacts of the selected route.

Elsewhere, cultural heritage and social considerations also played a key role in routing decisions, for example at:

- Tepekoy, to avoid a cemetery;
- Avcilar, to avoid a single dwelling;
- Yurtbasi, to avoid land proposed for future housing;
- Yaylaci, to maximise distance from a school;
- Osmaniye, to avoid impact to multiple landowners.

Some 285km of route sections were also modified in order to implement the necessary design at fault crossings (15km) and in order to implement an optimised design at slope areas and crossings.

2.3.6.5 Determination of the pipeline centreline

As much of the pipeline detailed design was completed during the definition and subsequent adjustment of the 'Specified Corridor', only a few additional changes were made to the final 'Pipeline Centreline'. In May 2002 a total of 28 changes involving a total of 38km had been carried out, primarily in order to accommodate further optimisations to the pipeline design.

2.3.7 Route change procedure

The BTC Pipeline route change procedure was initiated in order to control changes to the pipeline centreline routing. The main reasons for the route changes are summarised below:

- Engineering:
  - geohazards constraints;
  - constructability issues;
  - optimisation issues.

- Environmental and Social:
  - community impacts;
  - ecologically sensitive areas;
  - archaeological constraints.

- Land acquisition and Designated State Authority (DSA):
  - land owner issues;
  - authority constraints.

The pipeline engineering team then processed the route change and reviewed the change to ensure that all aspects of pipeline routing had been considered, and that no potential conflict was caused by alterations to the selected route.

Each route change was assigned a unique number and a route change log tracked the status of these route changes. All and any documentation associated with a particular route change is maintained in a Master route change file, which also contains the relevant route change request form that initiated the process.

During DE there have been three succinct routing phases with the corridor being 'narrowed' through three phases. For each phase a route change log was established. These phases were defined as:

- 500m - 'Preferred Corridor';
- 100m - 'Specified Corridor';
- 28m - 'Construction Corridor' (22m in forests and equal or less in environmentally sensitive areas).

2.3.8 Determination of the construction corridor for the acquisition of land

Prior to the determination of the final 'Construction Corridor' it was decided to increase the standard working width from 22m, as defined in the Host Government Agreement, to 28m conforming with standard, international pipeline installation practice for pipeline diameters of 42 inches and above. It should be noted, however, that whilst a standard 28m width was defined, the environmental assessment process would require the narrowing of this standard width in order to minimise potential impacts at a number of locations due to the identification of Ecologically Sensitive Areas, forest crossings, etc. Whilst it is possible to narrow the width over relatively short lengths of the pipeline route, health and safety and technical feasibility considerations prevent the overall narrowing of the construction corridor below the stipulated 28m.

The use of a standard working width of 28m for the execution of the pipeline construction will provide distinct advantages in terms of:

- the safe execution of all works carried out on the construction working width;
- the minimisation of risks that the Construction Contractor would utilise additional land outside the working width without prior landowner agreement and indemnification;
- continuous access of emergency, safety, maintenance and supply vehicles via the construction working strip (avoids need for single track vehicle passage);
- the avoidance of possible mixing of stripped topsoil with excavated subsoil;
- the use of standard pipeline installation methods.

In the process of determining the final 'Construction Corridor', all areas of standard working width (28m), reduced working width (22m) and enlarged working width (35m) were identified. Additional working and lay down areas at crossings were also identified.

Based on this information the relevant land cadastre and title deed records were researched and on site asset surveys performed to allow the preparation of relevant files for the permanent acquisition of the 8m wide 'Pipeline Corridor' and the temporary expropriation of the 'Construction Corridor'. Since expropriation is not appropriate for areas in the possession of the

Ministry of Forestry (in compliance to the Article 17 of Forest law numbered 6831) the land will be acquired for period of 49 years.

2.3.9 Parallel routing with the East Anatolian Natural Gas Pipeline

The East Anatolian Natural Gas Pipeline (NGP) transports natural gas from Iran to Turkey and was commissioned in 2001. The proposed Turkish section of the BTC Pipeline will run parallel to this existing line for about 31% of its length, between the cities of Erzurum and Sivas (see Figure 4.4).

In general the parallel alignment of the two pipelines provides the following advantages.

- The environmental impact can be minimised as impacts associated with construction, operation and maintenance activities (eg disturbance of natural flora and fauna, tree cutting, etc) will be contained within a single pipeline corridor.
- The social impact will be limited to one joint corridor, and the long-term disturbance of the population will be minimised.
- The construction programme will be facilitated as an existing corridor can be used.
- For maintenance and operational inspection, common access can be used.

The BTC Pipeline will typically be laid at a minimum separation distance of 12m from the existing NGP. This minimum separation distance will allow the employment of standard pipeline construction methods for the installation of the BTC Pipeline. Furthermore it will ensure that the permanent corridor of the BTC Pipeline (4m either side of its centreline) will not overlap the safety corridor of the NGP (7m either side of its centreline).

If at any point it becomes necessary to reduce the separation distance to less than 12m (owing to topography constraints, for example), then installation of the BTC Pipeline will be subject to specialised construction methods, design factors and addressed in the separate operation agreements of the two pipeline operators (BOTAŞ).

2.3.10 Above Ground Installations

2.3.10.1 Pump station locations

The selection of the pump station locations was determined by the elevation requirements for the location of the pumps, derived from the overall pipeline system hydraulics. The site selection was an iterative process, sometimes requiring the re-routing of the pipeline in order to reach an area suitable for the installation of the station. A survey team selected possible locations at or close to the pre-defined sites, taking due account of environmental, socio-economic and cultural heritage constraints.

After the initial site selection, subsoil investigations were performed by the geological team to confirm the ground-bearing capacity as being suitable for the installation of heavy equipment; namely the main pump drivers and tanks. The survey team also assessed the topography of the selected location, in an attempt to identify relatively flat terrain, where a station layout could be realized without too many split levels. This was not always achievable in mountainous terrain.

Other detailed studies, including a Qualitative Risk Assessment (QRA), were performed in order to confirm the acceptability of the selected station locations in terms of environmental, archaeological and social impact considerations.

In addition, general station selection criteria in terms of infrastructure availability, such as: access roads, natural gas (driver), electrical power and water supply, as well as ground stability and general station layout criteria and landownership status were investigated during the process of station site selection, within the flexibility determined by pipeline hydraulic studies.

Following the initial selection of four pump stations and one pressure reduction station:

- two pump station locations (PT2 and PT3) were relocated during the DE phase on the basis of a number of technical considerations which were primarily associated with layout and area of landtake;

- the pressure reduction station (IPT1) was relocated primarily on the basis of landscape, visual and ecological impact.

2.3.10.2 Pump driver selection

A pump driver selection study was undertaken in the DE phase. The study considered the use of both crude oil and natural gas as fuel for the driver sets. Selection also took into consideration such factors as capital cost, operational cost, constructability and operability. The driver/fuel combinations studied comprised the following:

- reciprocating engine fired by crude oil (RC Crude);
- reciprocating engine fired by gas (RC Gas);
- turbine fired by crude oil (turbine crude);
- turbine fired by gas (turbine gas).

Table 2.1 summarises the findings of the pump driver selection study for the key factors that influenced the final decision.

Both of the crude fired pump driver options have the disadvantage of not being able to meet NO_x emission limits through combustion technology. Stack injection of water/urea is required, leading to greater resource use and cost. Crude oil, per unit of power generated, produces a greater mass of CO_2 than natural gas.

Natural gas is therefore the preferred fuel for the four pump stations and will be provided for BTC operation via branch line connections to the existing NGP (pump stations PT2/3/4) and via a branch line connection to the proposed South Caucasus Gas Pipeline (PT1) with gas being initially supplied from the NGP.

Both the gas reciprocating engine and gas turbine can meet NO_X emission limits through current construction technology. Gas reciprocating engines (>41%) are, however, substantially more efficient than turbines (<30%), producing proportionally less CO_2. Gas reciprocating engines are also the least cost option (mainly through fuel efficiency). Selection of gas reciprocating engines as the pump driver is therefore justifiable on grounds of economic, technical and environmental considerations.

Table 2.1 Selection Criteria for Pump Driver

	RC Crude	RC Gas	Turbine Crude	Turbine Gas
Constructability	Feasible based on size of unit loads, roads and access.	Feasible based on size of unit loads, roads and access.	Feasible based on size of unit loads, roads and access.	Feasible based on size of unit loads, roads and access.
Operability	Proven driver in oil and gas pipeline operation.	Proven driver in oil and gas pipeline operation.	Proven driver in oil and gas pipeline operation.	Proven driver in oil and gas pipeline operation.
Nitrogen Oxides Emissions	NO_x emissions would exceed World Bank emissions standards, thereby requiring NO_x control. This would involve stack injection of a water/urea mixture.	Clean burn system allows NO_x emissions to be controlled to within World Bank standards.	NO_x emissions higher than RC crude and would require similar mitigation.	Dry low NO_x technology allows World Bank standards on NO_x emissions to be comfortably met.
Resource Use	Water abstraction supply for NO_x control. Urea transport to site for NO_x control. Diesel required for start-up.		Water use and urea requirement greater than for RC crude. Diesel required for start-up.	
Opportunities	Heat recovery for onsite low pressure steam and hot water supply feasible.	Heat recovery for onsite low pressure steam and hot water supply feasible.	Heat recovery for onsite low pressure steam and hot water supply feasible	Heat recovery for onsite low pressure steam and hot water supply feasible
Fuel Efficiency	42.8%	41.4%	27.8%	29.8/%
CO_2 generation (1)	RC Gas x 1.33	Lowest CO_2 emissions option	RC Gas x 2.04	RC Gas x 1.39
Cost (Capital and Operational Expenditure)	RC Gas x 1.24	Least cost option, over 40 year life largely due to fuel efficiency.	RC Gas x 1.4	RC Gas x 1.06

(1) as a combination of fuel type and engine efficiency
- crude oil – 12 tonnes carbon per joule
- gas – 15.3 tonnes carbon per joule

(Intergovernmental Panel on Climate Change)

2.3.10.3 Block valves (BV)

Block valve (BV) stations will be installed along the pipeline route in order to allow for a closing of the pipeline during normal operation or as part of an emergency intervention procedure. BVs are an integrated part of the pipeline leak detection system. A total of 52

intermediate BV stations will be installed along the BTC Pipeline route between the Georgian border and the BTC Marine Terminal. The actual locations and distances between the stations were chosen in view of the following requirements.

- The project specific agreements, which call for intermediate BV at a general separation distance between 20km and 30km, considering acceptable limits of pipeline leakage and loss in the event of failure as identified in the Project Environmental Impact Plan and Loss Control Philosophy.

- The requirements of the principle design code for crude oil pipelines, the American Society of Mechanical Engineers (ASME) B31.4, which calls for block and isolating valves for limiting hazard and damage from accidental discharge and for facilitating maintenance of the piping system, highlighting the particular importance of major river crossings and public water supply reservoirs and areas where construction activities pose a particular risk of external damage to the pipeline.

- Main environmental features, which included: major plains; groundwater resources; dams and reservoirs; major geological features with regard to spill migration (eg karst and fault zones); ecologically important areas; populated areas; and major archaeological features.

The considerations listed above were incorporated into a comprehensive QRA of the entire BTC Pipeline. The QRA followed an environmental risk assessment approach whereby the locations of block valves and the application of other site specific design measures (such as increased pipeline wall thickness, deeper burial of pipeline, etc) were determined taking full cognisance of sensitive environmental features along the pipeline route. This analysis is discussed in detail in Section 8.

Subsequently, DE considerations optimised the final locations of block valves on a valve by valve basis, through knowledge of the route gained in field investigation and from aerial photography. The final locating of the block valve sites, while taking cognisance of the requirements of the Turnkey Agreement, good design and the results of the QRA, took into consideration:

- minimising footprint;
- location near existing access roads so as to minimise the need to provide new access infrastructure (and associated impacts);
- minimising conflicts with existing land uses.

2.3.11 Other design options

Ongoing interaction between the Engineering Design and EIA teams has enabled the consideration of a number of other options in regard to construction and operation of the pipeline and AGIs. These include such matters as:

- methods for crossing watercourses, roads, rail, etc;
- wastewater treatment methods;
- waste management techniques.

These matters are highlighted in Volume 2, Section 4 and are referenced, where appropriate, in other relevant sections of this Report.

2.4 OPTIONS FOR THE MARINE TERMINAL

2.4.1 Marine terminal site selection

2.4.1.1 Alternative sites considered

Alternative sites for the BTC Marine Terminal in the Gulf of Iskenderun were identified following an initial site survey. Five candidate sites were selected (see Figure 2.7) and their main characteristics are summarised below.

Site 1 : Kamisli Cape is within the existing BOTAŞ Terminal boundaries. The elevation is about 30m. The sea depth increases relatively rapidly with distance from shore. Substrate is hard rock.

Site 2 : This site is also within the existing BOTAŞ Terminal boundaries. It is a flat area, very close to both Incirli Settlement and the existing BOTAŞ facilities.

Site 3 : This site comprises a flat area, very close to Toros Gubre Fertilizer Facility's social facilities and the jetty under construction at the time of the site selection exercise.

Site 4 : This site is at the end of the Gulf of Iskenderun. It comprises a very flat area and the seabed is shallow for some distance from shore. The area is dedicated as a 'Free Trade Zone'. The local lithology is oligo-miocene. In the event of an earthquake there is a risk of liquefaction.

Site 5 : This site is at the end of the Gulf of Iskenderun. It is a very flat area and the sea is very shallow. It lies between the beach and a wetland area inland. The subsoil could present structural problems for foundations and there is the risk of liquefaction in the event of an earthquake.

Beyond Site 5, towards the outer Gulf of Iskenderun there is the large Karabasmak wetland area followed by a residential area. On the other side, beyond Site 1 towards Yumurtalik, again the land is mostly privately owned and used for summer houses, and around Yumurtalik there are various archaeological and valuable/sensitive ecological areas.

The topography of the region potentially allows the opportunity to select a site where gravity flow can be used for loading oil, thereby avoiding the requirement for additional pumping. This saves energy and has a positive environmental effect by reducing overall CO_2 emissions.

The alternative sites considered for the marine terminal are described below and summarised in Table 2.2.

Figure 2.7 The Five Candidate Sites for the BTC Marine Terminal

Table 2.2 Comparison of Alternative Sites for the Marine Terminal

COMPARISON CRITERIA	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5
Elevation Difference (no pumping)	X	-	-	-	-
No Land Acquisition	X	X	-	X	-
Suitable Ground Conditions	X	X	X	-	-
Third Party Safety	X	-	-	X	-
Sufficient Depth	X	X	X	-	-
Minimal Landtake of Natural Habitat	X	X	-	-	-
X: site possesses; -: site does not possess Source: [Ref 1]					

Other key site selection criteria included:

- absence of significant geohazards;
- minimisation of need for new infrastructure in undeveloped areas;
- sufficient land area to accommodate the facilities;
- minimisation of the expropriation costs.

Following the comparative evaluation of the five alternative sites, four of the sites were found to be heavily constrained.

- On Site 2 the available area is too small to locate the tanks and too low for gravity loading and is also squeezed between the existing BOTAŞ facilities and Incirli Settlement.

- Sites 3, 4 and 5 are greenfield sites, no infrastructure exists and the elevation at these sites is also too low for gravity loading. Each of these sites also lies outside the current land holdings of BOTAŞ and so land acquisition from third parties would be necessary.

- For Site 3 and (particularly) Sites 4 and 5, the sea depth is shallow and would necessitate a long jetty.

- Sites 2, 3 and 4 all raised possible marine traffic problems due to the separation distances from the existing jetties.

- Sites 4 and 5 have shallow water and the access is partially blocked by a large anchoring area.

- Site 5 is very close to a wetland area so subsoil stability is likely to be a problem

The site location selection study therefore indicated that the preferred option would be the construction of the marine terminal on land currently owned by BOTAŞ adjacent to its existing facility near Ceyhan (Site 1). This site is to the west of the existing BOTAS Terminal and has a number of advantages over the alternative sites.

- It is within the existing BOTAŞ Marine Terminal boundaries. Therefore, land acquisition will have minimal impact.

- It is the only site with elevation (approximately 30m) that would allow gravity flow to contribute to loading. Other sites are flat and would therefore have required a pumping station.

- There is sufficient space for the proposed facilities.

- The distance between the proposed and existing jetties will be sufficient not to interfere with the shipping traffic of the existing jetty.

- The sea deepens quite rapidly to reach a sufficient operational depth. No dredging would be required for construction or for maintenance.

- The shallow subsurface is hard rock and therefore a suitable foundation for tanks.

2.4.1.2 The proposed site

From the evaluation of the alternative sites for the BTC Marine Terminal, the proposed site was selected as a suitable location. In addition to those points mentioned above, it has several other advantages when compared with the alternatives.

- The impact of constructing and operating adjacent to an existing site is likely to be lower than developing a greenfield site.
- Gravity loading saves energy and will reduce CO_2 emissions.
- Oil spill response capability will be augmented by existing response equipment and resources at the existing BOTAŞ facility.
- No loss of significant ecological and land use resources will result.
- There is no new real estate cost.
- There are possible lower operating costs pending commercial agreements to share certain facilities (eg fire-fighting).
- Seismic hazards criteria are met.

2.4.2 Marine terminal design alternatives

2.4.2.1 Choice of loading concept - Jetty versus Single Point Mooring (SPM)

There are two main concepts that can be used for the tanker export of hydrocarbon fluids, namely a jetty or a single point mooring (SPM). These two alternatives were examined during the basic engineering phase of the Project. Initially, the following criteria were applied:

- environmental considerations and risks;
- operational considerations including safety aspects and risks;
- nautical and maritime aspects;
- construction impact;
- cost considerations.

Subsequently, cost as a criterion was excluded from the evaluation. Based on the remaining evaluation criteria, the jetty solution was found to be the optimal solution for the BTC Project; the advantages of a jetty over an SPM are summarised in Table 2.3 below.

In summary the jetty was the preferred alternative due to:

- higher environmental risks for a SPM with respect to oil spill risk;
- lower environmental impact of a jetty installation during construction;
- lower safety risk for a jetty due to easier access and quicker response time;
- operability advantages for a jetty due to the jetty characteristics and jetty experience of BOTAŞ.

2.4.2.2 New build terminal versus extension of existing facilities

Extending the existing terminal was not considered as a viable option. The existing terminal at Ceyhan was constructed in three phases between 1974 and 1987 to export Iraqi crude oil transported by pipeline. The two facilities do not share a common ownership. Rigid fiscal monitoring and product segregation for all products transported via the BTC Pipeline will be required. Additionally, the two facilities are subject to different international agreements and requirements.

2.4.2.3 Volatile organic compounds (VOC) emissions control

VOCs remain in cargo tanks after unloading and are forced out of the tanker when a new liquid cargo enters the tank. Some VOC will come from the new cargo but, as the pressure of the inert gas system is maintained, the quantity will be smaller in comparison to that from the earlier cargo but will contribute to the overall inventory. The vapour pressure of crude oil (such as ACG) is lower than that for other hydrocarbon products. As such, the formation of VOC in crude tanker cargo compartments is less likely than for product tankers. However, given the size of crude tankers and crude terminal throughputs, total VOC emissions can be significant.

VOC emissions can have the following environmental effects:

- toxicity – eg through constituents like benzene;
- stratospheric ozone depletion;
- contribution to tropospheric ozone (incidentally classified as a contributor to global warming);
- odour nuisance.

It is therefore desirable to manage these emissions in an appropriate way. VOC emissions control has been looked at during both Basic Engineering and DE. During Basic Engineering, different means of control were evaluated and during DE, alternatives for the preferred option were assessed.

Basic engineering phase

The BE phase started with the premise that volatile organic compounds (VOC) fugitive emissions during loading operations would be minimised and that this would be initially achieved through a closed, hard-piped system containing no open components from which VOCs could escape.

The alternatives evaluated during Basic Engineering are summarised in Table 2.3 below.

Table 2.3 Jetty versus SPM

Jetty	SPM	Comments
General Design Considerations		
Two berths for tankers, requiring approximately 700m turning circle. Length from shore 2.5km. Water depth up to 25m.	Two SPMs required to achieve design loading rate. Vessels require turning circle of up to 2.2km. Seabed pipelines required out to water depth of 27-28m, 3-4km from shore. Significant difficulties in locating second SPM would require a total of 10-12km of offshore pipelines.	Jetty requires a smaller navigational safety zone and would have less impact on other marine users.
Jetty loading end to accommodate control room, fire fighting equipment and oil spill response equipment.	Control and emergency response facilities located onshore and/or a dedicated vessel.	Jetty provides more convenient and cost-effective platform for oil spill response equipment.
Operational Risks		
All loading operations under control of terminal personnel.	Split responsibilities for loading between terminal and vessel crews.	
BOTAŞ has experience and established procedures for existing jetty loading.	No existing experience and procedures in SPM loading.	Jetty preferred on basis of past experience and cleaner lines of communication.
Nautical Aspects		
Weather related berthing delays at existing Ceyhan terminal are 15-30 days per annum.	SPMs can operate safely in harsher sea state and weather conditions than jetties.	SPMs allow more loading days per annum.
Environmental Considerations		
Flow line routing to the jetty can be achieved with minor impact to ecology and land use.	Construction of the pipeline landfall and provision of pipe-stringing areas would lead to ecological and temporary land take impacts.	Jetty results in lowest temporary construction footprint.
An exclusion zone to allow for safe manoeuvring by tankers berthing at the jetty will conflict with local fishing activity.	Tankers mooring at SPMs require approximately 3 times the turning circle of similar size tankers approaching a jetty; additionally there would be two SPMs. Exclusion zone to fishing and other activity would be substantially greater.	Similar safety zone considerations to those noted above.
Substantially visible coastal structure.	Low visibility.	SPM would have least visual impact.
All emergency response facilities located at jetty end in close proximity to actual loading operations.	Emergency response equipment would need to be loaded onto a dedicated response vessel.	Jetty would provide more rapid response capability for a loading spill.
Jetty construction would permanently occupy seabed for the length of the causeway, with lesser long-term effects from the piled jetty. Jetty structures would provide some positive 'artificial reef effect'.	Up to 12km of seabed would be disturbed by dredging and pipelaying activities.	Jetty would result in lowest temporary seabed disturbance.
Connecting and disconnecting operations have highest risk of oil spill – losses would largely be linked to the inventory of loading arms.	Losses of oil at SPMs would most likely be via floating loading hoses – in the event of a rupture the inventory is greater and therefore so is the potential spill size.	Jetty has lowest environmental risk due to a loading spill.

Box 2.2 Summary of Basic Engineering VOC Control Alternatives

Condensation

Condensation of the hydrocarbon vapours would be accomplished using refrigeration systems. Typical recovery for this method is 50% to 95%. Due to the low concentrations, very low (sub-zero temperatures) would be needed to condense the VOC. The liquid VOC would then be separated from any other liquefied gases and returned to storage as no other marine terminal system (such as a fuel gas system) could accept them and the crude tanks will be at a temperature which would cause most of the liquefied vapours to flash back to gas form, much of which would escape as fugitive emissions. The lack of a reasonable outlet (such as a fuel gas system) means that the investment in a condensation system would not be an effective method to mitigate vapour emissions.

Adsorption

Adsorption of the VOC can be accomplished with activated carbon adsorption systems that can achieve recovery rates as high as 99%. The large volumetric flow from the tankers would necessitate fairly large units to accommodate the high flow rates while maintaining the VOC adsorption performance. The carbon units need to be regenerated regularly. As with the condensation system discussed above, there is no readily available outlet for the vapours such that regeneration would be accomplished by oxidising (burning) the VOC. As a result, the VOC emissions from tanker loading would be emitted as CO_2 instead of VOC. The primary advantage of capturing the VOC with a carbon adsorption unit prior to oxidation over direct oxidation is that the CO_2 emissions would primarily result from the VOC themselves rather than an additional significant quantity of pilot fuel.

Absorption

Absorption of VOC is accomplished by passing the vapours through a lean oil/crude oil absorption system to remove the VOC component. However, the performance of this system would be inferior to that of activated carbon adsorption units. As with the adsorption option discussed above, an absorption system would require regeneration (stripping of the VOC) or replacement (new supply of lean oil). ACG may be a suitable absorption media, but further investigation would be required to determine if ACG or another lean oil would be required. The logistics of operating this type of system on the jetty are a significant factor. Efficiency is also a consideration, since in the order of 20% of VOCs would be released. However, a power supply is required for operation.

Oxidation

Direct oxidation of the VOC would be accomplished using destruction processes (eg flares, incineration or catalytic oxidation). These systems generally require auxiliary fuel supply to maintain the 'pilot', ensuring that the large quantity of inert gas accompanying the VOC does not stop the oxidation process. Direct oxidation provides the simplest operating configuration but would likely require a supplemental, clean-burning fuel supply. Additionally, the VOC and supplemental fuel oxidation would result in CO_2 emissions well above that which would result from burning of the VOC only.

Although the primary source of VOC emissions during loading is the VOC generated in the cargo tanks during the prior unloading operation, setting a requirement for tankers to arrive at Ceyhan with their cargo tanks free of VOC was not considered as this would simply transfer the problem elsewhere.

In terms of environmental effects the choices for VOC recovery can be summarised as follows.

1. *Do nothing*: this would result in the emissions to atmosphere of quantities of VOC with impacts comprising potential toxic/health effects, stratospheric ozone depletion, contribution to tropospheric ozone and smog formation and odour nuisance to nearby communities.

2. *Recovery and oxidation with gas assisted flare*: this option would remove virtually all the above impacts but replace them with emissions of CO_2 and traces of NO_x and VOC.

3. *Adsorption onto activated carbon followed by oxidation*: much the same as Option 2 above but less emissions since fuel gas would not be required.

4. *Condensation and injection into a fuel gas system*: emissions of CO_2 and traces of NO_x would still result but with the benefit of power/energy being generated.

Although in environmental terms, Option 4 is the preferred option, it has proven impractical since a constant and reliable flow to the potential end user could not be guaranteed.

Adsorption and oxidation, although leading to emissions of CO_2 and traces of NO_x, have substantial environmental benefits over release of VOC to atmosphere. Absorption has the benefit of largely removing CO_2 emissions although a power supply is required for operation.

Detailed Engineering phase

The DE phase therefore examined different means of oxidising the recovered VOCs, through one of two potential processes.

1. *Combustion*, defined as the process of rapid oxidation of a fuel resulting in energy release in the form of heat and light. Two smokeless flaring options were evaluated, namely water injection and forced air-assisted.

2. *Incineration*, defined as the controlled combustion of waste gases where the products of combustion are contained in a combustion chamber at a minimum temperature for a specific time frame. Two types were evaluated, namely several small units and one large enclosed ground flare.

Following engineering studies, the recommended option for VOC handling was an Air Assisted Elevated Flare (AAEF). However, owing to radiation constraints, a flare stack height of 40m was required. The length of the flame was estimated to be an additional 39m in height. Due to environmental impacts, especially noise and visibility, BTC Co rejected this option.

Subsequently, two VOC handling methods were assessed in terms of emissions, capital and operating costs.

1. **Enclosed Ground Flare (EGF).** An EGF can be installed as a series of smaller units or as one large EGF unit with approximate dimensions of 10m diameter by 25m height. The system is preferable to the AAEF option, in respect of radiation, noise and visual impact. The hydrocarbon conversion rate of the EGF is approximately 99.5%.

2. **VOC Recovery System**. A VOC Recovery System (developed by Kvaerner, in cooperation with Statoil, Norsk Hydro and Conoco) was considered as an alternative to incineration, to enable the reduction of VOC emissions without generating the large quantities of CO_2 associated with the EGF. The proposed VOC recovery method was absorption at high pressure in a crude oil bypass stream and return to the tanker. VOC recovery units are a relatively new concept and have experienced operational and reliability problems. The assessment was based on a 78% recovery rate for VOCs.

The assessment results of the emissions for both alternatives are summarised in Table 2.4 below.

Table 2.4 Summary Evaluation of Combustion/Incineration Alternatives

EMISSION PARAMETER	INCINERATION	VOC RECOVERY
VOC Emissions - tonnes annually	215	8,800
CO_2 Emissions - tonnes annually	152,000	9,200
SO_2 Emissions - tonnes annually	390	410
NO_x Emissions – tonnes annually	36	16

To support the evaluation, a dispersion modelling exercise was carried out to evaluate the impacts of emissions from the two VOC handling options. Existing sources and other proposed sources were not included in the evaluation. Thus, the modelling results were used for comparative purposes only and do not reflect the cumulative impacts of each option on air quality.

The results are summarised as follows.

- The maximum annual average VOC concentration estimated for the EGF is approximately 15µg/m^3. The maximum hourly concentration generated by the EGF is 270µg/m^3 (located within the BOTAŞ facility limits). This is within ambient air quality guidelines and standards.
- The maximum annual average VOC concentration due to emissions from the VOC Recovery System would be approximately 600µg/m^3 and is located offshore. The on-shore concentrations would reach a maximum of 150µg/m^3 (immediately due west of the proposed jetty). Hourly concentrations for VOC would be between 100-3,000µg/m^3. This is non-compliant with Turkish Standards for Total Hydrocarbons (280µg/m^3).

Potential cumulative impacts (see also Section 16) to air quality in combination with third party sources were also an important consideration.

- Taking VOCs alone, the existing BOTAS marine terminal is already a substantial source. In the context of local air quality, the VOC Recovery System would substantially add to it.
- In addition, the Sugozu coal-fired Power Plant is under construction. Once it begins operation it will contribute significant amounts of nitrogen dioxide to the atmosphere. The EGF would also contribute nitrogen dioxide but these would be in minor amounts in comparison to the Power Plant.

Furthermore the VOCs and nitrogen dioxide can interact in the atmosphere to form tropospheric ozone, a gas with implications to human health and agricultural crops. In combination with VOCs from the existing BOTAŞ marine terminal and nitrogen dioxide from the operational Sugozu power plant, the VOC Recovery System would make a significant contribution to this potential future problem. The EGF would make a minor contribution only.

The following conclusions can be drawn:

- Based on the modelling results, the VOC Recovery System would be non-compliant with at least one ambient air quality standard (Turkish hourly maximum for Total Hydrocarbons).
- The EGF is compliant with relevant guidelines and standards for ambient air quality.
- Both VOC Recovery System and the EGF have global impacts. However, in comparison with the EGF option, the Recovery System would have the potential to make a significantly greater contribution to any local air quality impacts both singly, cumulatively with the existing BOTAŞ marine terminal and cumulatively in future in terms of interacting with power plant nitrogen dioxide emissions to form tropospheric ozone.

Based on the above findings the EGF was selected as the preferred option.

2.5 SUMMARY AND CONCLUSIONS

The planning and design of the BTC Project has involved the integrated consideration of alternative crude oil transportation means, pipeline routes and sites for: block valve stations, pump stations, pressure reduction station, and the marine terminal. In addition, the developing design has integrated engineering, constructability, environmental, social and operability issues in a multidisciplinary, iterative process of option identification and evaluation.

This process has delivered a proposed pipeline route alignment and locations for each of the pipeline associated facilities (described in greater detail in Section 4) and a site and layout for the BTC Marine Terminal at Ceyhan (described in greater detail in Section 9).

The integrated design approach that has characterised the development of the pipeline to date will continue through the future refinement of the engineering design, the planning and implementation of construction activities and in the commissioning, operation and maintenance of the new pipeline and associated facilities.

BIBLIOGRAPHY

Ref 1 PLE and Parmas (1999) Baku Tblisi Ceyhan Crude Oil Pipeline Feasibility Study and Ceyhan Marine Terminal: Volume 1.

Ref 2 John Charman, Mark Lee. June 2002. BTC Crude Oil Pipeline Project Turkey. Geotechnical Audit – Landslides.

Ref 3 ILF. May 2002. Structural Calculations Of Pipeline At Fault Crossings. ILF REP EPL PLG 022. Rev. 0 (see Appendix 7: Structural Calculation Of Pipeline At Fault Crossing Kiziloluk).

3 APPROACH AND METHODOLOGY

3.1 OVERVIEW OF THE EIA PROCESS

3.1.1 General considerations

In compliance with the provisions of the Host Government Agreement (HGA), the approach adopted in this EIA is in accordance with World Bank requirements (Article 8.42, Operational Policy OP4.01) and EC Directive requirements (85/337/EEC, as amended by EC Directive 97/11/EC). These requirements stress the flexibility of the EIA as a process that can be adapted to suit the specified needs of the project that it is applied to, provided it also complies with local regulations.

The development of the planning and design of the Turkish section of the BTC Project has been described in Section 2. Although this document presents a summary of the findings of the EIA process to date, EIA as a process was applied from much earlier in the overall project development, whereby Scoping ran in parallel with development of the 'Preferred Route Corridor' and selection of the marine terminal site.

Figure 3.1 shows that the EIA has proceeded in parallel, and interacted, with the other processes of stakeholder consultation and project development and design, with baseline data feeding in throughout. To some extent these can all be regarded as ongoing processes: detailed design will be completed; the Construction Contractors will make bids and include environmental specifications in those bids; detailed working method statements will be prepared and these will include environmental and social mitigation; work will proceed; performance will be monitored and where necessary corrective actions will be undertaken. Similarly, a draft of this EIA Report was prepared for the purposes of information dissemination and disclosure. Thus: stakeholders and regulators has the opportunity to respond to and comment on the EIA findings; a number of the EIA findings were revisited; and mitigation measures and management plans were amended and expanded in order to reflect stakeholder feedback on the disclosure draft.

The EIA process and its component parts as they have been followed to date are described in the following sections. However, it is worth briefly presenting some of the underlying aspects of the EIA methodology in terms of defining types of impact, how geographical extent has been addressed and the generic project activities considered in the EIA.

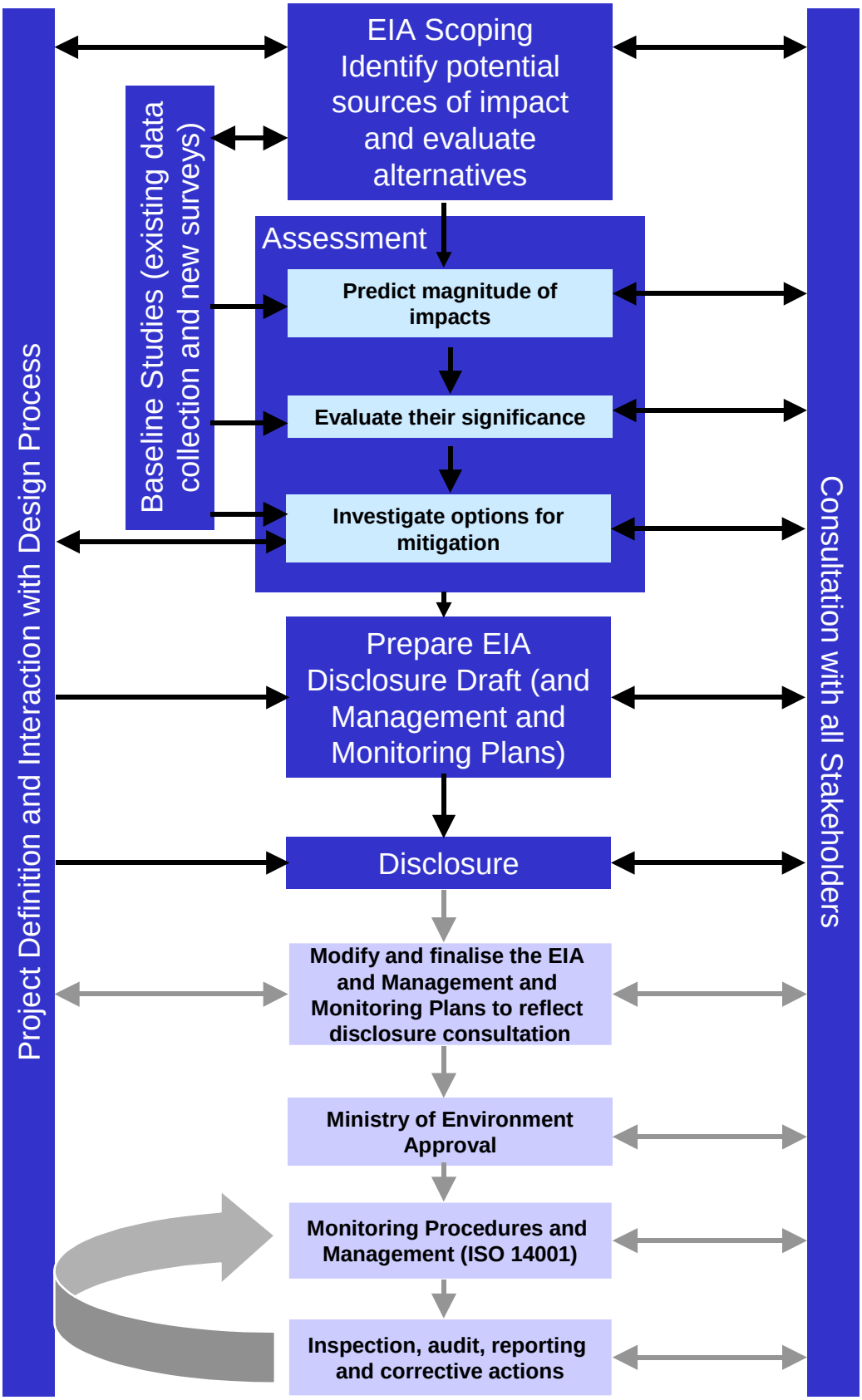


Figure 3.1 Overview of the BTC EIA Process

3.1.2 Types of impact considered

Box 3.1 defines the types of impact addressed in this EIA. The definitions provided below apply to both the environmental and socio-economic impacts described in the EIA report. Where practical these terms are used to qualify impacts, although in most instances it can be assumed that the default is a direct, negative impact; these latter terms are therefore not generally used.

Box 3.1 Types of Impacts Considered

Negative – an impact that is considered to represent an adverse change from the baseline, or introduce a new undesirable factor.

Positive – an impact that is considered to represent an improvement to the baseline or introduces a new desirable factor.

Direct (or primary) – impacts that result from a direct interaction between a planned project activity and the receiving environment (eg between occupation of the pipeline corridor and the pre-existing habitats).

Secondary – impacts that follow on from the primary interactions between the Project and its environment as a result of subsequent interactions within the environment (eg loss of part of a habitat affects the viability of a species population over a wider area).

Indirect – impacts that result from other activities that are encouraged to happen as a consequence of the Project (eg exclusion of fishing activity at the marine terminal jetty may lead to pressure on marine resources elsewhere).

Cumulative – impacts that act together with other impacts to affect the same environmental resource or receptor (see Section 3.9).

Short-term: impacts that are predicted to last only for a limited period (eg during pipeline construction) but will cease on completion of the activity, or as a result of mitigation/reinstatement measures and natural recovery (eg temporary employment of unskilled workers during construction).

Long-term: impacts that will continue over an extended period, (eg noise from marine terminal operation) but cease when the Project stops operating. These will include impacts that may be *intermittent or repeated* rather than continuous if they occur over an extended time period (eg repeated seasonal disturbance of species as a result of pipeline inspection).

Permanent: impacts that occur during the development of the Project and cause a permanent change in the affected receptor or resource (eg the destruction of a cultural artefact or loss of ancient woodland) that endures substantially beyond the project lifetime.

Accidental: impacts that result from accidental events within the Project (eg loading arm leak at the marine terminal) or in the external environment affecting the Project (eg landslide). In these cases the probability of the event occurring is considered.

Table 3.1 provides qualifications of the geographic (or spatial) extent for the various environmental aspects considered in the EIA.

3.1.3 Main project activities considered in the EIA

The Project activities covered in the EIA are summarised in Box 3.2 and addressed in full in the project description sections (Sections 4 and 9) and impacts and mitigation sections (Sections 6, 7, 8, 12, 13 and 14).

Box 3.2 Main Project Activities Considered in the EIA

Construction Phase

- Pipeline construction
- Marine terminal construction
- Post-reinstatement effects of pipeline construction
- AGI construction (pump stations, pressure reduction station, block valves)
- Construction camps, laydown areas and other ancillary facilities
- Access and logistics
- Use of resources (water abstraction, construction aggregates)

Commissioning of the Pipeline and Marine Terminal

Operational Phase

- Pipeline operation
- AGI operation
- Marine terminal operation
- Accidental events
- Use of resources

Table 3.1 Geographic Scope of Potential Impacts

	LOCAL	REGIONAL	NATIONAL	INTERNATIONAL/GLOBAL
Soils	Important to land use and habitat function at settlement/district/ municipal level	(1)	N/A	N/A
Landscape	Valued at settlement/district/ municipal level (attracts visitors from settlement/district/ municipality)	Valued at provincial level (attracts visitors from wider province)	Valued at national level (attracts visitors from within Turkey)	Valued internationally (attracts foreign tourists)
Surface water	Streams and small rivers (RVX3, 4, 5)	Medium size rivers (RVX2) catchment areas, dams, reservoirs	Major river (RVX1), major dam	Transboundary: river/stream crossing national boundary (2). Coastline and territorial waters of another country.
Groundwater	Springs, wells	Aquifer	N/A	Transboundary: aquifer spanning national boundary (2)
Ecology – habitats	Important at settlement/district/ municipal level	Important at provincial level	Important/designated at national level	International designation (eg Ramsar)
Ecology – fauna, flora	Important as resource (3) or to habitat function at settlement/ district/municipal level	Important as resource (3) or to habitat function at provincial level	Protected in national legislation	Internationally listed/protected (eg IUCN, CITES)
Air Quality – human health	Ground level concentrations (glc) perceptible at settlement/district/ municipal level	glc perceptible at provincial level	N/A	Transboundary: glc perceptible across border (2)
Greenhouse gas emissions	NA	NA	Exceed 1% of national emissions	Exceed 0.1% of global emissions
Noise	Experienced at individual residence settlement/ district/municipal level	N/A	N/A	Transboundary: experienced across border (2)
Traffic	Perceptible on settlement/district/ municipal roads	Perceptible on main provincial roads	N/A	N/A
Cultural Heritage	Important at settlement/district/ municipal level	Important at provincial level	Nationally designated	Internationally valued (eg World Heritage Site)

(1) Regional scale impacts to soil would result from multiple local scale impacts.
(2) Transboundary impact as opposed to international scale impact.
(3) Resource for direct exploitation or that has cultural value or that attracts tourism.

3.2 CONSULTATION

3.2.1 Function of consultation

The function of consultation is to understand as far as possible how the Project will impact all stakeholders, and to obtain their ideas and opinions on management of impacts in order to influence project design, implementation and follow-up. It is also an important opportunity for local people to become better informed about planned activities. Consultation is also an important opportunity to obtain local knowledge. The Project has sought to carry out consultation in line with national regulations, international best practice and BTC Co policies (see Appendix D: Policy, Legal and Administrative Framework).

Effective disclosure through the release of timely, accurate and comprehensive information is essential in ensuring that the likely impacts (both positive and negative) are understood by stakeholders and to allow the stakeholders to provide feedback to the Project.

3.2.2 Stakeholder identification

At the beginning of the EIA process, the BTC Co, BOTAŞ and their respective consultants worked together to identify the key stakeholders that should be consulted at various stages of the Project. It was agreed that these stakeholders should be divided into the following categories, each requiring a different approach:

- **Authorities** comprising elected and appointed authorities at the national, provincial, district and settlement level (settlement heads known as Muhtars);
- **International, national and local non-government organisations (NGOs)** particularly those with an interest in environmental and social issues within the districts and provinces traversed by the pipeline and marine terminal and in Turkey as a whole;
- **Interest groups** comprising the media, university institutions and their foundations, people with local agricultural interests, cooperatives, local business establishments and business associations, chambers of commerce and others;
- **International Finance Institutions (IFIs)** including International Finance Corporation (IFC); Overseas Private Investment Corporation (OPIC); Export Import Bank of America (EXIM); Japan Bank for International Cooperation (JBIC), Export Credits Guarantee Department (ECGD) and European Bank of Reconstruction and Development (EBRD);
- **International Organisations:** including the Turkey representatives of the United Nations Development Programme (UNDP), International Labour Organisation (ILO), World Bank (WB), European Union (EU) etc.
- **Residents** of the urban and rural settlements within a 4km corridor of the pipeline route in the provinces of Ardahan, Kars, Erzurum, Erzincan, Gumushane, Sivas, Kayseri, Kahramanmaras, Osmaniye and Adana. Also included are those people living in close proximity to the proposed BTC Marine Terminal, as well as residents of coastal settlements along the Gulf of Iskenderun.

A complete list of all stakeholders identified and consulted thus far and a more detailed record of the public consultation process is provided in the Public Consultation and Disclosure Plan (PCDP) presented as Appendix A2 and Appendix A1 respectively to this EIA report.

Box 3.3 Use of the term 'Settlement'

The report uses the term 'settlement' rather than 'community' when referring to a geographical collection of people affected by the BTC Project. This is in recognition of the fact that, within any particular settlement, a number of different communities are likely to exist. The term 'settlement' is thus considered to encompass communities, households and individuals within it. These latter terms are, however, used when it is considered appropriate to do so.

3.2.3 Consultation tracker

The consultation tracker is a computer database system referred to as a Property, Engineering, Referencing and Consultation System (PERCS), which uses Microsoft Access 2000 software. It is designed to manage and track data produced during the consultation activities and has been used to record and collate all consultation activities undertaken as part of the EIA. Specifically, it has the ability to store details of all consultees/stakeholders, including information on the nature of the consultation undertaken, key issues raised, actions to be undertaken and the relevant contact details.

The tracker has been used to identify issues raised during settlement level consultation and other stakeholder meetings, in tracking such issues and delegating actions. It has also been useful in tracking correspondence with stakeholders and feedback from settlements outside of the planned activities. The database has been the primary domain for storing all feedback received during the public disclosure period. The main ways in which the tracker functions have been utilised to handle disclosure feedback are outlined in more detail in the PCDP (Appendix A1).

3.2.4 Consultation activities to date

Table 3.2 summarizes the various consultation activities that have taken place during each phase of the pre-construction period.

Plate 3.1 to Plate 3.14 provides a photographic record of the consultation activities undertaken in Phases 1 to 4. Photographs from Phase 5, public disclosure are provided following the discussion of results of disclosure in Section 3.2.6.

Plate 3.1 Provincial Governors Meeting

Plate 3.2 Local Authorities in Alvar Settlement, Erzurum

Plate 3.3 National NGO / Interest Group Meeting, Ankara

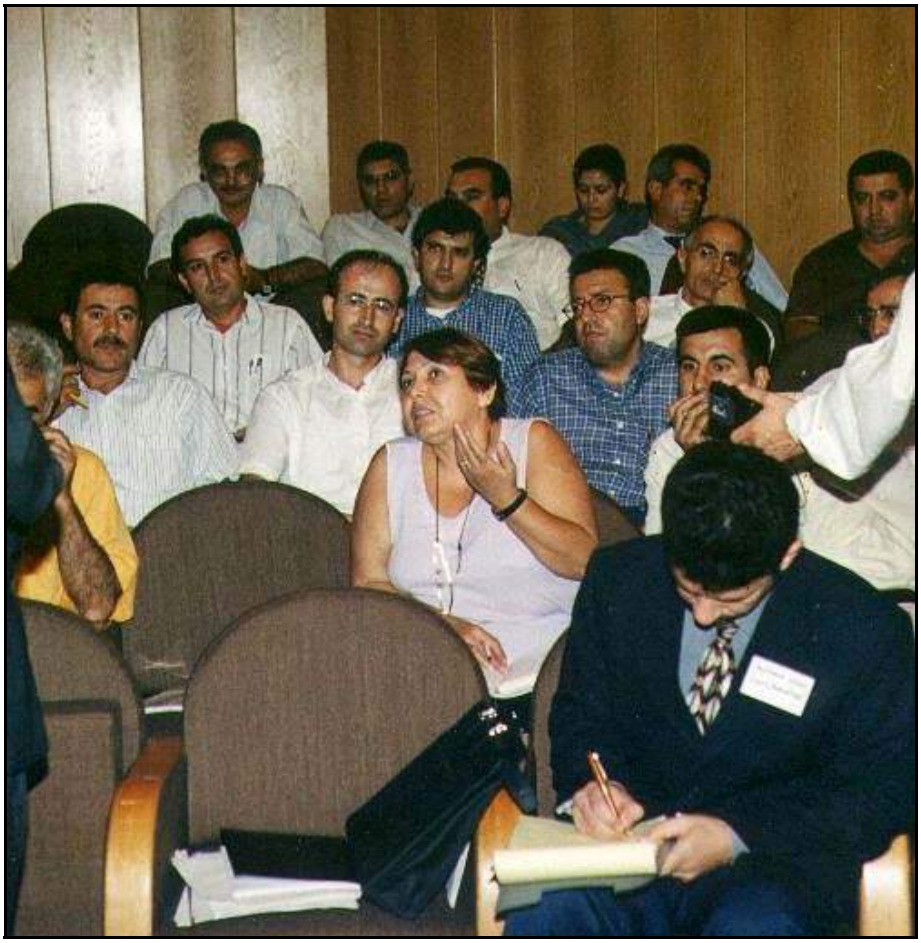


Plate 3.4 Local NGO / Interest Group Meeting, Adana

Plate 3.5 Marine Terminal Consultation, Sahil Sitesi, Adana

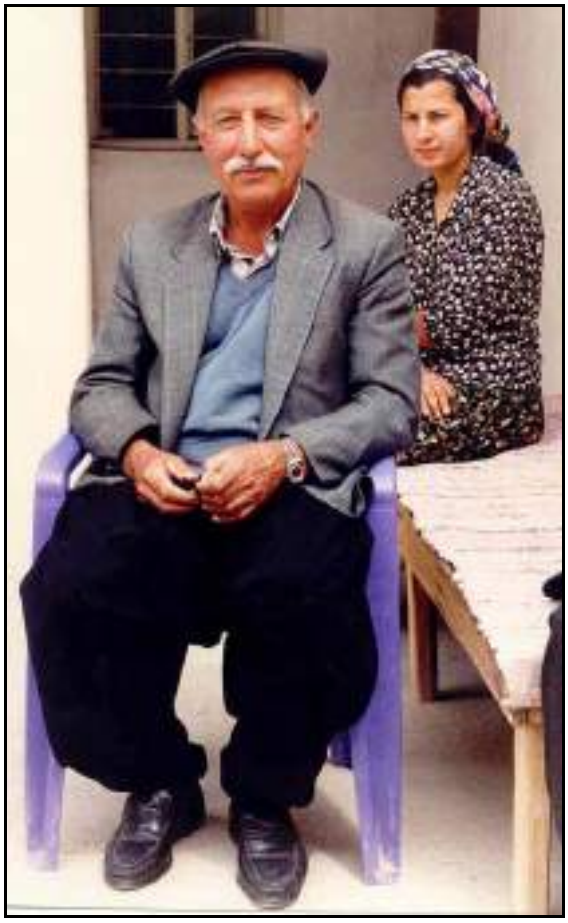


Plate 3.6 Muhtar of Yenigun Settlement, Osmaniye

Plate 3.7 Muhtar and Children of Egirmez Settlement, Erzurum

Plate 3.8 Women's Consultation Meeting in Kahramanmaras

Plate 3.9 Consultation Meeting in Sivas

Plate 3.10 Women's Meeting in School in Ardahan

Plate 3.11 Consultation Meeting in School in Erzurum

Plate 3.12 Consultation in Erzincan

Plate 3.13 Household Questionnaire Being Administered in Adana

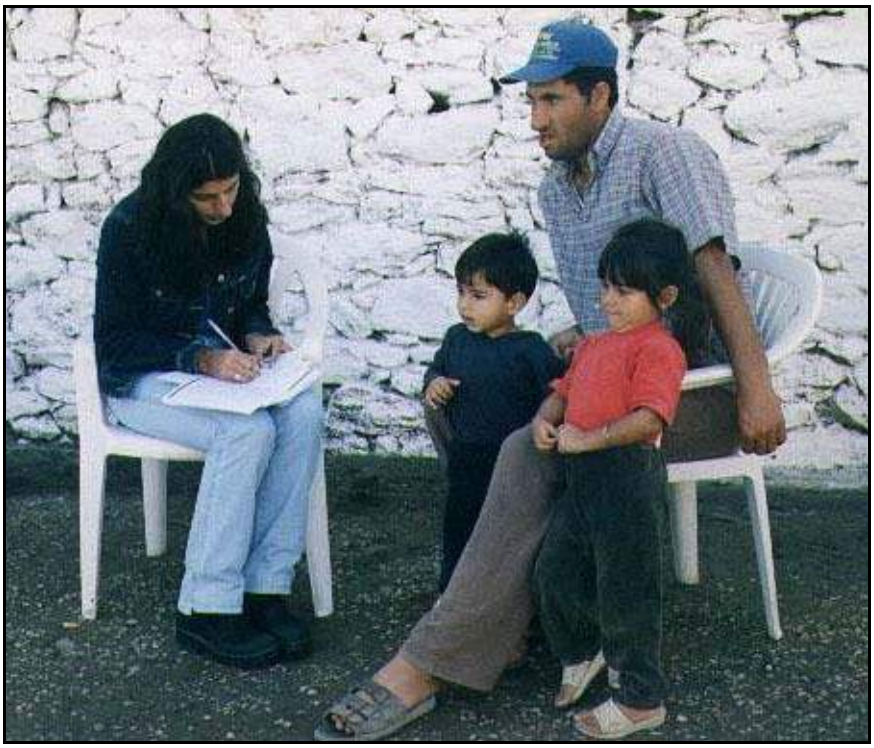


Plate 3.14 Household Questionnaire Being Administered in Adana

Table 3.2 Summary of BTC Consultation in Turkey

Stage/ Phase	Main Activity	Date	Consultees	Forum	Methodology
Consultation undertaken to date					
Phase 1 Stakeholder Identification and Preliminary Consultation	Scoping	September 2000 to January 2001	Provincial Governors and Local Authorities National Authorities	Meetings Written Information Requests	One to one meetings to inform national authorities and the relevant governors about the Project and to allow during discussion the identification of key constraints within the 4km corridor.
Phase 2 Information Distribution and Introductory Meetings	Introducing the Project	1) August to September 2001	1) Provincial Authorities (10 Governors) District Authorities (22 Sub-Governors, Muhtars of settlements within the 4km consultation corridor, and other local authorities or specialists including Jandarma, Mayors and District Directorate representatives of Agriculture and Cultural Heritage)	Meetings Workshops	1) One to one meetings to present the ESIA Information Package, provincial maps with the suggested centreline of the route, the Project Leaflet, and constraints maps. Discussions assisted in refining the consultation process to ensure its appropriateness for the local context, identify issues of concern and additional stakeholders. Distribution of 500 press packs and over 2000 information packs; workshops attended by 260 NGOs and 60 press organisations.
On-going Consultation and Opportunity for Feedback	Project Updates Receipt of Feedback from Stakeholders	2) On-going	2) All Stakeholders	Telephone or Facsimile Feedback	2) Incorporated into project materials was project contact details, thus ensuring stakeholders could provide additional feedback or raise concerns outside of the formal consultation meetings. This was most commonly in the form of telephone calls or facsimile.
Pre-Mandate Dialogue with IFIs.	Project Overview and Update	3) February, June, December 2001	3) IFIs: IFC, EBRD, ECGD and OPIC.	Informal Dialogue	3) Pre-mandate dialogue and project updates through informal discussions with IFIs in Washington D.C, USA and London, England.
Phase 3 Impact Identification	Baseline Data Collection and Stakeholder Liaison	1) October 2001	1) International and national NGOs, national media and other Interest Groups	Meetings	1) Three separate meetings to inform on project scope, the EIA activities and schedule and solicit input on impacts and the consultation process. Information packages sent prior to meetings.

Stage/ Phase	Main Activity	Date	Consultees	Forum	Methodology
		2) September 2001	2) Local NGOs, media and other interest groups		2) 11 meetings, one in each province traversed by the pipeline and one media meeting in Adana province with objectives as above.
		3) September to October 2001	3) Settlement Muhtars and inhabitants (pipeline and marine terminal)		3) The following: • Community level meetings in 105 settlements including eight district centres • Settlement level questionnaires administered for the pipeline and marine terminal in 96 settlements • Household level questionnaires administered to 1,328 households along the pipeline and 200 in the marine terminal area
		4) December 2001	4) Settlements in the vicinity of the four pump stations and one pressure reduction station (AGIs).		4) Community level meetings in 21 settlements within 5km radius of the AGIs; household level and settlement level questionnaires administered in 11 settlements within 2km radius of the AGIs. An additional community meeting was held in April 2002 (in the vicinity of PT1, Ardahan) to discuss concerns raised during the initial meetings and surveys.
		5) February 2002	5) Settlements in the vicinity of the three primary construction camps		5) Community level meetings in 16 settlements within 5km of proposed camp site; 77 household level questionnaires administered at eight settlements; and seven settlement level questionnaires administered with Muhtars Two additional community meetings were held in April 2002 (in the vicinity of the construction camp site 3 (Lot C), Kahramanmaras) to discuss concerns and receive feedback concerns on the proposed new camp location.

Stage/ Phase	Main Activity	Date	Consultees	Forum	Methodology
On-going Consultation with Stakeholders	Project Updates	6) February 2002	6) Telephone interviews with Muhtars of additional settlements with land parcels within 28m of ROW		6) 210 telephone interviews with Muhtars (and other local authorities eg Imam, teacher etc.) of settlements not previously consulted.
		7) On-going	7) Turkish Foundation for Combating Soil Erosion, Reforestation and the Protection of Natural Habitats (TEMA) Foundation for the Conservation and Promotion of the Environment and Cultural Heritage (CEKUL) Economic and Social Studies Foundation (TESEV) World Wide Fund for Nature (WWF) Birdlife / DHKD Turkish Marine Environment Protection Association (TURMEPA) IFC (Turkey representative) Istanbul University Archaeology group. European Union (Turkey representative) World Bank (Turkey representative) UNDP Turkish Marine Research Centre (TUDAV)		7) A series of meetings were held in Istanbul and Ankara with key national NGOs and interest groups as part of public consultation. A number of these groups were also met in relation to the development of the Projects community and environmental investment programmes.
Post Mandate Meeting with IFIs	Consultation with IFIs	8) January 2002	8) Meeting with IFC		8) First post mandate meeting held with IFC in Baku, Azerbaijan.
Phase 4 Development of Mitigation Measures	Development of mitigation measures	1) January-February 2002	1) DSI (State Hydraulic Affairs) Rural and Urban Development Foundation United Nations Development Programme (UNDP) Development Foundation of Turkey (TKV)	Focus Group Interviews	1) Reality test specific mitigation measures via focused meetings in Ankara relating to employment, community relations, health, geological and pollution prevention issues.

Stage/ Phase	Main Activity	Date	Consultees	Forum	Methodology
			Turkish Employment Organisation (ISKUR) Representatives from the Doctors Association of Turkey (Turk Tabipleri Birligi) Chamber of Geologists Middle East Technical University Geology Department Hacettepe University Geology Department Chamber of Civil Engineering MTA Turkish World Life Hacettepe University, Department of Environmental Engineering Chamber of Environmental Engineering Ministry of Environment Undersecretariat of Maritime Affairs		
Ongoing dialogue with IFC	Project Update	2) April 2002	2) IFC	Meetings and Field Visit	2) In-country field visit and formal presentation to IFC in Ankara, Turkey
Phase 5 Disclosure of draft EIA and Incorporation of Comments Received	60 day public disclosure of findings and mitigation measures and finalisation of draft EIA	Disclosure July to August 2002	State Authorities (ie government ministries) National Level Stakeholders (Media, NGOs, Interest Groups) Regional/Local Level Stakeholders (Media, NGOs, Interest Groups) Directly Affected Settlements International Organisations International NGOs	Information Distribution Meetings in Ankara, Istanbul and along the Pipeline Route	One general meeting and 11 focus meetings with state authorities. Two meetings with national NGOs and interest groups (one in Istanbul and one in Ankara),, one meeting with national media (in Istanbul), 10 meetings with local authorities (one in each province), NGOs and interest groups and approximately 49 meetings with local residents across 36 settlements. 1 meeting with media (in Adana) Formal presentations, Question and Answer sessions and dissemination of written information such as a Non Technical Summary (NTS) (approximately 11,000 copies) and community

Stage/ Phase	Main Activity	Date	Consultees	Forum	Methodology
					pamphlet (approximately 22,000) providing information on the Project, findings and proposed mitigation measures. Comments received on the draft EIA have been reviewed and incorporated, where appropriate. The final EIA (this document) to be submitted to the Ministry of Environment and subsequently the International Finance Corporation for review.
Ongoing Dialogue with IFC and IFI Lenders	Project Update	August 2002	IFC, EBRD, JBIC, OPIC and independent consultants Mott McDonald	Meetings and Field Visit	In-country field visit and formal presentation to IFI Lender group in Ankara, Turkey.
Future planned consultation phases					
Phase 6 (Ongoing consultation during construction and operation)	Promote community relations	-	Directly Affected Settlements	Implementation of a community relations programme	See Social Management and Monitoring Plan (Appendix C8)

3.2.5 Outcome of Consultation to date

3.2.5.1 Key generic issues

Through the analysis of stakeholder perceptions, the consultation process identified a number of key issues, including both perceived benefits and concerns associated with the Project. The issues were subsequently categorized and fed into the EIA process with the aim of maximizing the benefits and minimizing the concerns.

Inevitably, different stakeholder groups prioritised different issues. Table 3.3 broadly indicates priority concerns by stakeholder groups. Concerns of local residents are dealt with in more detail in the perceptions review of Sections 5 and 10 for the pipeline and marine terminal respectively.

Table 3.3 Key Issues for Different Stakeholder Groups

State Authorities	Local Authorities	National NGOs	Local NGOs	Local Residents
Damage to infrastructure, roads, electricity lines and railways. Safety to be maintained and damage repaired.	Damage to infrastructure including power lines and water supply.	Oil spill risk and potential impact on the natural environment and underground water sources.	Environmental risks, oil spills, damage to forests, dangers to animals.	Damage to local infrastructure, roads, irrigation channels, agricultural land, and water supply; and pressure on local services, transport and electricity.
Damage to agricultural activities and forestry lands. Damage to marine ecology.	Damage to agricultural land.	Environmental impacts on agriculture, forestry and marine ecology.	Early warning about spills and leaks, threats to water supply.	Safety implications of construction work and increased traffic on roads on humans and stock.
Disruption to water supply for humans and animals.	Effects on animals.	Land acquisition.	Compensation amounts for expropriation. Compensation for damage caused.	Compensation amounts for expropriation. Compensation for assets and crops. Compensation for damage caused.
Reinstatement of vegetation, soils and agricultural land.	General environmental damage. Land exploration and compensation for damage caused.	Social impacts and employment issues. Security Issues.	Adequate benefits for the local economies.	Impact of construction workers on traditional settlements.
Permission to be obtained from the correct ministries to carry out work.	Earthquake risks, potential damage to pipeline. Safety and security issues	Geology, archaeology, cultural heritage.	Earthquake risks.	Opportunity for local employment on construction, and provision of goods and services.
Source: Consultation Tracker Database of Stakeholder Consultation Issues				

3.2.5.2 Key impacts that have been identified through consultation for mitigation

Once the generic issues had been identified, and more specific impacts identified/analysed, mitigation measures were developed to address as many of these impacts as possible. Details of these measures are outlined in Residual Impacts (Section 15).

Refining the mitigation measures is an iterative process and has involved extensive consultation over a period of a year. The consultation included the following:

- discussions with settlement inhabitants and Muhtars both formally through settlement meetings and informally in one to one interviews at the settlement level (see Plates 3.5-3.14);
- meetings with authorities and other interest groups in Ankara;
- individual meetings with relevant authorities such as State Hydraulic Affairs (DSI) and the Designated State Authority (DSA) on specific issues such as land acquisition and irrigation systems;
- two group meetings with international and national NGOs and interest groups in Ankara and Istanbul (see Plate 3.3);
- one to one meetings with specialist organisations such as the Turkish Foundation for Combating Soil Erosion, Reforestation and the Protection of Natural Habitats (TEMA), World Wide Fund for Nature (WWF) and Economic and Social Studies Foundation of Turkey (TESEV);
- frequent meetings with project engineers to check the feasibility of approaches and ensure that feedback from external stakeholders was fed into the project design process.

During these meetings, ideas for mitigation were put forward by the Project and by stakeholders and gradually refined to produce the set of measures included in this report (see Sections 6 and 12).

The following specific concerns were repeatedly raised throughout the consultation process and are the focus for mitigation development.

Environmental

- damage to environmental resources (eg marine ecology, water);
- oil spills risk;
- earthquake damage to the pipeline.

Employment

- priority recruitment of project affected settlements;
- the need for a fair and equitable recruitment process which is not susceptible to corrupt processes or bias in the process and is overseen by an independent individual;
- suggestions as to how the recruitment process should be managed.

Land Acquisition and Compensation

- a fair and transparent land acquisition process;
- sufficient information about the process and how it would work;
- a fair and equitable compensation process for damage to buildings and agricultural infrastructure as a result of construction activities (irrigation system, drainage etc);
- timely payments of compensation;
- independent arbitrators for dealing with complaints.

Safety, Security and Health

- the integrity of the pipeline and whether or not settlements would be in danger from its proximity;
- injury to local residents during construction;
- injury to animals on the RoW during construction;
- the need for adequate security measures to protect the pipeline and nearby settlements;
- health impacts to settlements from pipeline construction;
- increased traffic on local roads.

Reinstatement, Infrastructure and Agricultural Activities

- degradation of roads and irrigation channels during construction;
- reinstatement of infrastructure to pre-construction levels;
- maintained access to grazing lands at all times;
- mitigation of impacts on agricultural activities such as bee keeping;
- mitigation/minimization of construction impacts such as dust and noise.

Construction Camps

- direct or indirect economic benefits;
- potential increases in noise and dust;
- disruption to social harmony;
- increased crime;
- damage to roads.

Pump Stations

- loss of communal pasture land;
- impacts on water resources;
- appropriate compensation and timely payment;
- increased traffic, damage to infrastructure;
- disturbance to social harmony.

Marine Terminal

- impact on livelihoods particularly fishing;
- impact on quality of environment (eg air pollution);
- permanent employment opportunities during construction and operation;
- decreased suitability of the Project area for tourism activities;
- in-migration of job-sectors and increased pressure on existing services.

Each of these issues have been addressed either through changes in project design or through the mitigation measures developed during the course of this EIA process. This is presented in Sections 6, 7, 12 and 13.

3.2.6 Disclosure

3.2.6.1 Disclosure activities

A draft of this EIA document was prepared specifically for public disclosure and was widely disseminated. Following the 60-day disclosure period (from the end of June to the end of August 2002) all comments received were incorporated as appropriate into the EIA, prior to formal submission of this document to the Government. The disclosure process involved the following components:

- the full draft EIA report (in Turkish) was made available for public review and comment in state authority offices, provincial and district governorship offices, and national and local

university libraries along the route. Precise locations were advertised in advance through the national and local media;

- the report was also exhibited at the Project office in Ankara(BTC Project Directorate, Sogutozu Mahallesi, Sogutozu Cad. No: 31, Balgat, 06520, Ankara);
- on the World Wide Web at www.caspiandevelopmentandexport.com, with appropriate links to all Project partners' websites. In Turkey, links were provided on www.bp.com, www.btc.com and www.botas.gov.tr.

Over 11,000 copies of the Disclosure Draft Non Technical Summary (in Turkish and/or English) were distributed to:

- state authorities;
- international organisations;
- international, national and local NGOs;
- interest groups and media;
- public libraries in provincial and district centre along the pipeline route;
- provincial, district and local authorities (including Muhtars of project affected settlements);
- interested residents from project affected settlements.

Approximately 22,000 Community Pamphlets (in Turkish) were distributed to all project affected settlements along the pipeline route and in the vicinity of the marine terminal. Additional copies were made available to interest groups and NGOs in addition to absentee landowners.

Appendix A7 comprises the Community Pamphlet that was distributed during disclosure.

Disclosure meetings were held during the months of July and August 2002 with the following stakeholders:

- the national media in Istanbul;
- national/international NGOs, donors, academics and other interest groups in Istanbul;
- national/international NGOs, donors, organisations, academics and other interest groups in Ankara;
- State authorities (government bodies) (one general meeting and 11 focus meetings);
- local NGOs, local media and other local interest groups at the provincial centres along the pipeline route (11 meetings in total);
- provincial authorities (elected and appointed), (10 meetings in total, held in conjunction with the local NGO / interest group meetings);
- local residents at a range of locations along the length of the pipeline (a total of 49 meetings were held in 36 settlements representing 111 settlements along the pipeline route);
- district (elected and appointed) and settlement level authorities were invited to attend those meetings held with provincial authorities and local settlements, wherever possible.

Public meetings in the marine terminal area were not held during the official disclosure period, as additional studies were being undertaken to further investigate potential impacts on fishermen. The decision was taken to postpone disclosure meetings in that area until such studies had been finalised. The additional studies were completed in early September and the results thereof are undergoing final review. Disclosure of the results will follow for settlements in the vicinity of the proposed BTC Marine Terminal.

It is important to note that although formal meetings were not held, these communities were sent the relevant disclosure documentation, ie NTS and the Community Pamphlet. They also had access to the

full draft EIA – from various named sources and also had the opportunity to comment on the draft EIA via free phone, mail, fax, Internet and feedback forms.

Announcements of the dates and locations for the disclosure programme were made through a combination of national and local newspapers and posters distributed throughout the pipeline corridor two weeks prior to the meetings.

Plates 3.15 to 3.25 illustrate the disclosure meetings held at the local, regional and national level.

Plate 3.15 National Media Meeting, Istanbul

Plate 3.16 National NGO Meeting, Istanbul

Plate 3.17 National NGO Meeting, Istanbul

Plate 3.18 Governor Visit, Kayseri

Plate 3.19 Local NGO Meeting, Kars

Plate 3.20 Local Media Meeting in Adana

Plate 3.21 Women's Community Meeting in Bestepe, Sivas

Plate 3.22 Community Meeting in Alacaatli, Erzincan

Plate 3.23 Community Meeting in Karayurt, Kayseri

Plate 3.24 Women's Community Meeting in Altinboga, Kahramanmaras

Plate 3.25 Discussion During a Women's Disclosure Meeting

3.2.6.2 Comments during disclosure

Comments were invited on the EIA during the 60-day public disclosure period. Comments were also received via the World Wide Web at http://www.caspiandevelopmentandexport.com, which had links to all Project partners' websites. In Turkey, links were provided on www.bp.com, www.btc.com and http://www.botas.gov.tr. A free phone line in Turkey was also established to enable people to submit comments via telephone. It was staffed during work hours (08:30 – 17:30) and outside of office hours there was an electronic answering machine. The free phone line will continue to be made available to the public throughout the construction and operation phases of the Project.

Plates 3.26 to 3.30 illustrate the distribution of disclosure documentation and the various mechanisms for receipt of comments.

Plate 3.26 Distribution of Non Technical Summary and Feedback Forms at Community Meeting, Sivas

Plate 3.27 Review of Community Pamphlets by Local Residents

Plate 3.28 Children with Community Pamphlets

Plate 3.29 Woman and Children Reading Disclosure Documentation

Plate 3.30 Reviewing the Disclosure Documents

At the end of the 60-day disclosure period, all the comments were examined according to the process outlined in the PCDP, (Appendix A1 of this EIA Report). Where appropriate, the EIA Report has been redrafted, taking the comments into account. This redrafted EIA Report will be submitted to the Ministry of Environment for approval determination. This review period is scheduled to last 30 days and can be extended by an additional 30 days by request of the Ministry of Environment. Thereafter, final amendments will be made and the EIA will be submitted to the International Finance Institutions (IFIs).

3.2.7 Results of disclosure

Following the 60-day disclosure period, the main issues raised were reviewed and have been addressed where appropriate in the EIA and management plans. Appendix A8 provides a summary of the results of disclosure through an examination of the feedback received from stakeholders and the response provided or action taken by the Project. The summary provides an explanation of feedback on the project itself, on social and environmental issues, monitoring and implementation and investment programmes. In addition, tabulated responses to comments made by State authorities are provided in Appendix A8.

3.2.8 Ongoing consultation

As outlined above, consultation is an ongoing process that does not stop once the EIA Report has been submitted for approval determination. On the contrary, it continues to be an integral part of the process of design, development and implementation of the BTC Project, of which the EIA itself is just one component.

During construction, the consultation process will be handled through two mechanisms. Firstly, the Community Relations Programme implemented by the Construction Contractor(s) and monitored by BOTAŞ and the BTC Co and, secondly, through the monitoring programme implemented by BOTAŞ and BTC Co and outlined in the management plans attached in Appendix C (particularly the Social Management and Monitoring Plan, see Appendix C8). This plan includes provision for consultation to take place on how effectively local settlements think the mitigation measures are being implemented. During operation, which is anticipated to begin in 2005, the consultation process will be handled by BOTAŞ through the BTC Project Community Relations Programme.

3.3 THE ROLE OF SCOPING

An early appreciation of the need to undertake a formal EIA of the BTC Project has ensured that scoping of the EIA commenced at an early stage in the planning and design of the BTC Project. Scoping has been a critical factor in both starting the EIA process and shaping it. Scoping has identified some or all of the matters to be addressed in the EIA, including, but not limited to:

- identifying the impacts to be assessed, especially focusing on those that are critical to decision-making by the project proponents, stakeholders and regulatory authorities;
- assessing the types of alternatives to be examined including routes, siting, design solutions and mitigation; and
- baseline aspects that require particular attention.

Scoping for the Turkish section of the BTC Pipeline has had two particularly important functions.

1. Since scoping was a parallel activity to the Basic Engineering phase, has it had a critical influence on route development leading to definition of the 500m wide ‘Preferred Route Corridor’ (see Section 2.3).

2. Scoping has also identified those aspects of the environment that would require further detailed study during the full EIA, and has initiated and assisted the impact identification process. The results of the Scoping Report [Ref 1] are summarised at the start of each of the respective impacts and mitigation chapters (Sections 6, 7, 12 and 13) of this EIA Report.

The scoping exercise involved extensive desk studies supplemented by focused field surveys, preparation of constraints maps, stakeholder identification, consultation with government regulators and provincial officials, interaction with the Basic Engineering design team (especially on routing issues and examining alternatives), identification of potential impacts and key issues for the full EIA and identification of information gaps and key issues of uncertainty that needed to be addressed during the EIA process.

Although the description of the scoping process provided above has, by necessity, been described as a discrete step in the EIA process, in application scoping is actually an ongoing and iterative activity. The use of scoping as a dynamic and evolving tool has enabled the EIA process to respond to new information, changed emphasis, or project modification arising from the baseline data collection, consultation and design processes.

3.4 INTERACTION WITH DETAILED DESIGN

The EIA team worked closely with the Detailed Design engineers, with EIA personnel based in engineering offices and with joint EIA/design teams mobilised for field survey work. The key benefits of promoting inter-disciplinary interaction were as follows:

- Detailed design commenced with reviews of the 'Preferred Route Corridor' (see Section 2.3) with the intention that this broad corridor be narrowed to the 'Specified Corridor'. This process was informed by the definition of a constraints hierarchy and the capturing of constraints information onto a series of constraints maps. This facilitated a consensus on key resources or locations that had to be avoided or the pre-requisite mitigation measures that were required to enable the route design to proceed. This involved a considerable degree of iteration through exchange of information and the analysis and reassessment of options supported and facilitated through meetings and discussions. It also involved joint field surveys with routing decisions being effectively made on the ground.

- Interaction with the design team continued the process of identifying potential impacts and furnishing the details (size of land take, components of gaseous emissions, location of discharges etc) that were necessary for impacts to be predicted.

- In the course of design, alternative means of achieving project objectives were examined. The EIA team ensured that environmental and social considerations were fed into the evaluation alongside the other criteria of technical, constructability/operability and cost (see also Section 2).

- The EIA team had a critical role in building mitigation into design. This was generally an iterative process whereby the EIA team evaluated the significance of impacts and brought critical issues to the attention of design so that solutions could be developed.

- The mitigation measures and procedures contained in the EIA and in the management plans were translated by the EIA team into environmental and social specifications that have been included in the Invitations to Tender for the Construction Contractors.

Although this EIA Report presents comprehensive information on the planned activities to be undertaken during the construction and operation of the Turkish section of the BTC Pipeline, as a process the EIA will continue to influence the management of project design, implementation,

commissioning and operation. A key element in achieving the Project's environmental and social management obligations will be the ongoing interaction between design, construction, commissioning and operating engineers and environmental and social specialists. A key vehicle for the management of this interaction is the suite of management plans, provisions and guidelines contained within Appendix C to this EIA Report as supplemented and amended by ongoing stakeholder consultation, environmental and social studies and design review.

3.5 LEGISLATION AND STANDARDS

The Policy and Legal Framework within which the EIA has been undertaken is outlined briefly in Section 1.5 and is described in detail in Appendix D. The regulatory context guiding public consultation throughout the EIA is identified in the Public Disclosure and Consultation Plan (PCDP) (see Appendix A1).

Legislation and standards have played a critical role in the EIA process. Pertinent Turkish and international legislation and standards for the protection of the environment and people were reviewed as part of the development of significance criteria for the EIA. Many legislative instruments offer standards of environmental performance and expectations for ambient environmental quality that can be applied to the Project. Where this is the case they have been used to develop impact significance criteria so that, for example, any predicted breach of a law would be regarded as a Major impact that the Project would then need to take action to avoid or mitigate to a legally acceptable level. These are referenced and described in detail in Section 3.7.

For some environmental and social aspects the requirements contained within Turkish Law and international standards are expressed in qualitative or relative terms and rely upon professional and societal appraisal of 'acceptability'. In these cases, a review of published guidance, expert opinion, evolving professional consensus and input from stakeholder consultation, during the scoping phase, has been used to develop appropriate impact significance criteria.

The basis of the significance criteria applied to specific technical assessments is referenced within the appropriate subsections of Section 3.8 below.

3.6 BASELINE DATA COLLECTION

The collection of data used in this EIA effectively began during feasibility studies, with a large part collected during the Scoping phase. Scoping also identified those areas for particular focus in this EIA in terms of additional or more intensive secondary data acquisition through further desk studies, together with the acquisition of primary data through field surveys, sampling and analysis and consultation. The use of a Geographical Information System (GIS) was important both in interpreting the data collected and in analysing and presenting relevant information on maps of the study area and route.

A good understanding of the baseline is key to understanding the nature and importance of project impacts and in feeding back to project design and routing decisions. Data were collected and the baseline subsequently described under the broad headings of:

- Climate;
- Soils – including physical nature, erosion characteristics, chemistry and potential contamination;
- Landscape;
- Surface water resources in terms of hydrology and quality;
- Groundwater resources;
- Ecology – habitats, species and protected areas;

- Air quality;
- Noise;
- Traffic;
- Archaeology and cultural heritage;
- Demographics and migration;
- Land ownership and use;
- Employment, livelihoods and skills;
- Infrastructure and services.

The data collected should be viewed as a snapshot in time. In some areas there will be additional data collection to resolve uncertainties and to feed into the management plans.

An absolute study area was not defined for the data collection since the area potentially affected by the Project varied by aspect. So, for landscape and visual impact, the EIA looked at a wide landscape context and identified viewing opportunities for visual receptors; this led to a study area that extended several kilometres either side of the route in some locations. For other aspects, such as flora, the study area was more closely centred on the design corridor. In this respect, species data were collected with relative intensity for a 500m wide corridor as the basic 'study' area, with only broader contextual habitat data presented for the wider project setting.

The methods used for baseline data collection for each environmental aspect are described in the respective 'baseline' sections (Sections 5, 10 and 11) of this Report. The methods used for socio-economic baseline data collection are described in Appendix A5.

3.7 ASSESSING IMPACTS

3.7.1 General considerations

The assessment of impacts (identify, predict, evaluate, mitigate) has been presented as a stepped sequence of activities in Figure 3.1 but, in practice, is a dynamic and iterative process. As previously stated, impact identification started in Scoping but has continued throughout the EIA process; as new information was obtained during the development of design and as consultation proceeded.

Impact identification also initiates the prediction-evaluation-mitigation sequence. However, the outcome at the end of this sequence may be a residual impact following mitigation that is viewed as either unacceptable or where there is room for improvement. Further mitigation is then examined or alternative design or locational solutions are developed. On occasions therefore the sequence can be applied in an iterative or cyclic manner until a satisfactory outcome is achieved, rather than as a once through sequence.

3.7.2 Impact identification

Impact identification was carried out in two main phases (against a background of it comprising an ongoing and iterative activity).

The first phase involved systematically identifying the potential impacts by considering how the project could interact with its environmental and social setting through all phases of its development. The initial identification considered the environmental aspects listed in Section 3.6 together with the project components. The latter were broken down, as appropriate, into discrete activities such as: clearing the RoW, pump station construction and marine terminal operational emissions. The objective of the first phase was to identify all the possible project impacts. The start of the exercise was largely based on an initial knowledge of the environmental and social setting and the project, especially the 500m route corridor, and was developed during the BE phase.

The second phase had the objective of deciding which, from a long list of potential impacts, should be focused on in the EIA. This was to ensure that baseline surveys and assessment activities focused on those matters most important to engineering design, development of mitigation and eventual external decision-making for the project. A number of factors helped guide the second phase, including: legislation, stakeholder expectations expressed in consultation, the professional judgement of the EIA and engineering teams, and BTC Co. policies.

In practice, impact identification could clearly not be a simple two-step sequential exercise. In the course of the EIA 'new' impacts were identified as more was learned about the environment through baseline studies, about stakeholders and their concerns through consultation, as engineering design evolved and as different options were evaluated and route changes were made. Impact identification therefore fed into the overall EIA process on a more or less continuous basis.

3.7.3 Predicting impacts

For each potential source of impact identified, a prediction – evaluation – mitigation sequence was applied. Prediction took into consideration any mitigation already inherent in the project design. Prediction methods varied substantially from one environmental or social aspect to another. For some, for example noise and air quality, predicted impacts were quantifiable through accepted methods of calculating or modelling. For other environmental aspects (eg ecology and landscape) this was not the case. For these, prediction may have involved some quantification (eg area of habitat lost) but also required professional judgement over such matters as habitat value (based on its designation) and ability to recover (eg based on past experience and research)[1]. For social aspects, stakeholder consultation played a critical role in determining impact significance. These considerations were carried over into the evaluation of environmental and social impacts.

3.7.4 Impact evaluation - environmental

For a particular environmental aspect for which quantification was possible, the significance criteria were determined by (a) the extent to which predicted impacts could be quantified and (b) the extent to which a quantified limit, standard or guideline exists. Where both (a) and (b) could be applied the significance criteria were linked to a numerical value (sometimes with caveats) that represented the limit, standard or guideline. Operational discharges to noise and atmosphere are examples of this type of aspect/significance criteria. The limit, standard or guideline used was derived from Turkish Law and or internationally recognised (eg EU or World Bank) standards.

For other environmental aspects, for which a more qualitative approach was required, ie those for which there are no applicable limits, standards or guideline values, a different approach was adopted. This involved setting significance according to a combination of the value or sensitivity of the resource affected and the magnitude of the effect on it. Examples of this type of aspect are ecology and archaeology. The significance criteria used in evaluating environmental impacts are described in Section 3.8.

3.7.5 Evaluating impacts arising from accidental events

For accidental events a similar approach was adopted in terms of looking at environmental sensitivity and severity of consequence, but the additional dimension of the probability or likelihood of the event occurring was also considered. The specific environmental risk assessment approaches used for unplanned events are explained in detail in Sections 8 (Pipeline) and 14 (Marine Terminal).

1 Aspects of the baseline can also be quantified (eg noise, atmospheric pollutant concentrations) and this is a critical input to quantifying and evaluating actual impacts from the Project.

3.7.6 Evaluating social impacts

3.7.6.1 General considerations

The evaluation of social issues and their impacts is not an exact science and requires a considerable degree of subjective judgement. The survey data that has been collected and consultation carried out provides evidence and support for impact evaluation, but does not allow impacts to be fully quantified, or their significance to be assessed or ranked numerically. The following methodology and assessment should be read with this in mind.

For each characteristic of the settlement (demographics and migration, land use etc), the types of socio-economic impacts that could be caused by the Project are identified(1). In evaluating those impacts, the following factors are taken into consideration for both the pipeline and marine terminal:

- the **likelihood** of the impact;
- the **duration** of this change: short-term disturbance (eg during construction only), long term (eg during operation period) or permanent;
- the **manageability** of the change and potential for it to lead to further changes beyond the control of the Project;
- the **ability** of the affected people to adapt to changes and thus maintain livelihoods over the long term.

The magnitude of the impact is then viewed from the perspective of those affected, by taking into account the **perceived importance** of the impact in the eyes of the affected people, regardless of the basis in fact.

The baseline information for each surveyed settlement was listed under headings detailing the socio-economic characteristics on the settlement level (eg demographics, employment, infrastructure). Information under each of these headings was then compared against a checklist of criteria to determine whether site-specific impacts were likely to occur, and thus require additional mitigation measures. These are above and beyond the impacts and measures identified in Sections 6 and 12. The criteria against which the baseline information was compared is provided in Sections 10 and 11.

For the marine terminal, an additional factor was taken into consideration in the evaluation of social impacts, namely, the **changes to the assets** that households depend upon for their livelihoods[2]. Consideration of this factor is part of the livelihoods assessment undertaken for the impacts associated with the marine terminal.

3.7.6.2 Overall considerations

When assessing impacts on livelihoods, a livelihoods assessment is undertaken. This takes a holistic approach to peoples' livelihoods and assumes that each person and group of people have a set of 'assets' of various types grouped into 'natural capital', 'physical capital', 'human capital', financial capital', and 'social capital'. The assets that fall within these groupings are illustrated below:

- **Natural capital:** land, water resources, livestock, fisheries, aggregates, environmental quality, etc;
- **Physical capital:** transport, communications, energy, housing, water and sanitation, schools, health facilities;
- **Human capital:** numbers, skills, knowledge, ability to work, health, education;

1 There are a number of other social and socio-economic issues that are regional in nature as opposed to route specific. These are being examined within the scope of another study entitled 'Economic and Social Implications of AGT/BTC (and Shah Deniz) in the Regional and National Context' This addresses broader issues of interest, including revenue management, access to energy, economic linkages, conflict and human rights and is addressed in this EIA in Section 16.
3 Refer to Section 13.

- **Financial capital:** incomes, savings and credit, pensions;
- **Social capital:** leadership and representation, access to support networks and non-governmental institutions, tolerance, ability to demand.

Livelihoods will be affected by a change to the total assets available to an individual or group. Where the total remains the same, but the balance between the different types of capital changes, the resulting impact on livelihood will largely depend on the ability of the individual or group to adapt to change.

3.7.6.3 Impacted groups

For social impacts it is often necessary to consider the impacts at the household, settlement and project level.

- **Household Level**
  Different households will often be affected in different ways by the same impact. It is therefore necessary to assess variation in impacts between different households. For example, a poor household dependent upon natural resources over which it has no legal rights may not have access to compensation or may be ill equipped to use compensation money in an appropriate way.

- **Settlement Level**
  It is useful to assess the impacts at the settlement level in order to develop further specific settlement level mitigation measures where appropriate.

- **Project level**
  It is also necessary to assess impacts at a more macro level in order to help the project team in order to assess cumulative impacts caused by the whole project.

3.7.6.4 Levels of significance

For the assessment of socio-economic impacts, a similar approach could be adopted to ranking impact importance: 'Minor', 'Moderate' and 'Major'. This type of ranking highlights to BTC and outside stakeholders those impacts that need the most consideration. For example, a development in a rural area may result in a small fluctuation in the economy of the area ('Minor'), may gradually alter the economy from a subsistence base to one that is more market driven over a generation ('Moderate'), or may result in a large influx of immigrants that fundamentally alter the economy within a year ('Major'). However, when viewed from the perspective of individual households, the ranking becomes more difficult. For example, a temporary increase in the local prices for raw materials in the local economy could reduce the ability for a poor household to maintain their livelihood, resulting in immediate consequences to their well-being. In this context it would undermine the significance of the term 'Minor'.

In the consideration of social impacts, this EIA therefore only refers to two categories of significance compared with the three levels of significance adopted for ranking environmental impacts. An impact will be ranked as either 'Significant' or 'Not Significant.'

Likelihood is not brought into the criteria for significance. Instead, this will be separately assessed. This is because perception of risk (ie the likelihood of an impact occurring) is different for each individual, depending on their level of livelihood or quality of life. Thus, for someone who is impoverished, an impact remains significant regardless of whether there is a high or low likelihood of it occurring, as they would be less able to adapt to the impact, in the event that it occurs.

3.7.7 Mitigating impacts and enhancement of benefits

The impact assessment was applied in an iterative way whereby the importance of an impact was evaluated according to a scale of 'Minor', 'Moderate' or 'Major' significance (explained in full in Section 3.8 for each environmental aspect). An impact assessed as 'Minor' required no further project faction (on the basis that the impact magnitude was sufficiently small, or that the receptor was of low sensitivity and/or that adequate controls were already designed in). An impact assessed as 'Major' always required further project action in terms of the EIA and design teams exploring measures to avoid it or to minimise/reduce it to an acceptable level; in seeking to mitigate 'Major' impacts the focus was on the effectiveness of available measures rather than on the cost or practicability of measures. For impacts assessed as 'Moderate', the emphasis was slightly different in that the onus was on demonstrating the impact had been reduced to a level that was as low as reasonably practicable. This did not necessarily mean that 'Moderate' impacts had to be reduced to 'Minor' ones, and cost of reducing impact versus the benefit of the reduction was a valid factor in coming to an eventual decision.

Mitigation in the BTC Project has been largely applied through a hierarchy whereby:

- a primary objective was to avoid impacts outright, eg through routing and siting decisions, or adopting a technology that avoided a certain type of emission;
- if outright avoidance was not possible, then impacts were reduced at source, eg through narrowing the right of way or minimising wastes;
- where avoidance or reduction at source could not be achieved, then the impact was abated on site, eg through erosion control measures, landscaping and waste management;
- where none of the above were practical, impacts were abated at the receptor, eg through transplantation of rare flora and fauna or moving beehives away from pipeline construction corridors;
- some impacts are completely unavoidable and required 'repair' mechanisms such as reinstatement of the pipeline corridor and decommissioned temporary work sites;
- where none of the above were practical, compensation was applied, eg for affected agricultural land users/landowners.

In terms of enhancement, the Project will implement a Community Investment Programme in order to bring sustainable benefits to settlements most affected by construction activities and an Environmental Investment Programme to offset the overall ecological impacts along the route.

3.7.8 Residual impacts

As previously mentioned, in the iterative process of impact assessment a prime objective was to reduce potentially significant (ie 'Moderate' and 'Major' for environmental impacts and simply 'Significant' for social impacts) impacts to acceptable levels.

The mitigation measures used in eliminating or reducing significant (ie 'Moderate', 'Major' or 'Significant') impacts have therefore been built into design and incorporated into contractual specifications for the Construction Contractors. This EIA therefore concludes with an assessment of the significance of the 'residual' impacts. These are the impacts that in the judgement of the EIA team will remain after the mitigation measures have been applied.

Clearly it is an ideal objective of the EIA process to move towards a position where there are no significant impacts. This is not always possible since uncertainty is an important factor in EIA, and where there is uncertainty one way to deal with it is to be conservative in the assessment. Potentially significant (ie 'Moderate', 'Major' or 'Significant') residual impacts are reported in this EIA in Section 15. They all stem from a degree of uncertainty (eg precisely how effective certain reinstatement measure might be in difficult soils or precisely how close residents are to noisy construction activity and hence the likely noise exposure levels) combined with a conservative application of the assessment process and criteria. Section 15 therefore also sets out how the BTC Project will specifically manage and reduce what are currently perceived as potentially significant (ie 'Moderate', 'Major' or 'Significant') impacts.

3.8 ENVIRONMENTAL IMPACT SIGNIFICANCE CRITERIA

3.8.1 Introduction

This Section sets out the significance criteria adopted for each environmental aspect. As stated in Section 3.7, significance criteria have been used in two ways.

- During the EIA, and interaction with project decision-making and design, the assessment criteria have been used to prioritise and to bring to the attention of BOTAŞ, matters which, in the view of the EIA team, should be considered for mitigation.

- The criteria have also been used to identify what needs to be reported in the Environmental Impact Statement; ie any impacts that the EIA team consider should be brought to the attention of the competent authorities. The criteria are then used to group these impacts as Minor, Moderate and Major.

Significance criteria are presented for both the construction and operational phases. For some aspects the criteria may vary slightly between the pipeline and the marine terminal, mainly due to different environmental quality standards for the terrestrial and marine environments.

The criteria have been developed specifically for the BTC Project, taking into account:

- legal requirements;
- the stated requirements of the project proponents in terms of performance standards;
- the nature of the Project itself (a linear development with potential impacts predominantly in the construction phase and site-specific developments along it and with potential impacts predominantly in the operational phase);
- the characteristics of the project's receiving environment;
- the concerns expressed by the stakeholders.

The remainder of this Section describes potential impacts, mitigation measures, assessment methods and significance criteria for:

- soils;
- landscape and visual impacts;
- surface water resources;
- groundwater resources;
- ecology;
- air quality;
- noise;
- traffic and transport;

- archaeology and cultural heritage;
- social issues.

3.8.2 Soils

The evaluation takes into consideration the provisions of the following legal instruments:

- Turkish Regulation on the Control of Soil Pollution;
- Solid Waste Control Regulation;
- Hazardous Waste Control Regulation;
- Law on Forestry (#6831);
- Law on Mobilisation for the National Afforestation and Erosion Control (#4122).

The significance of impacts on soils has been evaluated using professional judgement and recognised soils science techniques, taking account of the following factors (See Table 3.4):

- the magnitude of the impact, as determined by its intensity, its extent in space and time, and the likelihood of its occurrence;
- the vulnerability of the soil to the change caused by the impact;
- the ability of the soil to recover from the impact.

It should be noted that the assessment relates to those areas of soil that will not be covered by permanent facilities (ie AGIs and the marine terminal) but focuses on soils that will be disturbed and then subsequently reinstated. The significance of impacts to soil resources lost to permanent structures is primarily in terms of impacts to ecology and land use and is addressed in the relevant specialised sections.

Table 3.4 Significance Criteria for the Evaluation of Physical Impacts on Soils

	MINOR	MODERATE	MAJOR
Soil erosion	Soil erosion predicted to occur at approximately the same rate as soil formation	Soil erosion predicted to be visibly active but no rill and gully formation evident	Rill and gully formation predicted to be evident to the point where it threatens the neighbouring land uses and/or pipeline corridor
Reduced soil productivity	Productivity losses predicted to last less than three months after construction	Productivity losses predicted to generally last less than one year after construction (but more than three months for arable land, more than six months in grazing pasture) but up to two years in upland areas with no formal land use	Productivity losses predicted to last more than one year after construction for arable farmland, more than two years in grazing pasture and more than five years in upland areas with no formal land use
Waterlogged soils	Water predicted to remain in surface depressions less than three months after construction	Water predicted to remain in surface depressions less than one year after construction but more than three months	Water predicted to remain in surface depressions for more than one year (effectively permanently) after construction

Deriving the scale of impact was a process involving several factors (described in more detail in Appendix B7).

For **soil erosion**, existing soil characteristics in terms of its erodibility provided the starting point. This is summarised in Section 5, Table 5.4 which rates erodibility for different soils in the project area

based on rainfall, soil structure, texture, permeability and organic matter. The table though is a simplification in that it considers bare soil on a 9% slope. It does, though, identify the more vulnerable soils. Predicted soil losses along the pipeline route were then applied to different configurations of soil, landscapes (terrain, slope etc) and reinstatement methods using the Universal Soil Loss Equation (USLE) [Ref 3]. USLE takes the concept of a soil loss tolerance rate based on the rate of soil erosion is equal to the rate of soil formation. The benchmark for reinstatement in the BTC Pipeline Project is a moderate soil loss tolerance rate (5-10te ha^{-1} yr^{-1}).

From this it is clearly apparent that soils with substantially lower formation rates (generally less than 5-10te $ha^{-1}yr^{-1}$) will be vulnerable to erosion, even when reinstated, leading to moderate impacts at least. The likelihood of the most severe form of erosion (rill and gully formation) was based on expert judgement allied with observation in the field of areas that are currently prone to this degree of erosion.

Soil productivity is primarily related to the topsoil and is a function of physical structure, chemistry/mineral constituents, and biological activity. Thickness of the topsoil layer is also a factor. Disturbance during stripping, storage and replacement has an influence on the above factors that varies between soils. Should mixing of topsoil and subsoil, of lesser or even zero productivity, occur (a significant risk where topsoil layers are less than 15cm) this too will affect productivity. Assessing the scale of impact was therefore based on a combination of knowledge of the soils in the project area and likely recovery periods based on previous experience [Ref 4].

Assessment of potential for **waterlogging** was based on a combination of:

- visual assessment of potential channel storage along the pipeline route;
- professional experience with flood planning in poorly drained areas.

The potential exists for soil contamination that could affect the Project or be caused by it. The Environmental Management and Monitoring Plan (EMMP) makes provision for prompt and complete cleanup of any contamination caused during construction (see Appendix C1). Typically such spills would be small, readily contained and soil would be removed as a waste. No significance criteria are therefore presented.

Soil contamination could also occur through leakage or rupture of the operational pipeline or terminal tanks and this is dealt with in Sections 8 and 14.

Finally, the Project could encounter contamination, which could then become a BTC liability, or its disturbance could impact nearby sensitive receptors or it could pose a threat to the health of the workforce or the operational pipeline itself.

Procedures are presented in the EMMP (and Waste Management Plan) for a risk-based approach to dealing with contaminated soils.

Disturbance of marine sediments could give rise to enhanced concentrations of suspended solids and potential mobilisation of contaminant materials with secondary effects on water quality and marine organisms.

Criteria for impacts to marine sediments are given in Table 3.5.

Table 3.5 Criteria for Impacts on Marine Sediment

	MINOR	MODERATE	MAJOR
Marine Sediment Disturbance	Short-term and/or limited to immediate area (within 100m) of project footprint	Short-term and/or extends to limits of jetty navigational exclusion zone	Long-term and/or extends beyond navigational exclusion area
Sediment Contamination	Low levels, non-harmful to benthic fauna, 'diluted' by sediment reworking by organisms and water movement	Levels that are detectable throughout the navigational exclusion zone but not noticeably harmful to benthic fauna	Levels that are detectable beyond the navigational exclusion area, have a noticeable affect on benthic fauna distribution or require cleanup

3.8.3 Landscape and visual impacts

This assessment examines landscape and visual issues for the pipeline route, together with AGIs and the BTC Marine Terminal.

Landscape and visual impacts, though closely related are fundamentally different in nature.

- Landscape impacts are those that arise from the change in character of an area, either by introduction of new elements or changes to existing ones. The receptors of landscape impacts are thus ambient features, and a distinction is made between the various project components that affect different landscapes.

- Visual impacts are changes in the view from a defined viewpoint. The receptors of visual impacts are therefore specific groups of people at specific locations, and the impact of the terminal development as a whole has been considered rather than the impact of separate project components.

Potential landscape and visual impacts will result from:

- changes to the physical structure and elements of the landscape, with possible effects on the wider character of the landscape;
- impacts on the visual amenity of people.

Construction activity may constitute a highly visible activity and the working width and other elements of construction may significantly modify the landscapes in which they are set. However, these are transitory activities. At any one location, activity may only be evident for a few weeks to a few months. Even construction camps and construction activities at the AGIs and marine terminal are unlikely to be present for more than two years at any one location. Potential landscape and visual impacts from these sources are therefore regarded as minor, and the assessment has focused on the potential long-term impacts that may remain after completion of construction and reinstatement, and due to the presence of permanent aboveground facilities.

The sensitivity of the landscape depends on its inherent quality and condition and on its ability to accommodate change. The sensitivity of viewers depends on their occupation and viewing opportunity.

Sensitivity can be described as low, moderate or high. The definitions set out in Table 3.6 below apply.

Table 3.6 Definitions of Sensitivity

SENSITIVITY	RECEPTOR	DEFINITION
Low	Landscape	Landscape that is not valued for its scenic quality or features and is tolerant of change.
	Sensitive Visual Receptors	Viewers with a passing interest in their surroundings, eg outdoor workers, motorists, business users (including terminal employees) and/or few of these viewers affected.
Moderate	Landscape	A moderately valued landscape, perhaps a locally important landscape, tolerant of some change.
	Sensitive Visual Receptors	Viewers with a moderate interest in their environment such as users of publicly accessible areas, public and private recreational open space and/or a moderate number of these viewers affected.
High	Landscape	A landscape of particularly distinctive character or one that is nationally valued for its scenic quality.
	Sensitive Visual Receptors	Viewers with proprietary interest and prolonged viewing opportunities, such as isolated residences, residential areas and hotels and/or a large number of these viewers affected.

The magnitude of potential impacts on landscape resources and visual amenity depends on the nature and scale of changes induced by the development. The magnitude of impact can be described as being low, moderate or high. The definitions in Table 3.7 apply to the changes caused by pipeline construction and those in Table 3.8 for AGIs and the marine terminal.

Table 3.7 Definitions of Impact Magnitude for Pipeline Construction

MAGNITUDE OF IMPACT	RECEPTOR	DEFINITION
Low	Landscape/Sensitive Visual Receptors	Small or imperceptible change in components of the landscape unlikely to last more than one year after construction.
Moderate	Landscape/Sensitive Visual Receptors	Perceptible change in landscape components that may last up to 5 years after construction.
High	Landscape/Sensitive Visual Receptors	Obvious change in landscape characteristics over an extensive area that is likely to last for more than 5 years after construction.

Table 3.8 Definitions of Impact Magnitude for Permanent Facilities

MAGNITUDE OF IMPACT	RECEPTOR	DEFINITION
Low	Landscape	Little change in landscape feature and/or introduction of a new feature completely in keeping with surroundings
	Sensitive Visual Receptors	Few viewers affected: less than 3 properties and/or long distance views: over 1500m
Moderate	Landscape	Moderate changes over localised area and/or introduction of new feature that is prominent but largely in keeping with its surroundings
	Sensitive Visual Receptors	Moderate number of viewers affected: 3-10 properties and/or proximity 500-1500m
High	Landscape	Notable changes in landscape character over an extensive area or intensive change over a more limited area and/or introduction of a prominent new feature that is completely out of keeping with its surroundings
	Sensitive Visual Receptors	Many viewers affected: over 10 properties and/or close proximity: less than 500m

The assessment of landscape sensitivity was based on initial familiarisation with the route and locations for permanent facilities through a desk study followed by a field assessment. The assessments for the permanent facilities were aided by examination of maps and aerial photographs. In addition, computer-generated models of the AGIs and marine terminal were used to generate Zones of Visual Influence (ZVI). These show the areas from within which the permanent facilities will be visible, taking account of the screening potential of intervening topography.

The assessment of landscape sensitivity is clearly a subjective exercise and a conservative approach was adopted in recognition of this. Gaining a broad understanding of visual receptors and their sensitivity was largely based on reviewing route maps for receptor locations with respect to the route and feedback from consultation with settlements in close proximity to Project facilities.

The degree of change in components of the landscape is critically linked to other factors such as:

- restoration/reinstatement of physical terrain;
- impacts to soils, including their appropriate reinstatement, recovery of their productivity and erosion control;
- reinstatement and recovery of vegetative cover.

Thus landscape and visual impacts are closely linked to predicted changes in terrain, soil and vegetative cover. For the permanent facilities, mitigation, through the provision of bunding and landscaping, also plays a role.

Impact significance is determined by evaluating the sensitivity of the landscape or viewer and the magnitude of change expected as a result of the construction of the pipeline. Thus, a Major impact will occur where both the sensitivity of the landscape or viewer and the magnitude of the impact are high. Definitions of impact significance are set out in Table 3.9 below.

Table 3.9 Significance of Landscape and Visual Impacts

	Low Magnitude of Landscape Change	Moderate Magnitude of Landscape Change	High Magnitude of Landscape Change
Low Landscape or Viewer Sensitivity	Minor	Minor	Moderate
Moderate Landscape or Viewer Sensitivity	Minor	Moderate	Major
High Landscape or Viewer Sensitivity	Moderate	Major	Major

3.8.4 Marine and surface water resources

3.8.4.1 Terrestrial surface water resources

The significance of any potential impact on surface water quality will depend on the present (or designated) use of the resource (eg for drinking supply, fishing, bathing) or its importance to ecology or amenity and the nature and magnitude of change caused by the Project.

The Regulation on Control of Water Pollution (RCWP) assigns ambient water quality criteria for receiving water bodies based on established water quality classifications. The four water quality classifications for inland surface waters (ie rivers, lakes and reservoirs) are as follows:

- Class I: High quality water;
- Class II: Slightly polluted water;
- Class III: Polluted water;
- Class IV: Extremely polluted water.

Table 4.2 in Appendix D sets out the required standards for aqueous effluents discharged to surface waters. Although these standards are intended for operational facilities, they will also be applied to the construction camps since they will be located in one place for over twelve months.

For pipeline construction activities, there will be two main generic types of impact:

- planned discharges of treated wastewater (eg at construction camps);
- 'disturbance' of watercourses directly through physical works, and indirectly due to run-off containing suspended solids from working and reinstated areas.

Planned discharges will always be treated to a specified quality that meets the requirements of World Bank and Turkish standards (whichever are most stringent for any given parameter). The standards will be set according to the existing use of the receiving water. For example, if there is a downstream fishery, the discharge will comply with the Turkish Regulation on Fishery Products.

Under Aquatic Products Law 1380, all of Turkey's seas and terrestrial surface water resources are classed as 'aquatic products' areas. In this context wastewater discharges must comply with the limits set out in Appendix 6 of the Fisheries Products Regulation, and the receiving waters should meet the requirements of Appendix 5 (refer to EIA Appendix D, Section 4.1).

Significance criteria for impacts to water quality (and secondary impacts to water users) are therefore based largely on compliance with standards, together with the quality of the receiving water and its ability to dilute the effluent. These are summarised in Table 3.10.

Table 3.10 Significance Criteria for Impacts to Surface Water Quality

MINOR	MODERATE	MAJOR
Effluent quality within discharge limits; rapid dilution achieved to levels where no discernible impacts to aquatic ecology are likely; discharge to any Class of water.	Effluent quality within discharge limits; poor dilution capacity in receiving water; Class I or II water.	Breaching of effluent discharge standards; discharge causing a negative change in class of the receiving water.

The second generic category of impact does not lend itself to being quantified either in terms of standards or impact prediction, for example:

- there are no standards which govern the temporary mobilisation of sediment in a stream during crossings works;
- even if there was a standard, predicting the resultant concentration would be an extremely imprecise exercise.

Under Aquatic Products Law 1380 (as amended by law number 3288), it is obligatory to obtain permissions from the relevant authorities based on advice from the Ministry of Agriculture and Rural Affairs before any activity that could adversely affect the growth and production of water products, such as filling, drying out altering the shape of a water body, and including excavation of gravel, sand etc and crossings works in general. Such works will require the supervision of personnel of the Provincial Directorate of Agriculture.

Assessing such impacts is therefore an exercise in professional judgement. Table 3.11 below summarises how this judgement has been applied.

Table 3.11 Assessment Criteria for Physical Disturbance to Surface Water Bodies

	Disturbance limited to immediate working area, visible sediment predicted in watercourses for less than three weeks after construction and no obscuration of the bed	Disturbance limited to within 1km of working area, visible sediment predicted in watercourses for longer than three weeks but less than three months after completion of construction and reinstatement but no obscuration of bed	'Disturbance' apparent >1km downstream, visible sediment predicted in watercourses for longer than three months after completion of construction and reinstatement and obscuration of bed
Highly polluted or polluted (Class III or IV) receiving water and/or little or no community use/ natural value	Minor	Minor	Moderate
Slightly polluted (Class II) receiving water and/or moderate degree of community use/ natural value	Minor	Moderate	Major
High quality (Class I) receiving water and/or important community/nature conservation resource	Moderate	Major	Major

So, within these criteria, a major open cut crossing in soft deep sediment material of a high quality water resource containing downstream fisheries and agricultural abstraction would be likely to cause Major impacts. Conversely, a crossing in a sand/gravel bed with no downstream users or nature conservation value would lead to Minor impacts.

3.8.4.2 Marine waters

Table 4.3 in Appendix D sets out the required standards for aqueous effluents discharged to marine waters. Although these standards are intended for the operating marine terminal, they will also be applied to the construction phase.

Planned discharges to the marine environment will always be treated to a specified quality that meets the requirements of World Bank and Turkish standards (whichever are most stringent for any given parameter). The effluent discharge standards will be set according to the existing use of the receiving water, which, for the purposes of this EIA, is deemed a fishery.

Under Aquatic Products Law 1380, all of Turkey's seas and terrestrial surface water resources are classed as 'aquatic products' areas. In this context wastewater discharges must comply with the limits set out in Appendix 6 of the Fisheries Products Regulation, and the receiving waters should meet the requirements of Appendix 5.

Under Aquatic Products Law 1380 (as amended by law number 3288), it is obligatory to obtain permissions from the relevant authorities based on advice from the Ministry of Agriculture and Rural Affairs before any activity that could adversely affect the growth and production of water products, such as filling, drying out altering the shape of a water body, and including excavation of gravel, sand etc. Such works will require the supervision of personnel of the Provincial Directorate of Agriculture.

An in situ survey will be carried out by the Ministry of Agriculture and Rural Affairs in compliance with the requirements of the Aquatic Products Law 1380 at the Marine Terminal site.

Significance criteria for impacts to marine water quality are therefore largely based on compliance, together with the diluting capacity of the receiving water and quality standards to protect its use. For the purpose of this assessment the use protection standards are taken as those set out in the EC Bathing Water Directive (see Appendix D). In this context the significance criteria for impacts to marine water quality are summarised in Table 3.12.

Table 3.12 Significance Criteria for Impacts to Marine Water Quality

MINOR	MODERATE	MAJOR
Effluent within discharge limits; rapid dilution capacity in receiving water	Effluent within discharge limits; poor dilution capacity in receiving water; likely exceedance of environmental quality standards inside exclusion zone	Breaching of effluent standard. Discharge causing an exceedance of environmental quality standard (based on EC Bathing Water Directive) outside exclusion zone, or at nearest bathing beach.

3.8.5 Groundwater resources

Article 12 of the Regulation on Control of Water Pollution (RCWP) presents a classification methodology for groundwater, as set out below:

- Groundwater Class I: high quality groundwater, suitable for the following needs:
  - drinking water supply (if needed, following disinfection); water supply for food industry.
- Groundwater Class II: medium quality groundwater, suitable for the following needs:
  - drinking water supply (following an appropriate purification);
  - agricultural (for irrigation and animal husbandry);
  - industrial process water.
- Groundwater Class III: low quality groundwater, inferior to the quality parameters for Class I or Class II groundwater. Use of such water is determined based on the degree of treatment "attainable economically and technologically, and with respect to health".

Article 13 of the RCWP describes how such groundwater classifications are determined. *Article 22* of the RCWP relates to prohibitions of the use of certain chemicals listed in national legislation, Notice on Hazardous and Harmful Substances in Water (12 March 1989), and the EU Directive on Dangerous and Hazardous Substances in areas where they could be released to the environment. A 50m protective zone around sources of Class I and Class II drinking water supplies (wells, springs etc) is delineated. Discharge or passage of any solid or liquid waste and construction of any building is prohibited in this protection area. *Article 22* additionally addresses issues regarding chemical storage, use of pesticides and spill prevention in areas near drinking water supply wells.

Based on the above considerations, assessment criteria for impacts to groundwater are set out in Table 3.13.

Table 3.13 Assessment Criteria for Groundwater

	General construction activity, trenching dewatering or abstraction at distance greater than 50m from springs or wells	Major crossings works, construction camps, storage areas for fuels/chemicals. Operational discharge to soakaway at distance greater than 100m from springs or wells	Large spill of oil or chemicals, abstraction or operational discharge to soakaway between 50 and 100m from spring or well	Large spill of oil or chemicals within 50m of spring or well
Class III aquifer unconfined/ Class II aquifer confined	Minor	Minor	Moderate	Major
Class II aquifer unconfined/ Class I aquifer confined	Minor	Moderate	Major	Major
Class I aquifer unconfined	Moderate	Major	Major	Major

In applying the assessment criteria outlined in Table 3.13 above, the utilisation of local aquifers may be referenced where such considerations may influence the value of the groundwater resource. For example, reference to the size of community that is dependent on the resource will be made together with an assessment of the effects of resource degradation upon that community.

3.8.6 Biological environment

3.8.6.1 Standards

The approach to the assessment of potential impacts on the biological environment along the pipeline route and at the marine terminal (including the jetty) has been based on Turkish national legislation and guidance and international guidance; these are summarised in Box 3.4.

The significance of ecological impacts is broadly a combination of the sensitivity and value of the resource (habitat or species) affected and the geographic scale, duration and permanency of the effect.

3.8.6.2 Habitat and species evaluation criteria

Habitat sensitivity and value have been assessed according to widely accepted criteria. The principal criteria employed are ‘naturalness’, ‘extent’, ‘rarity’ and ‘diversity’, supplemented by a range of supplementary criteria; each of the criteria are summarised in Box 3.5 below.

Box 3.4 Law and Guidance in Regards to Ecological Assessment

Turkish Law:

- Environment Law No. 2872 (11th August 1983)
- National Parks Law No. 2873 (11th August 1983)
- Hunting Law No. 3167 (5th May 1967)
- Law on Establishment and Duties of Ministry of Forestry No. 3800

Turkish Guidance:

- Risk categories devised by the International Union for the Conservation of Nature in 1994
- Risk categories used by Demirsoy (1996), based on the IUCN Red Data Book
- Classification system for risk categories for birds devised by Kiziroglu (1993)

The first and second categories were used to assess all fauna except birds.

International Guidance:

- *World Bank Group:*
- Environmental Assessment Sourcebook: Update Number 20 (Chapter 2) – Biodiversity and Environmental Assessment
- Environmental Assessment Sourcebook: Update Number 10 (Chapter 2) – International Agreements on Environment and Natural Resources
- Pollution Prevention and Abatement Handbook 1998
- Operational Policy: OP 4.04, Natural Habitats
- Biodiversity and Environmental Assessment Toolkit
  - *OPIC Environmental Handbook;*
  - *US Environmental Protection Agency (EPA):*
- Considering Ecological Processes in EIAs (Guidance in applying NEPA)
- Pollution Prevention – Environmental Impact Reduction Checklists for NEPA Reviewers (General Checklist: Habitat Preservation and Protection; Siting; and Oil and Gas Projects)

Box 3.5 Criteria for the Evaluation of the Sensitivity and Value of Affected Habitats and Species

The presence of any habitat, plant or animal species that is internationally, nationally, regionally or locally rare, especially species protected under Turkish legislation.

The presence of any habitat, plant or animal communities, which are internationally, nationally, regionally or locally uncommon or suffering serious reduction nationally or locally.

The diversity of the habitats and their individual species richness are important. In general, the greater the total number of species recorded, the greater the conservation interest of the area. The presence of a nationally or locally important population of a particular species; an assessment of whether the habitat is a representative example of special interest or value.

The 'naturalness' of the habitat. Naturalness and diversity can be strongly correlated and recreated habitats tend to be more species poor than their natural or semi-natural equivalents.

The fragility and sensitivity of the habitat and its ability to recover (either naturally or with assistance) from disturbance. This criterion is linked also to size, naturalness and rarity but generally fragile sites are usually highly fragmented, decreasing rapidly in extent and number and are difficult to recreate.

The recorded history of the site. The loss of an irreplaceable biological record would be particularly significant. Such records may also be of cultural and historical value.

Whether at the local level the habitat is an ecological corridor between other isolated habitats of ecological importance.

Whether a species has a seasonally variable vulnerability due, for example, to breeding, critical feeding times or migratory passage.

Whether any species has cultural significance (for example, as a resource utilised by local settlements).

The amenity value of the site.

The research value and education potential of the site.

Habitat and species have been similarly assessed according to accepted criteria such as rarity and the extent to which they are under threat. The importance of species to wider ecological communities (eg predator/prey relationships) has been considered and specific protection of species under national legislation has also been taken into account.

Together these factors feed into a subjective judgement on whether a habitat/species is evaluated as being of high, medium or low conservation value/sensitivity.

3.8.6.3 Scale of impact

The assessment of the likely scale of ecological impacts is generally a subjective judgement and it is often difficult to attach definite levels of scale to impacts in the way that quantitative prediction (eg for noise) allows. As the quantitative prediction of the scale (and consequently the level of significance) of ecological impacts is widely acknowledged as problematic, monitoring (eg of re-vegetation, disturbance of sensitive animals during works) will play an important role. Monitoring will also allow the Project to make adjustments, where practicable, for impacts that cannot be predicted or quantified at this stage in the development of the Project. The definitions in Box 3.6 were used in this EIA, where possible, to qualify the likely scale of predicted impacts.

Box 3.6 Assessment Criteria for the Magnitude of Ecological Impacts

Major Impact: affects an entire population or species in sufficient magnitude to cause a decline in abundance and /or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations*. A major impact may also affect a subsistence or commercial resource use to the degree that the well being of the user is affected over a long term. In the case of fish an impact over one season/generation would be significant.

Moderate Impact: affects a portion of a population and may bring about a change in abundance and / or distribution over one or more generation*, but does not threaten the integrity of that population or any population dependent on it. *Moderate Impacts* to the same resource multiplied over a wide area would be regarded as a *Major Impact*. A short-term effect upon the well being of resource users may also constitute a moderate impact.

Minor Impact: affects a specific group of localised individuals within a population over a short time period (one generation* or less), but does not affect other trophic levels or the population itself.

*These are generations of the animal/plant species under consideration not human generations. It should be noted that the reinstatement and recovery potential of an affected habitat also needs to be considered in applying the above criteria.

(Modified from Ref 2)

The evaluation and assessment criteria, presented in Box 3.5 and Box 3.6 respectively, allows the development of impact matrices as a tool to summarising and analysing predicted ecological impacts.

Examples are presented in Table 3.14 below. Habitat and fauna/flora have been categorised as locally/regionally, nationally or internationally important. It is the interaction of these two elements (scale of impact, value of receptor) that determine significance. Significance is therefore Major for impacts of a large magnitude on receptors of high value and lower for smaller impacts on receptors of lower value.

Table 3.14 Summary Criteria for Assessing the Significance of Ecological Impacts

	Minor Impact as defined in Box 3.6	Moderate Impact as defined in Box 3.6	Major Impact as defined in Box 3.6
Locally important habitat or flora/fauna according to criteria in Box 3.5	Minor	Minor	Moderate
Nationally important habitat or flora/fauna according to criteria in Box 3.5	Minor	Moderate	Major
Internationally important habitat or flora/fauna according to criteria in Box 3.5	Moderate	Major	Major

During the Disclosure process, it was suggested that a quantitative, monetarised value be applied to the assessment of ecological resources.

Although the valuation of ecological resources has been the subject of considerable academic debate, the lack of consensus as to the suitability and utility of monetarising ecological value has resulted in such an approach not being applied within typical EIA methodologies (including those advocated by the World Bank, the European Union, the Government of Turkey or the principal international professional EIA associations such as the International Association of Impact Assessment).

The principal constraint to using such an approach lies in the development of robust and appropriate methods for applying a monetary valuation to ecological resources that capture the value of each species that contributes to the ecology of an area, as well as the combination of these species to derive a value for the resultant habitat. As ecological resources are non-tradable commodities, academics have attempted to employ a range of techniques to quantify 'proxy' prices or 'hedonic' valuations. However, such research is very resource intensive, and work best on valuing permanent impacts on readily identifiable environmental assets. There may therefore be problems with assessing impacts over long pipeline routes that run through a wide variety of landscapes.

3.8.7 Atmospheric emissions and air quality

3.8.7.1 Standards

Standards for the protection of air quality have been derived from various sources, including the following:

- Turkish Regulation on Preservation of Air Quality
- EU standards
- World Bank standards
- World Health Organisation standards

The most pertinent of these are summarised in Appendix D.

3.8.7.2 Construction phase

The main sources of emissions to the atmosphere during construction will comprise dust, vehicle emissions and emissions from sources such as generators at construction sites and work camps. For the latter (ie non-dust) sources, the key concern is human health due to carbon monoxide (CO), nitrogen oxides (NO_x), sulphur oxides (SO_x) and fugitive hydrocarbons. However, none of these emissions will be of a scale or longevity to have anything more than a highly localised and minor air quality effect and the development of significance criteria for these effects would not be appropriate.

The emission of dust from construction activities is, by its nature, very variable, depending as it does on the type of activity, soil friability and prevailing wind speed and direction. Consequently, methodologies for predicting dust impacts rely upon detailed information on the timing, duration and location of construction activities, the meteorological conditions, the local soil and subsoil profile and the location and sensitivity of potential sensitive receivers.

Although an agricultural engineering study was conducted to predict likely deposition rates of dust to agricultural areas adjacent to the working corridor, this looked at the mean rate over a period of construction time. Ambient conditions could still lead to episodes of dust nuisance and the perception that crops were being damaged. For these reasons, a qualitative assessment has been undertaken at this stage for the potential for nuisance from dust emissions during construction. The issue of dust impacts to agricultural activities was also the subject of consultation with the potentially affected residents (see Case Study 6).

The assessment criteria in Table 3.15 have been used to determine the potential for a receptor to be exposed to dust nuisance as part of the environmental management of construction activities. Because so many variables influence the likelihood of dust impacts actually occurring, there is no value in seeking to predict impacts throughout the route, at AGIs and the BTC Marine Terminal. However these criteria have been used in Sections 6 and 12 to identify areas where particular mitigation measures are likely to be required.

Table 3.15 Summary Criteria for Assessing the Significance of Dust Impacts

	Non-sensitive land types. Sensitive receptors >250 m from nearest working area	Sensitive land uses, residences or sensitive natural habitats <250m but >100m from nearest working area	Sensitive land uses, residences or sensitive natural habitats <100m from nearest working area
Dry conditions, wind speed <4ms^{-1}	Minor	Minor	Moderate
Dry conditions, wind speed >4ms^{-1} towards receptor	Minor	Moderate	Major
Dust deposition exceeds threshold in Turkish Regulation on Preservation of Air Quality	Moderate	Major	Major

3.8.7.3 Operational phase

The assessment has assumed that the facilities will be designed and operated to standards equal to or better than the World Bank emission standards set out in Appendix D.

The significance of potential impacts associated with the predicted short-term and long-term ground level concentrations has been assessed by reference to accepted Turkish and International standards for ambient air quality as listed in Appendix D. The limits and guidelines in these standards have been taken as the Environmental Assessment Level (EAL) for the purposes of developing the significance criteria defined below. The significance of impacts has been predicted for both short term (less than 24 hours) and long term (24 hours and greater) ground level concentrations.

Short-term exposures

The significance of impacts has been predicted for short-term (less than 24 hour) ground level concentrations according to the criteria given in Table 3.16.

Table 3.16 Significance Criteria for Short-term Ground Level Concentrations of Atmospheric Pollutants

	MINOR	MODERATE	MAJOR
Short-term (less than 24hr) ground level concentrations.	Effects that are below <75% of the environmental assessment level (EAL).	Any resulting effect that brings the local air quality above 75% of any of the environmental assessment levels (but still within it).	Any identified breach of the environmental assessment levels adopted for the EIA.

Longer-term exposures

The short-term criteria presented in Table 3.16 are unsuitable for longer-term predictions of ground level concentrations, especially if receptors are exposed to more than one source of pollution. In both the UK and the US, an approach is adopted broadly based on the premise that no single activity should be allowed to take up the whole or substantial part of a 'pollutant allowance' in any one area.

The UK Environmental Agency has issued guidance that defines an emission leading to a process contribution to long term ground level concentrations of less than 1% of the Environment Assessment Level (EAL) as being insignificant (ie no need to consider further in the assessment process).

On the other hand, if the process contribution, in combination with background concentrations, is greater than 70%, then the impact is significant (a Moderate impact in the terminology used in this EIA) requiring the application of the best available control technology to reduce it further. A Minor impact can be defined as being somewhere in between insignificant and significant. A Major impact would be an exceedance of the EAL. Minor impacts need no action, Major impacts would be unacceptable and would need to be designed out through emissions control, higher stack height etc. Moderate impacts would need some action depending how close they are to the 70% 'threshold'. Significance criteria are summarised in Table 3.17.

Table 3.17 Significance Criteria for Long-term Ground Level Atmospheric Pollutant Concentrations

	INSIGNIFICANT	MINOR	MODERATE	MAJOR
Long term ground level concentrations	Predicted concentrations at receptors <1% of the EAL	Predicted concentrations are >1% and <70% of the EAL when added to baseline levels	Predicted concentrations are >70% and <99% of the EAL when added to baseline levels	Predicted concentrations exceed the EAL when added to baseline levels/

Therefore, taking as an example the WHO annual mean limit value for nitrogen dioxide of 40 μgm^{-3}, the significance criteria can be defined as follows.

- If the process contribution (ie that from this project) to ground level concentrations is within 1% of the EAL (ie 0.4μgm^{-3}) impacts will be considered insignificant and require no further assessment.
- If the process contribution added to ambient concentrations is below 70% of the EAL (ie 28μgm^{-3}) this would be a Minor impact and would be deemed acceptable.
- If the process contribution added to ambient concentrations is greater than 70% of the EAL (ie between 28μgm^{-3} and 40μgm^{-3}) this is classified as a Moderate impact and best available control technology would need to be applied to reduce it further.
- If the process contribution added to ambient concentrations exceeds the EAL (ie is greater than 40μgm^{-3}) this would be a Major impact and would need to be designed out.

Greenhouse gas emission

Greenhouse gas (GHG) assessment criteria are summarised in Table 3.18. These criteria recognise that carbon dioxide (CO_2) is not the only GHG of concern; consideration is also given to potential emissions of methane and nitrous oxide. The total GHG emissions forecast is presented as tonnes of CO_2 equivalent (CO_2-e) according to the methodology of the UN Framework Convention on Climate

Change [Ref 5]. The results are discussed in Section 16 (Cumulative Impacts) and Appendix B2 (Air Quality Modelling Results).

Table 3.18 Criteria for Greenhouse Gas Emissions

	MINOR	MODERATE	MAJOR
CO_2-e Emissions	<0.1% of total Turkish CO_2-e emissions	>0.1 to <1% of total Turkish CO_2-e emissions	>1% of total Turkish CO_2-e emissions

3.8.8 Noise and vibration

3.8.8.1 Standards

Criteria against which predicted noise and vibration levels are assessed have been derived using relevant, recognised national (ie the Turkish Noise Control Regulation) and international guidance (eg World Bank and World Health Organisation). The purpose of the Turkish Noise Control Regulation (NCR) (11 December 1986) is to ensure the creation of an environment in which noise will not disturb 'the repose and peace and the physical and mental health of human beings'.

The assessment has been developed using the current best estimate of activities, scheduling, plant and plant utilisation based on experience from similar construction projects, together with source data provided from engineering design.

3.8.8.2 Criteria for the construction phase

The NCR addresses noise in two ways: control of noise levels at source; and setting standards to protect receptors.

The maximum allowable noise emissions for various construction noise sources taken from the NCR are provided in Table 4.6 in Appendix D. These levels have been interpreted as sound power levels except for the specification for trucks that is a maximum noise level.

Limits from the NCR for noise levels to be achieved at receptors during construction are presented in Table 3.19Table 3.19. When noise levels exceed the acceptable levels at a distance of 1m from noise sensitive structures in the environment, measures must be taken to reduce noise to acceptable levels.

Table 3.19 Turkish Ambient Noise Standards for Construction and Operation of the Proposed Project

Noise Source	L_{eq} (5 minute) (dB(A))	
	Day (06:00-22:00)	Night (22:00-06:00)
Construction Site Noise		
Building construction (continuous)	70	-
Road construction (temporary)	75	-
Impact noise	100 (L_{max})	-
Operational Noise		
Continuous	65	55
Sudden	70	60

The World Bank does not specify limits on construction noise but in line with common European/UK practice, Turkish regulations indicate a daytime limit of $L_{Aeq\ 5\ minutes}$ 70/75 dB(A) outside of dwellings. Thus daytime construction phase significance can be defined by absolute limits qualified by specified hours of working.

Taking the above standards into consideration the construction noise impact significance criteria used in this EIA are summarised in Table 3.20 below.

Table 3.20 Construction Noise Impact Assessment Criteria

	MINOR	MODERATE	MAJOR(1)
Construction activity (noise levels at receptor)	Daytime (06.00 – 22.00) $L_{eq(5\ minutes)}$ <70dB(A). Night-time $L_{eq(1\ hour)}$ <45dB(A) Duration <4 weeks	As for Minor but duration >4 weeks	Daytime (06.00 – 22.00) $L_{eq(5\ minutes)}$ >70dB(A). Night-time $L_{eq(1\ hour)}$ >45dB(A) See also Note (2) below
Levels based on World Bank standards and Turkish noise regulations. 1. By virtue of their temporary nature Major construction noise impacts will not be rated as unacceptable, but the major focus for mitigation and monitoring actions will be on where they may potentially occur. 2. For industrial and commercial receptors a $L_{eq\ (one\ hour)}$ of 70dB(A) is allowed.			

Vibration from most construction activities does not generally give rise to perceptible levels of vibration outside of construction sites. Even vibration from percussive piling (eg sheet piling) generally falls to imperceptible levels beyond about 100m. Imperceptible levels are reached at much smaller distances for other plant such as excavators and dozers. Sensitive receptors within 100m of locations where percussive piling is expected (such as crossings) have been identified, and mitigation measures have been identified accordingly.

Blasting may also give rise to vibration. Significance criteria used to evaluate impacts from blasting are summarised in Table 3.21 (and are quantified in Section 6) in terms of receptor distances from potential blasting areas.

Table 3.21 Blasting Impact Criteria

MINOR	MODERATE	MAJOR
No perceptible vibration noise levels within 100 dB(A) L_{max} (1)	Vibration perceptible; noise levels within 100 dB(A) L_{max} (1)	Structural damage and/or noise levels exceed 100 dB(A) L_{max} (1)
(1) Based on Turkish noise regulations.		

3.8.8.3 Criteria for operation

According to the World Bank, noise abatement for an operating facility should achieve either the levels specified in Table 3.22 below or a maximum increase in the ambient noise level of 3dB(A) (this is generally interpreted as the level measured outside the property in a free field location).

Table 3.22 World Bank Noise Standards

	Maximum allowable Leq (hourly), in db(A)	
Receptor	**Daytime 07.00-22.00**	**Night time 22.00-07.00**
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Taking the above standards into consideration the noise impact significance criteria used in this EIA are summarised in Table 3.23 below.

Table 3.23 Operational Noise Impact Assessment Criteria

	MINOR	**MODERATE**	**MAJOR**
Operational phase (assumed continuous 24 hrs) – noise levels at receptor	$L_{eq\ (one\ hour)}$ <45 dB(A) and <3dB(A) above ambient – *no project action required*	$L_{eq\ (one\ hour)}$ <45 dB(A) and >3dB(A) above ambient – *impacts to be reduced the greater they are above ambient*	$L_{eq\ (one\ hour)}$ >45 dB(A), or if ambient is already above 45dB(A) then >3dB(A) above ambient – *impacts unacceptable* See also Note (1) below
1. For industrial and commercial receptors a $L_{eq\ (one\ hour)}$ of 70dB(A) is allowed.			

3.8.9 Traffic and transport

A generic approach has been taken to the prediction and evaluation of traffic impacts since the exact location of worksites and access routes will be ultimately identified by the Construction Contractors. Consequently, traffic impacts on individual roads will be assessed at that time and the means to manage them through Traffic Management Plans will be formalised.

The potential for impacts to arise has been identified by relating estimates of construction generated traffic to the baseline traffic flows on the strategic roads likely to be used (eg between ports and possible construction base sites). To reflect a worst case, this has been undertaken for the period during which vehicular activity during construction will be at its peak.

In order to perform this exercise, the assessment criteria set out in Table 3.24 have been used to indicate the significance of changes in traffic flow. In the absence of Turkish or international criteria, these criteria are drawn from recognised guidance in the UK and have been developed specifically for the purpose of evaluating impacts (on traffic conditions, pedestrians and cyclists) arising from traffic generated by new developments.

Table 3.24 Traffic Assessment Criteria

POTENTIAL IMPACT	ASSESSMENT	ASSESSMENT CRITERIA
Traffic [(a)] conditions	Changes in traffic flow	Potentially significant impact (further assessment required) if: traffic flows increase by > or =10% traffic flows increase by > or = 5% (where network is sensitive) trips (in / out combined) increase by >100 in a peak hour
Impacts on pedestrians and cyclists [(b)]	Percentage change in traffic flow	Significant impact if traffic flows increase by > or =30%
(a) UK Institution of Highways and Transportation (1994) Traffic Impact Assessment, IHT (b) Crompton D H (1981) Pedestrian Delay, Annoyance and Risk, Imperial College London		

With respect to the traffic conditions criteria presented above, it should be noted that the criteria relate principally to long-term traffic generation (ie traffic normally expected to arise during the operational life of a development). In determining the significance of potential construction traffic impacts in relation to these criteria therefore, particular account has been taken of the duration of impacts where these are likely to be short term events.

The potential for other impacts, including disruption arising from pipeline crossings of existing transport infrastructure, was based on professional judgement. The main aim was to identify potential impacts from the perspective of putting management measures in place through a Traffic Management Plan.

3.8.10 Cultural heritage

3.8.10.1 Standards

The approach to the assessment of the potential impacts on cultural heritage along the surveyed pipeline corridor is designed to meet the requirements as set out in Turkish law (Protection of Cultural and Natural Entities Law, *No. 2863, July 21, 1983*). In addition, guidance from the following international organisations was also considered.

- World Bank Group
  - Environmental Assessment Sourcebook UPDATE, Cultural Heritage in Environmental Assessment, September 1994, reissued December 1996.
  - OP Note No. 11.03 Management of Cultural Property in Bank Financed Projects.
  - World Bank Procedures: Draft BP 4.11, May 2001.

- United Nations Educational, Scientific and Cultural Organisation (UNESCO)
  - International Venice Charter for the Conservation and Restoration of Monuments and Sites, 1996.
  - Recommendation on International Principles Applicable to Archaeological Excavations, December 1956, Updated 25 November 1999.

- International Council on Monuments and Sites (ICOMOS)
  - Charter for the Protection and Management of the Archaeological Heritage, 1990.
  - Charter on the Protection and Management of Underwater Cultural Heritage, 1996.
  - Burra Charter.

- Making Good Decisions about the care of important places.

The key stages in the management of impacts to cultural heritage are contained in the Cultural Heritage Management Plan (CHMP) and are summarised below:

- identification of heritage issues through a desk review of available information (eg MoC's archaeological inventory, UNESCO World Heritage Convention), consultation and field surveys;
- field survey and significance assessment of heritage;
- development of measures to avoid, minimize or mitigate impacts, including possible excavation or salvage operations;
- development and agreement of chance find procedures;
- development and agreement of measures to protect cultural heritage, which will be, reflected in legal agreements and bidding/contract documents.

Cultural heritage comprises a wide range of resources, including all over-ground, underground or submarine moveable and fixed entities related to culture, religion and fine arts pertaining to prehistory and historical periods, which are defined as cultural entities [(1)] and places related to local folklore, mythology and traditions, locations of historical and cultural festivals, events and rituals. During the desktop research and field surveys undertaken as part of the cultural heritage assessment (and during the social surveys undertaken as part of the wider EIA process), a wide range of cultural heritage resources were researched and assessed, and this process informed the cultural heritage input to the route selection and detailed design processes. In assessing the preferred pipeline route corridor and its associated facilities, the results of the baseline investigations defined the scope of the assessment to be focussed primarily on the implications for the archaeological resource and the provisions required to ensure that the uncertainty associated with the discovery of, as yet, unrecorded deposits is effectively managed. This focus is reflected in the content and intent of the CHMP (see Appendix C7).

3.8.10.2 Significance criteria

Following a preliminary assessment of the potential impacts of the pipeline on cultural heritage resources without mitigation, appropriate mitigation measures were developed. These were then agreed with the relevant authorities, consultees and stakeholders. As described above, the measures will continue to be developed and will be formalised in the Cultural Heritage Management Plan. In addition, a protocol has been signed between BOTAŞ and the Ministry of Culture (General Directorate of Monuments and Museums) concerning sites of cultural heritage importance.

The magnitude of the impacts has been graded as follows.

- *Major:* extensive or total disturbance/removal of the site.
- *Moderate:* partial disturbance /removal of the site.
- *Minor:* limited disturbance to the site setting and peripheral features.

An additional category, '*Uncertain'*, has been applied where the extent of site data, or the nature of construction activities does not enable a determination of likely effects at this stage, but generally a cautious approach in determining the significance of impacts has been applied.

For the purposes of this assessment, the importance of a site or feature of archaeological or cultural heritage significance is determined by its MoC classification, which can be summarised as follows.

1 As defined in Article 3 and Article 6 of Protection of Cultural and Natural Entities Law (dated 21 July, 1983 and numbered 2863).

- *First-Degree Site*: if a high density of findings exists at the investigated site, the site is proposed as first-degree site. Some World Heritage sites are First-Degree sites.

- *Second-Degree Site*: a site possessing the same feature similar to first-degree sites but it is occupied by the village settlements at present time, is designated as second-degree site.

- *Third-Degree Site*: a site where there are no findings but there is the possibility of the existence of an ancient settlement or a part of it, is designated as a third-degree site.

The significance of any residual impact on a site or feature of archaeological or historical importance will then depend on the following factors.

- The magnitude of the impact taking account of the extent to which the impact can be mitigated (as above).
- The importance of the site.

The significance criteria are summarised in Table 3.25.

Table 3.25 Summary Criteria for Assessing the Significance of Archaeological Impacts

	Impacts (usually temporary) to the site setting and peripheral features	**Partial damage to site and its setting**	**Complete destruction of site or a substantial part thereof**
Third degree site	Minor	Minor	Moderate
Second degree site	Minor	Moderate	Major
First degree site	Moderate	Major	Major

* These criteria, which have been identified by taking into account the potential impacts of the activities during the Land Acquisition and Construction Phase on the archaeological remains, do not constitute any judgement on the value or importance of those remains.

3.8.11 Social impact significance criteria

As described in Section 3.7.6, only two categories of significance are considered for social impacts. An impact will either be 'Significant' or 'Not Significant' whereby impacts, both negative and positive, are considered 'Significant' if:

- they reduce or increase the ability of a household to maintain or improve its store of livelihoods assets over the short or long term;
- they reduce or increase quality of life over the short or long term beyond that acceptable to those that are affected [1].

Using these generic significance criteria as a framework within which to assess social and economic impacts, more specific significance criteria are then developed for each of the impacts discussed in Sections 6 and 12.

[1] Quality of life includes characteristics such as tranquillity, landscape, family relations and 'way of life' in addition to livelihood assets. It is a very subjective characteristic and can only really be evaluated by those affected by a project.

Likelihood is not brought into the criteria for significance. Instead, this will be separately assessed. This is because perception of risk (ie the likelihood of an impact occurring) is different for each individual, depending on their level of livelihood or quality of life. Thus, for someone who is impoverished, an impact remains significant regardless of whether there is a high or low likelihood of it occurring, as they would be less able to adapt to the impact, in the event that it occurs.

3.9 CUMULATIVE IMPACTS

The IFC Procedure for Environmental and Social Review of Projects (IFC, December 1998) states that environmental assessment includes consideration of:

> *"..cumulative impacts of existing projects, the proposed project and anticipated future projects."*

EC guidance on EIA has similar requirements and specifically states that the assessment of cumulative impacts shall be an integral part of the overall EIA and not a separate or add-on activity.

Impacts are cumulative generally when they act with others in such a way that the sum is greater than the parts. This is not always the case. Sometimes they will simply be the sum of the parts, but that sum may become more significant than the individual parts. In general, the types of cumulative impact of relevance to the BTC Project can be defined as follows.

***Accumulative*:** the overall effect of different types of impact at the same location on the same receptors (for example, fugitive dust emissions, construction noise and construction traffic on a single community);

Interactive: where two different types of impact (which may not in themselves be important) react with each other to create a new impact (that might be important) (eg water abstraction from a watercourse might exacerbate the impacts caused by increased sediment loading);

***Additive*:** where impacts from the primary activity (ie the construction and operation of the BTC Project) are added to impacts from third party activities (for example, other major projects in the vicinity of the BTC Pipeline which are already underway, planned or may happen in the foreseeable future).

For this EIA the assessment of accumulative and interactive impacts has been undertaken integrally with the overall assessment. The latter type of cumulative impact, additive impacts, where the BTC Project may potentially cause impacts in combination with other proposed third party impacts, is addressed in detail in Section 16. The approach and methodology for the cumulative impact assessment is described in detail in that Section.

Emissions of greenhouse gases have global warming implications. The significance for these emissions has been assessed according to the criteria set out in Section 3.8.7.3 and the implications are presented in Section 16.

3.10 TRANSBOUNDARY IMPACTS

World Bank Document Operational Policy 4.01 stipulates that transboundary impacts (ie impacts that cross the borders of Turkey into neighbouring countries) should be considered in the EIA process.

The assessment of potential transboundary impacts for this EIA has considered the following:

- sediment mobilisation into rivers near the Georgia border;

- potential terrestrial oil spills transported in rivers;
- potential marine oil spills transported to the coasts of other Mediterranean Sea states.

The significance of transboundary impacts has been assessed according to the criteria described above. Transboundary impacts are identified and discussed in the relevant Sections (6, 8 and 14) of the EIA.

3.11 REPORTING THE FINDINGS OF THE EIA PROCESS

The assessment methodologies and criteria described within this section have been employed systematically and consistently during the EIA process. However, it was recognised very early on in the process that the types of development associated with the construction and operation of the pipeline, and AGIs would require different reporting protocols and formats to those for the marine terminal.

- For the BTC Pipeline and Above Ground Installations (AGIs), the reporting of impacts has been structured (Sections 6 and 7) to take into account the fact that many of the generic impacts will be similar throughout the length of the route.

  - As such the construction impacts are dealt with as a series of tables, each providing details of impacts and mitigation by receptor for each route lengths (typical route length 20km).

  - As the operational impacts are largely limited to AGIs (pumping stations, pressure reduction station, block valve stations and access roads), the treatment of operational impacts has been led by physical structure rather than by receptor.

- For the BTC Marine Terminal, the construction and operational activities, which may result in impacts to the largely separate terrestrial and marine receptors, are addressed on the basis of a division between the terrestrial activities and environment (Section 12) and marine activities and environment (Section 13).

3.12 DIFFICULTIES FACED IN UNDERTAKING THE EIA

Like most EIAs, the BTC Project EIA has faced a number of challenges in terms of the accuracy of predicting impacts, and developing appropriate mitigation. These generally centre on the following.

3.12.1 Accuracy, depth of detail and gaps in knowledge of the baseline

Seasonal constraints and evolving design were the primary influencing factors in this regard. Seasonal considerations in terms of snow cover affecting accessibility and ability to identify flora at less than desirable times of year then prevented meaningful follow up surveys from being undertaken. Where these difficulties were faced the fall back was to rely on approaches that included:

- revisiting desk data for the 500 m corridor, and at a higher level the 10 km corridor;
- review of maps, satellite images and aerial photography by expert ecologists;
- a series of follow-up ecological surveys undertaken during the summer of 2002, the results of which have been incorporated into the EIA Report, following the Disclosure period.

To the extent possible the EIA used information gleaned from such sources as a basis for assessment. However, there is no substitute for site-specific data and the EIA therefore identifies locations where pre-construction surveys and data acquisition will be required, and if necessary for management and mitigation measures to be revised in response to new findings.

3.12.2 Developing Design

While EIA is generally a process that parallels and interacts with design, it relies on design for certain data to address impacts. In this respect it has also to follow design. In a project of the scale and complexity of BTC there are inevitably issues that still have to be resolved in terms of the precise nature of project activities. The majority, if not all, of these are construction related, including for example:

- the precise locations of temporary access roads;
- the exact types and volumes of wastes to be generated;
- construction traffic flow rates and its routes to and from working areas.

The EIA provides a comfort factor for these impacts in terms of generic mitigation measures and a professional judgement on the extent to which they can be mitigated. The measures are described in detail in the Management and Monitoring Plans. However, to effectively close the issue requires two additional steps:

- for the appointed Construction Contractors to determine precise locations for access roads, to quantify waste volumes and traffic flows, and then to work these in to the Management and Monitoring Plans so that they are site/activity specific;
- to obtain BTC Co and/or Turkish regulatory approvals.

These requirements are contained in the Invitation to Tender for Construction Contractors and will be carried forward into the contract documents.

3.12.3 Accuracy of impact prediction and effectiveness of mitigation

The accuracy of impact prediction is affected by both the issues discussed above, together with the prediction technique used. In all instances, wherever there was uncertainty the significance criteria were applied conservatively to ensure that mitigation would not fall short of that required.

However, regardless of this cautious approach uncertainty remains. This is a key role of the Management and Monitoring Plans and the overall management approach (see also Section 17 and Figure 3.1). Impacts will be monitored, as will the effectiveness of mitigation. Where impacts are found to be unacceptably high and/or mitigation fails to achieve its objectives, corrective actions will be implemented.

BIBLIOGRAPHY

Ref 1 Baku-Tbilisi-Ceyhan Crude Oil Pipeline Project, Environmental Scoping Report, PLE-REP-EPR-PLE-006 B, 2001

Ref 2 Duinker PN and Beanlands GE (1986). The significance of environmental impacts, an exploration of the concept.

Ref 3 Wischmeier WH and Smith DD (1978), Predicting rainfall erosion losses – a guide to conservation planning. Agriculture Handbook No 537, US Department of Agriculture, Washington DC.

Ref 4 Soil and Water Conservation Society (1995), Farming for a Better Environment: A White Paper. Ankeny, Iowa.

Ref 5 Intergovernmental Panel on Climate Change (1997), Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Revised Guidelines), IPCC/OECD/IEA, Paris, France.

4 BTC PIPELINE - PROJECT DESCRIPTION

4.1 INTRODUCTION

This Section of the Report describes the Turkish section of the proposed BTC Pipeline, including the associated above ground installations (AGIs). The proposed BTC Marine Terminal is described in Section 9.

The following aspects of design, construction, operation and decommissioning of the proposed pipeline are presented:

- Project overview, presenting an overview of the entire BTC Pipeline Project;
- Project development and schedule for implementation;
- Interaction with other pipelines;
- Basis for pipeline design;
- Description of the pipeline;
- Description of the associated AGIs;
- Construction of the pipeline;
- Construction of the AGIs;
- Reinstatement and erosion control;
- Testing and commissioning;
- Routine operation and maintenance;
- Decommissioning and abandonment plans;
- Environmental, social, health and safety management;
- Project resources, emissions, discharges and wastes generated.

4.2 PROJECT OVERVIEW

The BTC Pipeline has been designed to transport crude oil from the Sangachal terminal near Baku in Azerbaijan, via Georgia, to a new marine export terminal at Ceyhan on the Mediterranean coast of Turkey. The overall route proposed is depicted in Figure 1.1 in Section 1.

The pipeline will be approximately 1,760km long, comprising the following sections.

- The Azerbaijan section of the pipeline will have a nominal diameter of 42 inches (1,050mm). The pipeline will be routed parallel to the existing Western Route Export Pipeline (WREP) from Baku to Supsa for much of its length.
- The Sangachal terminal will house the main pipeline control room for the entire BTC Pipeline as well as a custody metering station. There will be two pump stations in Azerbaijan: one (PSA1) will be located within the Sangachal terminal complex and the other (PSA2) will be located approximately midway between the terminal and the Georgia border. The pump station PSA1 will also house facilities for launching pipeline inspection gauges (pigs) and PSA2 will house pig receiving/launching facilities. There will also be two dedicated pig launcher/receiver stations (IPSA1 and IPSA2) and a number of valve stations along the pipeline route.
- The Georgia section of the pipeline will have a nominal diameter of 46 inches (1,150mm). This section too will initially be routed parallel to the existing WREP oil pipeline, before diverting south towards the Turkish border.
- There will be a custody metering station soon after crossing into Georgia territory. There will also be two pump stations (PSG1 and PSG2), each with pig

launcher/receiver facilities, and one dedicated pig launcher/receiver station (IPSG1) and a number of valve stations along its length.

- The Turkish section of the pipeline will be approximately 1,076km in length (to the site fence of the BTC Marine Terminal) and have a diameter decreasing from 46 inches to 42 inches to 34 inches (850mm) along the route. For approximately 40% of its length it will run parallel to the existing East Anatolian Natural Gas Pipeline (NGP) and it will also be routed close to the South Caucasus Pipeline (SCP) for some of its length (see Section 4.4).
- There will be a custody metering station located approximately 22km after the pipeline enters Turkish territory. There will be four pump stations (PT1/2/3/4), each with pig launcher/receiver facilities. There will also be one pressure reduction station (IPT1) with pig launcher/receiver facilities upstream of the BTC Marine Terminal. The Turkish section of the pipeline is also fitted with 52 intermediate block valve stations to facilitate isolation of discrete sections of the pipeline in case of any breach in the integrity of the pipeline system and to facilitate maintenance.
- The pipeline terminates at the BTC Marine Terminal which comprises a tank farm for intermediate storage of oil that has been transported down the pipeline, a fiscal metering station to measure the quantity of oil exported, and a berthing and loading facility to transfer oil to ocean tankers. The terminal will also house a backup control room for the entire BTC Pipeline. Further details on the BTC Marine Terminal are provided in Section 9.

A schematic overview of the overall oil export scheme is depicted in Figure 4.1.

Operation of the entire pipeline will be fully automated via a system of distributed process control of all pump stations, block valves and metering facilities. Flow rate control will be facilitated via control of pump speed and the number of pumps on line. Centralised control will be exercised from the control room located at the Sangachal terminal. It will also be possible for key components of the pipeline system, such as pumps, isolation valves and emergency shutdown valves, to be controlled locally.

Loading of crude oil on to tankers will be controlled from the control room on the BTC Marine jetty. The Ceyhan control room will also be fitted with fully functional standby control facilities for operation of the entire pipeline system in the event of malfunction or loss of control at Sangachal.

The proposed pipeline will initially transport crude oil produced from the Azeri, Chirag and Gunasli (ACG) fields augmented by other regional crude oil and condensate streams as additional export reserves become available. When fully operational and running at design capacity, the BTC Pipeline will convey 50 million tonnes per annum (tpa) from the Caspian Region to the BTC Marine Terminal at Ceyhan.

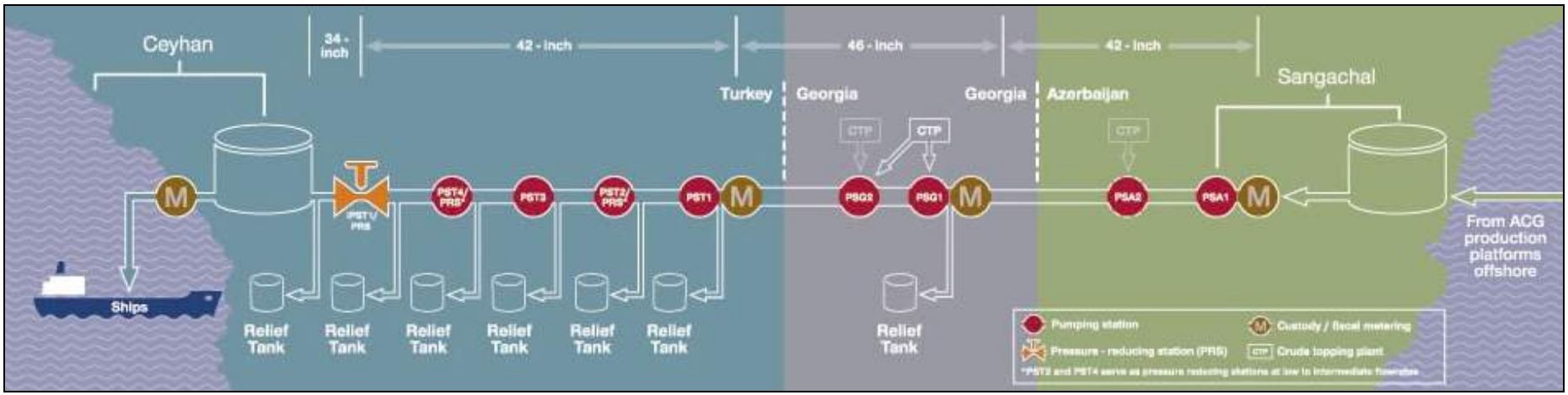


Figure 4.1 Schematic Overview of Overall Oil Export Scheme

4.3 PROJECT DEVELOPMENT AND SCHEDULE FOR IMPLEMENTATION

4.3.1 Project development

The sequence of stages for the implementation of the BTC Project is depicted Figure 4.2. These stages are discussed below.

4.3.2 Project need and consideration of strategic alternatives

There is a compelling need for the BTC Pipeline; this is presented in Section 1.3. The various strategic alternatives that have been studied and evaluated in determining and then subsequently confirming the need for the pipeline are discussed in Section 2.2.

4.3.3 Feasibility studies and consideration of design/routing alternatives

The project concept as described in Section 4.2 represents the culmination of an ongoing process of field investigations, design and environmental assessment over a period of five years. Feasibility studies and preliminary environmental assessment of the proposed pipeline commenced in 1997. These studies included an assessment of various design alternatives, which are described Sections 2.3 and 2.4.

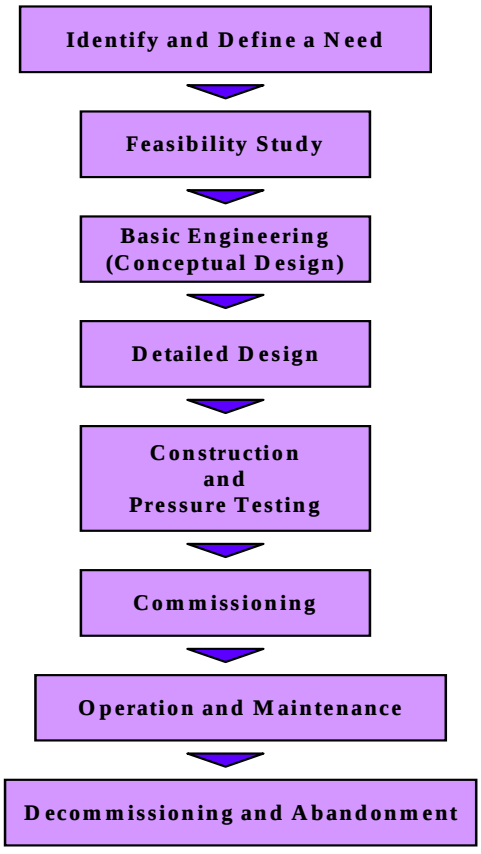


Figure 4.2 Project Sequence for BTC Pipeline

4.3.4 Basic engineering and environmental scoping

Basic Engineering in Year 2000-2001 yielded a conceptual design of the proposed pipeline together with development of terrain protection and reinstatement techniques and seismic design criteria. Concurrent environmental baseline surveys, risk assessment and environmental scoping contributed to the process of narrowing the pipeline route corridor from the 10km wide Corridor of Interest to a 500m wide Preferred Route Corridor and to a selection of the preferred site for the BTC Marine Terminal.

4.3.5 Detailed engineering, public consultation and EIA

Detailed Engineering commenced in June 2001 concurrently with the appointment of the international Environmental Impact Assessment consultants and the production of this EIA Report. This EIA work built on the scoping studies and environmental work undertaken in Basic Engineering. The 500m wide Preferred Route Corridor was walked by engineers, geotechnical scientists and environmental specialists. Detailed terrain evaluation studies, seismic investigations and ecological surveys (supported by extensive public consultation) has informed the development of the route alignment and pipeline design and enabled the preferred route corridor to be narrowed to a Specified Route Corridor of 100m width. This was followed by definition of a Construction Corridor comprising a standard working width of 28m, modified to reduced working width of 22m or an extended working width of 35m where terrain or other features demand.

This process has added significant rigour to the BTC Pipeline proposals, thereby enabling the proposals to be subjected to a comprehensive environmental and social assessment. As outlined in Section 3, close interaction between the EIA team and the engineering contractors has enabled environmental considerations and stakeholder concerns to influence not only route alignment, but also the location of AGIs (pump stations, the pressure reducing station and block valve stations), development of restoration and reinstatement measures and other mitigation.

4.3.6 Project schedule and remaining stages of project development

Land acquisition will commence in Autumn 2002. Pre-construction mobilisation will commence in October 2002 with groundbreaking commencing in late December 2002. The pipeline construction period in Turkey is scheduled to last for 22 months. Commissioning is scheduled to commence in October 2004 with normal operation scheduled to commence in February 2005. The schedule for sequencing of remaining project activities is presented in Figure 4.3.

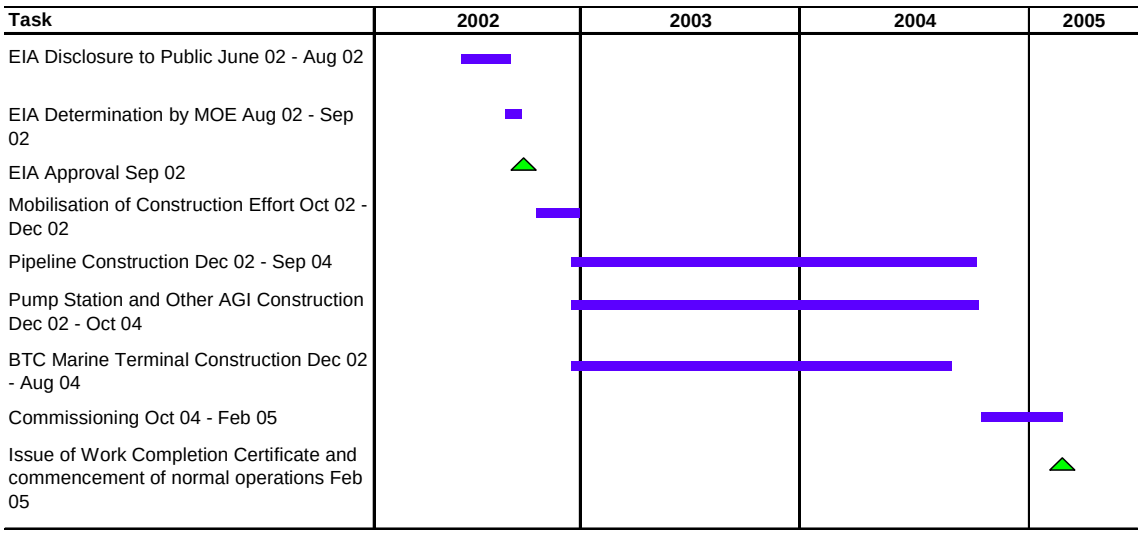


Figure 4.3 Schedule to Project Completion

It is anticipated that the BTC Pipeline and its associated facilities will have a lifetime of approximately forty years and that they will be decommissioned thereafter in accordance with international standards in place at that time (see Section 4.13 below).

4.4 INTERACTION WITH OTHER PIPELINES

4.4.1 Interaction with the East Anatolian Natural Gas Pipeline (NGP)

The East Anatolian Natural Gas Pipeline (NGP) was commissioned in 2001 and transports natural gas from Iran to Turkey. In Turkey, the proposed BTC Pipeline will run parallel to this existing line for about 40% of its length, between the cities of Erzurum and Sivas (see Figure 4.4). Parallel routing of the two pipelines will have two potential advantages:

- There will be a requirement for only a single right of way (RoW) and both pipelines will be able to share common maintenance access routes for the stretches where they are in proximity to each other.

- The proximity of a reliable source of natural gas will enable all BTC Pipeline pump stations to utilise clean burning natural gas supplied via a branch from the gas trunk lines rather than having to utilise crude oil to fuel the reciprocating engines that drive the pumps. In this regard, BTC Pump Stations PT2/3/4 will each be fuelled with gas from the NGP (see also Section 4.4.2 below).

There are two potential concerns related to the proximity of the NGP to the proposed BTC Pipeline.

- There are potential safety implications associated with a gas pipeline laid in close proximity to the proposed BTC Pipeline, particularly during construction of the BTC line. In this regard a separation distance of 12-18m will be maintained between the two lines. (This is discussed in detail in Section 2.3.9.)

- Stretches of the existing gas pipeline have not been adequately reinstated and this requires further attention. Those areas of the NGP corridor that are outside of the proposed BTC working width, that were damaged by the gas pipeline construction

activities and would constitute a threat to the BTC line, will be reinstated in advance of BTC Pipeline construction. The BTC Contractors will reinstate the BTC working width to the best condition practicable under these circumstances. Implementation of this reinstatement strategy is discussed in detail in the Reinstatement Plan (RP), see Appendix C2.

4.4.2 Interaction with South Caucasus Natural Gas Pipeline (SCP)

It is anticipated that the proposed South Caucasus Pipeline (SCP) will transport natural gas from the Shah Deniz fields in Azerbaijan, via Georgia, to Turkey. It will be routed parallel to the BTC Pipeline through much of Azerbaijan and Georgia and the two proposed pipelines will cross the Georgia/Turkey border approximately 30m apart. The two pipelines will diverge and will then run at a distance of 20km apart for some distance before diverging further (see Figure 4.4).

The proposed SCP is currently planned to be operational in 2005, possibly some months after commissioning of the BTC Pipeline. It is planned for natural gas from the SCP line to be routed via a branch line to BTC Pump Station PT1 to fuel the engine drivers for the pump station. In the event that the SCP is not operational until after the BTC Pipeline, the PT1 engines will be fuelled by gas from the NGP. The potential environmental impacts associated with such a temporary situation have been fully evaluated in this EIA and are discussed in Section 7.

4.5 PIPELINE DESIGN BASIS

The Host Government Agreement (HGA) requires that the Project conform to *'relevant international standards as well as the standards and practices generally prevailing in the international petroleum pipeline industry for comparable projects'.*

4.5.1 Design codes

The HGA contains a **Code of Practice** that sets out the principles, standards and practices applicable to the design, construction and operation of the pipeline and the associated facilities that comprise the BTC Project. The Code of Practice requires that the BTC Pipeline will be designed, fabricated, constructed, tested and commissioned in accordance with the requirements of the American Society of Mechanical Engineers (ASME), namely ASME B31.4 (1998 Edition)[(1)]. A wide range of other international codes and standards are also identified and these have been applied, where appropriate, to specific elements of the Project design.

4.5.2 Design life

The proposed BTC Pipeline has a 40-year design life. Whilst the pump stations, metering stations and other AGIs will be designed for an initial 30-year design life, enhanced maintenance measures will be applied if required to maximise the potential for all facilities to be operable for an extended lifetime should this be required.

[1] The American Society of Mechanical Engineers (ASME) issues engineering codes and standards. These codes have wide application throughout the world and are generally regarded to reflect international best practice. ASME B31.4 (1998 Edition) is the latest revision of the code for Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.

Figure 4.4 Overview of BTC, East Anatolian NGP and Shah Deniz (SCP) Pipeline Routes

4.5.3 Design safety factors

In the context of engineering design, the term 'Safety Factor' is a multiplier that is used to ensure that the maximum design load or capacity is maintained below the maximum value that could be sustained by a pipeline system component or structure without failure. Safety factors are used, therefore, to ensure that design proceeds in a manner incorporating a significant margin of safety.

In accordance with normal engineering practice, and the requirements of the engineering standards adopted for the Project, safety factors have been incorporated in each element of the engineering design for the BTC Pipeline. A 0.72 design factor will be applied to the majority of the pipeline route; this equates to a design that will accommodate 1.39 times the maximum expected load.

Where required by the applicable design standards, or considered appropriate by the engineering team, additional safety factors have been incorporated into the design to reflect key environmental sensitivities. As a result, a more conservative 0.6 design factor (accommodating 1.67 times the maximum expected load) has been applied for BTC Pipeline sections close to:

- areas of geotechnical (potential subsidence or settling) and seismic (potential earthquake and landslip) sensitivity;
- road, rail and river crossings;
- areas of particularly high groundwater sensitivity (such as shallow aquifers and larger rivers).

The use of a more conservative design factor in such areas has typically led to the provision of thicker walled linepipe than would be required if based only on anticipated hydraulic pressures and construction considerations at these locations.

4.5.4 Design pressures and temperatures

The design pressure (also referred to as the Maximum Allowable Working Pressure, MAWP) of the BTC Pipeline system within Turkey will be 100 barg, with a maximum operating pressure of approximately 94 barg as determined by hydraulic considerations. As with the use of safety factors in the design process, the adoption of a design pressure higher than the maximum operating pressure reflects a conservative approach to the design of the BTC Pipeline system. Pressure control systems, backed up by pressure relief facilities located at each of the pump stations, the pressure reduction station and the BTC Marine Terminal, will ensure that the pressure in the BTC Pipeline system does not exceed the maximum allowable pressure under all operating conditions, including surge.

The BTC Pipeline has been designed for an external temperature range for the buried line of minus 10^{o}C to plus 50^{o}C. The anticipated external temperature of the buried pipeline will be within this range even under the most extreme climate and operating conditions.

4.5.5 Crude oil characteristics

It is anticipated that ACG crude will constitute a significant proportion of the material transported during the lifetime of the BTC Pipeline. The key physical characteristics of ACG crude oil are listed in Table 4.1.

Table 4.1 Specifications of ACG Crude

PARAMETER	VALUE
Water and sediment	0.5 % vol max
Water content	0.3 % vol max
Density at 15ºC	852 kg m^{-3} (API deg 34.5)
Reid Vapour Pressure	69 kPa
Pour point	-6 ºC
Wax Appearance Temperature	37.7 ºC
Gross heating value at 15ºC	44,800 kJ kg^{-1}
Net heating value at 15ºC	42,020 kJ kg^{-1}
Wax content	4-10 wt%
Inlet temperature	30º-40ºC
H_2S	<10ppm wt
Sulphur	1480 mg kg^{-1}

Hydraulic modelling carried out during the design process has primarily been based on these physical properties and on variations of these physical properties.

The crude characteristics listed in Table 4.1 indicate that much of the pipeline will be operating at a temperature, which is below the wax appearance temperature, ie the temperature at which waxes within the crude start to solidify and form lumps within the crude. The BTC Pipeline has specifically been designed with facilities to cater for this phenomenon (see Section 4.7.7).

Provision has been made for the transport of regional crudes and condensates other than an ACG crude. The physical and chemical characteristics of differing crude oil and condensate blends could vary slightly from those of pure ACG crude. The degree of divergence will be dependent on the characteristics of each blended material and the proportions in which they are blended. The BTC Pipeline has been designed to operate reliably and safely when transporting material with physical characteristics diverging from those of the design crude specified in Table 4.1 above.

4.5.6 BTC Pipeline capacity

The anticipated crude oil production profile of the ACG fields during the first three years of the Pipeline's operation is such that the volume of ACG crude requiring transportation via the BTC Pipeline will be lower than this design capacity. This is illustrated in Figure 4.5, which shows that the volume of ACG crude available will reach BTC Pipeline design capacity of 1000mbd in 2008. The pipeline is designed for a minimum flow rate of 100mbd. However, as noted earlier, it is anticipated that the BTC Pipeline will also transfer other crudes and

condensates from the region. Figure 4.5 indicates the minimum projected throughput during the first three years of pipeline operation.

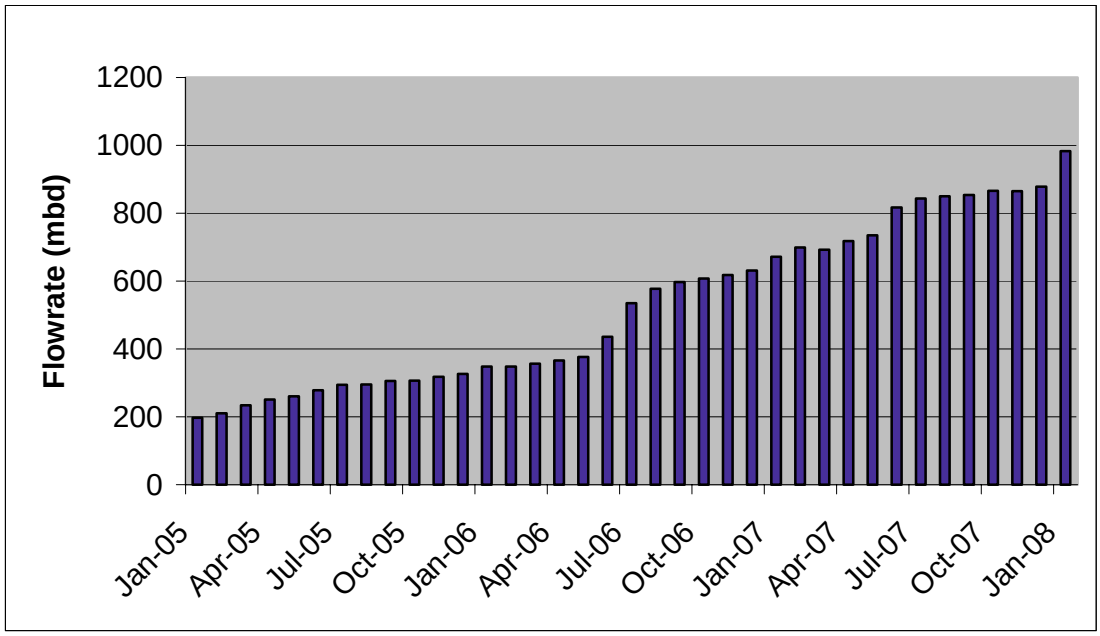


Figure 4.5 Projected Flow Profiles of ACG Crude

4.5.7 Hydraulic design

The engineering design team has conducted a detailed analysis of the hydraulic conditions that will be encountered along the BTC Pipeline, under various flow regimes and design assumptions. This analysis has been used to determine the most appropriate spacing of pump stations (Section 4.7.3) and the determination of pipe diameters (Section 4.5.8).

In order to accommodate the full 50 million tpa flow capacity at a operating pressure of not more than 94 barg, it has been determined that four pump stations will be required along the Turkish section of the pipeline.

On the basis of flow capacity, hydraulic modelling and design pressures, the pipeline diameters of 46, 42 and 34 inches have been adopted for the Turkish section as discussed in Section 4.5.8.

4.5.8 Pipeline length and diameter

The total length of the Turkish section of the proposed BTC Pipeline will be approximately 1,076km. The diameter of the pipeline, which is determined by hydraulic considerations, will vary along this length as follows:

- the initial section of the pipeline, comprising a length of approximately 22km from the Georgia-Turkey border to the first pumping station PT1, will comprise 46 inch (1,150mm) nominal diameter pipe;

- the intermediate section of the pipeline, comprising a length of approximately 924km from PT1 to the pressure reduction station IPT1, will comprise 42 inch (1,050mm) nominal diameter pipe;

- the final section, comprising a length of approximately 130km from IPT1 (where the pressure in the pipeline is reduced) to the BTC Marine Terminal, will comprise 34 inch (850mm) nominal diameter pipe.

4.5.9 BTC Pipeline material and wall thickness

The majority of the Turkish section of the pipeline route will be formed of continuously welded high-grade API 5L Grade X65 carbon steel. Other material grades may be selected for parts of the route where special conditions, such as fault crossings, exist. In such cases, a material grade exhibiting greater flexibility may be selected to enable the pipeline to better withstand seismic events.

The wall thickness of the pipe is determined by operating pressure considerations while applying the specified 0.72 design factor. In areas of particular environmental risk, where an increased safety factor applies (see Section 4.5.3), the wall thickness will be increased accordingly. For the 34 inch diameter pipe, the wall thickness will range from 8.74mm to 17.48mm, for the 42 inch diameter pipe it will range from 10.31mm to 20.62mm and for the 46-inch diameter pipe it will vary from 11.91mm to 20.62mm.

4.5.10 Corrosion protection

Even though the pipeline will be constructed of high quality steel, if unprotected, it would corrode over time, principally as a result of electrical currents that are naturally induced from contact of the metal pipe with the surrounding soil; such induced currents result in metal loss from the pipe, ie corrosion. Biological and chemical activity in the material surrounding the pipeline can also contribute to corrosion.

A high integrity three-layer polyethylene coating will be applied to the external surface of the pipe at the manufacturer's premises, prior to delivery to the laydown yards. This coating will insulate the metal exterior surface of the pipeline from the surrounding soil, thereby reducing the potential for induced current corrosion and biological and chemical attack on the pipeline. During pipeline construction, an additional coating will be applied to the pipe joints after welding. This field joint coating will be carried out at the location of the pipeline installation. The entire coating of the pipe and the welds will be checked by non-destructive testing (NDT) to ensure integrity before the pipe is laid into the trench. Mechanised Ultrasonic Testing, which provides instantaneous results, is the preferred method.

Additional protection against corrosion of the buried pipeline will be provided by a cathodic protection system, which will comprise an impressed current system with sacrificial anode ground beds.

The internal condition of the pipeline will be regularly monitored (see Section 4.6.7) and will be subject to ongoing maintenance (see Section 4.12) to minimise the potential for corrosion.

4.5.11 Pipeline cover and stabilisation

The pipeline will normally be buried to a depth of at least 1m. The minimum cover, such as in areas of rocky terrain will be 0.8m. Increased depth of cover (to an appropriate depth) will be considered in areas of agricultural land where deep ploughing is undertaken. Where the pipeline traverses areas with sensitive groundwater aquifers the depth of cover will be increased to 1.2m. The depth of cover will be increased to 1.5m at railway and main road crossings.

At river crossings the potential exists for erosion of the river banks or scouring of the river bed to expose the buried pipeline. Scour or erosion in a river channel can be the result of bed degradation, a confluence, a construction, a bend or the presence of a structure that presents a barrier to flow.

For the BTC Pipeline, the depth of burial at river crossings will be 1.5m below the calculated scour depth, based on a design flood return period of 100 years (ie a 1 in 100 year flood event). The minimum scour depth is set at 0.5m, implying a minimum pipeline burial depth at river crossings of 2m.

Calculation of scour depth requires knowledge of key hydraulic characteristics of the river stream or creek concerned, such as water depth, hydraulics rapids, energy scope etc. These parameters are determined by field surveys. Two approaches adopted for the calculation of the scour depth for rivers, streams and creeks crossed by the BTC Pipeline are:

- where sufficient field survey has been undertaken (and all watercourses where changes in the channel has been preserved), the watercourse has been hydraulically modelled utilising the internationally recognised HEC-Ras River Analysis System Version 2.2 (1998) software package of the Hydraulic Engineering Centre of the US Army Corps of Engineers;

- where insufficient field survey has been available to develop a hydraulic model or where field observations have indicated that no major changes in the channel occur, a cross-sectional analysis approach utilising Mannings Equation has been adopted.

In areas of shallow groundwater and at river crossings the pipeline will be concrete coated prior to burial to provide stabilisation by ensuring negative buoyancy, thereby combating the tendency for the pipeline to float.

Erosion and Scour Protection measures will be installed, where necessary, to protect river banks, river channel walls and river beds at river crossings.

- Protection of river banks from erosion will be achieved via application of vegetative cover (re-vegetation), gabion[(1)] mattresses and gabion boxes, riprap[(2)], or concrete walls. The choice among these alternatives will depend on site-specific requirements and availability of the materials.

- For channel slopes and bottoms where the shear stress (tractive forces) created by the river flow on the channel surfaces is greater than the shear stress resistance of the

[(1)] Gabions are permeable blocks comprising graded rocks and stones caged within wire netting. They are used to underpin steep slopes to provide structural slope stability and to facilitate erosion control. They can be shaped as blocks or blankets.
[(2)] Riprap is a blanket of graded rock (not caged) which is placed on stream bank surfaces to provide structural slope protection and erosion control

channel material, then riprap and gabion mattresses/boxes will be installed to achieve erosion/scour protection.

4.5.12 Special crossings design

4.5.12.1 Design of special river crossings

Of the rivers which require crossing, the following five rivers have been identified as requiring special attention by virtue of their characterisations as meandering rivers or rivers with a tendency to become braided or to change their course (lateral migration):

- Hasankale River;
- Karasu River;
- Aksu River;
- Zamanti River;
- Ceyhan River.

The measures outlined in Section 4.5.11 for pipeline covers and protection of river crossings have been enhanced for these five special river crossings. In particular, the hydraulic model described above was applied based on a design flood return period of 200 years (1 in 200 year flood event). The results showed that the design as calculated for 1 in 100 year was satisfactory and the integrity of the crossing was not threatened.

For these five river crossings, the calculated burial depth (1.5m below calculated scour depth) will be maintained for the entire crossing width (including the associated flood plain), in anticipation of the river changing course during the design life of the Project (40 years). The case study attached outlines a number of the erosion and scour design considerations associated with the Ceyhan River crossing.

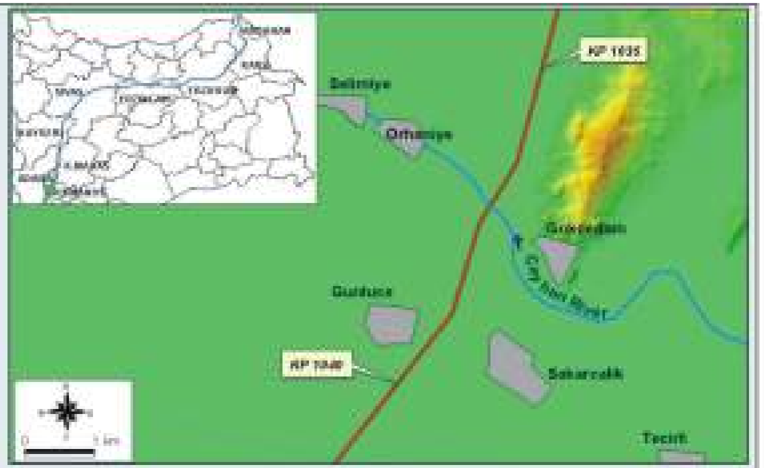
In addition to the engineering challenges encountered during the planning and design of river crossings, a number of environmental considerations were brought to bear during the design process. The attached Kura River case study provides an illustration of the range of ecological issues that have been resolved through the integration of environmental considerations into the design, planning or programming of the river crossing works.

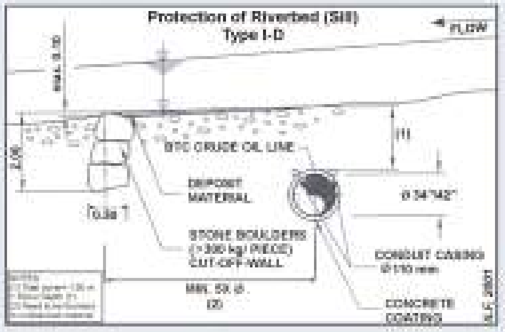
CEYHAN RIVER CROSSING DESIGN

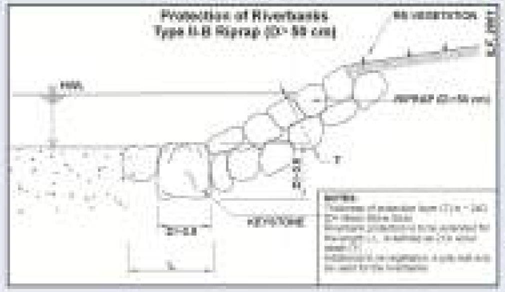
Calculations were carried out using a design flood return period of 100 years. The design criteria to be used for protection against scour must comply with the General Directorate of State Hydraulic Works (DSI) standard requirements. These calculations took a number of variables into account, such as water depth, hydraulic radius, energy slope, etc.

There are a number of factors that can influence scour in a river channel, including bed degradation, a confluence, a constriction, a bend or the existence of a structure like bridge piers, abutments, groynes and sills.

Crossing of rivers, canals, streams and dry creeks will be undertaken in such a way so as to ensure the integrity of the pipeline under all conditions of the water flow and to minimise river bed erosion. The disturbed portion of the riverbed will be returned to pre-construction contours where possible and the backfill over the pipe will be at least as scour-resistant as the original bed material. The minimum depth of cover of the pipeline will be 1.5m below the calculated scour depth throughout the entire flood area of the river. Riverbanks will also be restored to their original condition and contours.







Ceyhan River is a meandering channel with a trapezoidal cross-section and mid-channel bars. The width of the river crossing is 130 m and the bed material consists of sand and gravel. Existing width and bed controls comprise boulders installed beneath the road bridge situated approximately 250 m upstream of the BTC pipeline crossing point.

Calculations carried out to determine the scour protection in Ceyhan River, indicated a potential scour depth of 1 m and therefore the pipe will need to be buried to a minimum depth of 2.5 m to the top of the pipe across the flood plain.

Erosion control devices will be installed and maintained until revegetation is sufficiently established. The riverbanks and riverbeds will be protected with rip rap based on a 100 year flood event. Rip rap is a blanket of graded rock which is placed on river bank surfaces to provide structural slope protection and erosion control. The length of protection assumed for major river crossings, such as the Ceyhan River, is 50m and the thickness for such rivers is estimated as 0.7m.

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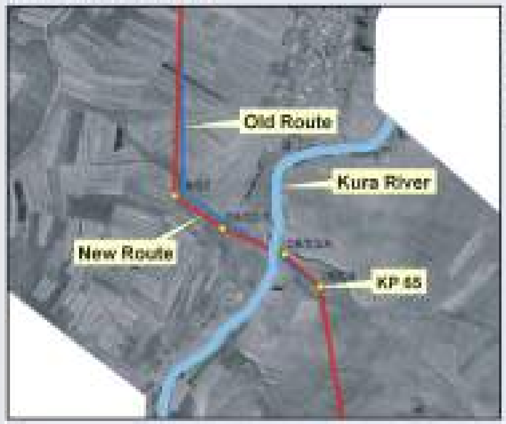
KURA RIVER CROSSING

The **Kura River** flows through a part of Turkey that is influenced both by the humid Euro-Siberian and the more arid Irano-Turanian phytogeographic regions. The humid maritime influence pervades inland along the Kura River, adding to the complexity.

There are two fish species breeding in the Kura River that are listed on the IUCN (International Union for Conservation of Nature) 2000 Red List. These are the Common Carp (*Cyprinus carpio*), which is listed as Data Deficient, and the Italian Barbell (*Barbus plebejus*), listed as Lower Risk-Near Threatened. In the Kura River, the Common Carp breeds between April and June and the Italian Barbell breeds between May and July. Both have a high commercial value. The Black Sea Salmon (*Salmo trutta labrax*) is also known to breed in the Kura River between December and February, although this species is not commercially valued.

In addition, the globally-threatened Meadow Viper (*Vipera ursinii*) has been recorded along the pipeline route near the crossing point of the **Kura River**.



The current water quality of the Kura River is poor. This has been confirmed by the water quality survey which identified elevated levels of nitrate and phosphate indicating that **Kura River** receives external discharges from nearby settlements.

MEADOW VIPER

ITALIAN BARBEL

COMMON CARP

Seasonality: Avoid crossing **Kura River** during the most sensitive period for fish breeding from April to July.

Water Quality: In relation to the potential for possible transboundary impacts, the water quality of the river will be closely monitored prior to and during the pipeline crossing construction activities.

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4.5.12.2 Design of fault crossings

An extensive fault investigation programme has been undertaken during detailed engineering.

Considerable attention has been devoted to characterising the geohazards encountered along the route; see Sections 2.3 and 6.2. While ecological, archaeological and socio-economic issues identified in the EIA have strongly influenced routing, consideration of geohazards has been one of the principal drivers. Landslides, karstic zones, areas of liquefaction and lateral spreading and faults have all been subject of intensive investigation. The design approach to karstic areas is illustrated in the attached case study on the Imranli Karstic Area. These investigations have encompassed interpretation of aerial photographs, field mapping, trenching and geophysical programmes.

Since there are 42 fault zones confirmed along the route, routing for fault avoidance is clearly not a feasible option. Focus during the Detailed Engineering phase has been directed on detailed delineation and characterisation of fault locations and their displacements. Of the 42 fault zones identified along the route, five are confirmed as Holocene active. The active fault structures are:

- Erzurum fault segments (confirmed);
- North Anatolian fault (confirmed);
- Deliler fault (confirmed);
- Cokak fault zone (confirmed);
- Kiziloluk fault (confirmed).

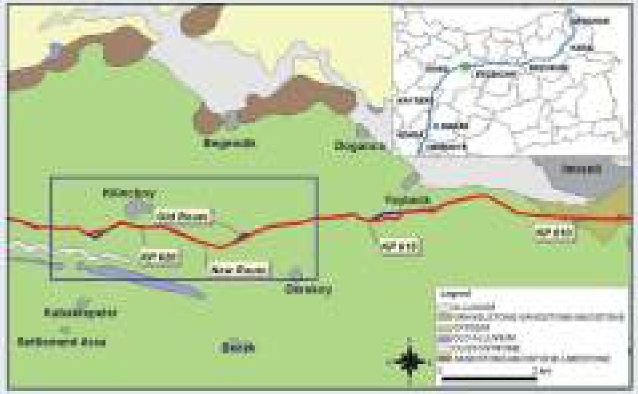
Each of these five active fault zones has been thoroughly assessed in order to locate the fault traces with reasonable precision and to establish the fault displacement parameters. The estimates of fault displacement have been derived from two sources:

- the empirical relationship between fault length, earthquake magnitude and displacement developed from a catalogue of more than 400 historical earthquakes worldwide;
- observations from trenches excavated across the faults.

Some of the faults are narrow features with only a few individual splays occurring across a zone of more than 10m. However, the Erzurum, North Anatolian and Cokak faults are complex structures with multiple fault splays. The latter two of these structures have fault splays distributed across zones that are up to 700m wide and include differing styles of deformation. Each of the active fault splays, may be characterised by multiple fault planes which will each accommodate displacement during an earthquake event.

The pipeline fault crossings have been designed to accommodate the large relative movements brought about by axial straining of the ductile steel pipe. This has required insight into pipeline behaviour for various crossing configurations, local soil restraints effects and detailed appreciation of fault displacements. In this regard, once design displacement have been determined for each fault crossing, a preliminary crossing alignment has been developed and this has been subjected to iterative non-linear finite element analysis (FEA) to assess the strain condition of the buried pipeline based on site-specific soil restraint parameters. Where an unacceptable pipeline strain condition was calculated, changes were made to the proposed pipeline alignment, soil restraint (see below) or pipeline wall thickness and the analysis repeated until an acceptable strain condition was determined.

IMRANLI KARSTIC AREA



The **Imranli Karstic Area** ranges from KP598+500 to KP590+612. Independent specialists, who have undertaken investigations of the pipeline route throughout the karst sections, have subdivided the karst regions into the following 5 karst models:

Model 1-Karst Margin. This comprises the marginal zone at the edge of the karst area and is always one of the most active for karst processes. No active sinkholes or foot caves have been observed in the vicinity of the pipeline route. In other areas of the Sivas Gypsum Karst, south of the pipeline route, these features can be observed at low cliffs adjacent to ephemeral lakes.

Model 2-Polygonal Doline Karst. The polygonal karst is a mature landscape where the entire surface is occupied by dissolutional dolines between a polygonal network of interfluves. Most dolines are less than 100m across and it appears that they have evolved through slow dissolution by rainwater.

Model 3-Old Polygonal Doline Karst. Here, much of the surface is occupied by dissolutional dolines separated by interfluve ridges, which have coalesced into larger features. Most dolines are greater than 100 m across, and base is close to the water table.

Model 4-Merokarst. Merokarst or 'halfkarst' comprises an evaporite sequence of gypsum interbedded with mudrocks. The model has a thick drape of soil, and karst features manifest in the form of wide shallow features.

Model 5-Mantled Karst. This model includes areas where a thick mantle of soil covers the gypsum. The mantle may be pitted by small subsidence and dropout sinkholes, but may also not have any noticeable karstic features.

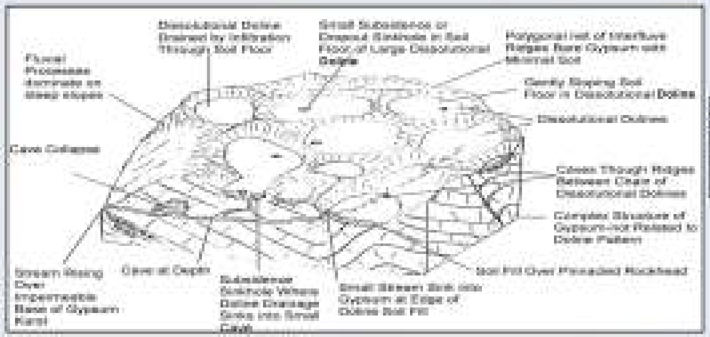
GENERAL VIEW OF THE KARSTIC AREA (MODEL 2)

The current route occupies an existing pipeline corridor.

Investigations carried out to determine a safe route through the karst area east of Sivas, comprised geophysical surveys including Ground Penetrating Radar (GPR) and Electrical Resistivity. Due to the clay content of the subsurface, electrical resistivity proved to be the most reliable method of investigation and consequently, potential void locations were identified. These areas have been drilled to verify the geophysical results and the probability of ground failure was also assessed.

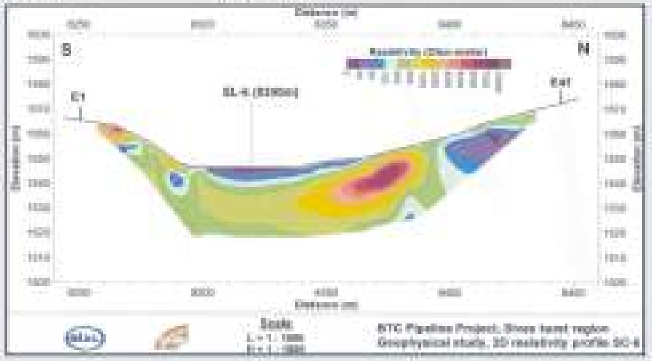
Some minor route changes have been made and these will be subject to further investigation.

Engineering design to mitigate against a collapse event has included increasing the pipe wall thickness.



Model 2 Polygonal Doline Karst

Potentially including some aspects of Model 3 karst.



In this section, a high resistivity zone with max. value of 10000 ohm-m was detected approximately 8 to 20 m below the ground surfaces. This could be interpreted as a karstic void.

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The design approach that has been adopted for the BTC Pipeline is such that the pipeline will cross faults using straight, constant slope segments, running approximately 200m – 300m on either side of the fault. The pipeline trench will be trapezoidal-shaped and will be packed with loose to medium granular cohesion-less backfill and minimum soil cover. At the point of crossing the fault, the pipeline alignment will be such that the crossing angle will promote tension in the pipeline in the event of sensitive displacement. Figure 4.6 illustrates a typical trench for fault crossing. The case study attached below outlines a number of issues associated with the Erzurum fault zone.

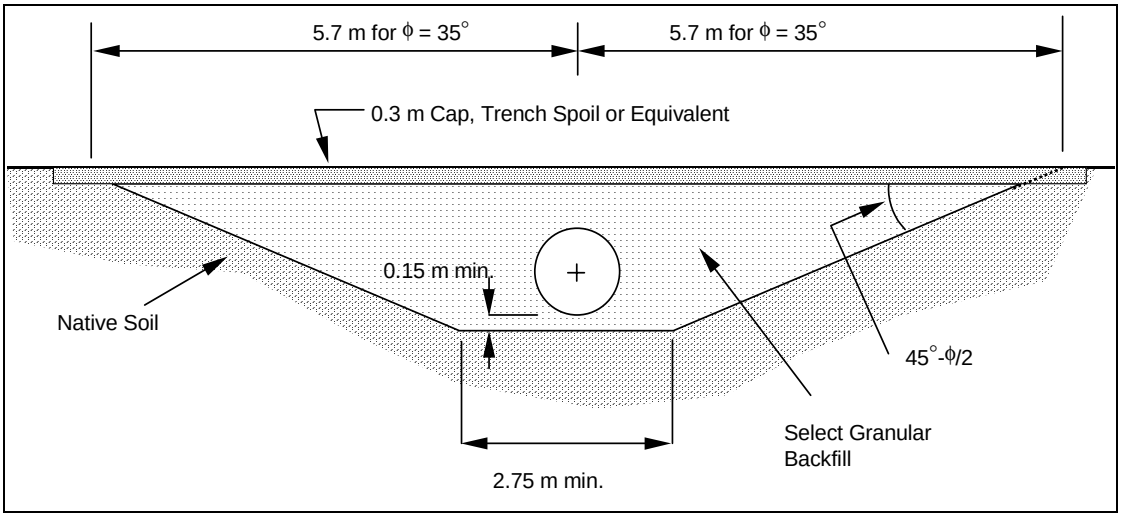

Figure 4.6 Illustrates a typical trench for a fault crossing.


ERZURUM FAULT ZONE
The Erzurum Fault Zone extends between Tortum and south of the Erzurum basin. The geology at the crossing comprises volcanic and volcano-sedimentary rocks of Miocene-Pliocene age with Holocene sediments exposed along the eastern segments. The fault is classed as a major fault () i.e. a fault with the potential for producing large earthquakes with approximate displacements of centimetres to metres). Within this fault zone, the eastern and middle segments comprise two active fault splays, whilst the western segment remains inactive. The eastern splay is further divided into three segments that occur across a zone approximately 150 m wide. The pipeline route crosses both the eastern and middle segments of the fault zone.
Erzurum Fault Zone (Eastern Segment)
Erzurum Fault Zone (Western Segment)
New Route
Old Route
KP 232
KP 230
KP 235
KP 240
Erzurum Fault Zone Crossing
Western Segment Trench
Tuff
Gravel
Block
The construction of the fault crossing will be supervised by an experienced geologist during the pipeline construction activities in order to confirm the location, width and style of deformation of the fault at the crossing point. The geologist will recommend modifications to the pipeline trench excavation during construction, if observations indicate a difference in the width of the fault zone other than that predicted.
Trench 1 was excavated perpendicularly to the fault on the Eastern segment with an E-W orientation. The total length of the trench was 40 m and the depth was about 2 m. 8 m of trench, which also contains the fault, was logged. The stratigraphic units of the trench were observed as shown in the cross section and the stratigraphy of the trench walls is symmetrical. Flower structure geometry developed in connection with the fault zone strike-slip deformation is exposed on the trench walls. The width of the fault zone in the exposed horizons is 1 m.
In respect of the data from Trench 1 pure strike-slip displacement occured during both of the earthquakes and a total vertical separation of 0.96 m took place on the western block through the displacement. The tectono-stratigraphic structure indicated that the deformation pattern is similar in both of the earthquakes and therefore their magnitudes must be similar.
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4.6 DESCRIPTION OF THE PIPELINE

4.6.1 Pipeline location identification

Sub-surface warning tape will mark the position of the pipeline along its entire route. Low level marker posts will be provided at all station sites, cathodic protection test stations, road, track, rail and water crossings, AGI facility fences, and any other locations deemed necessary to provide identification of the pipeline route and to aid surveillance. Where appropriate, markers will be within line-of-sight of adjacent markers. All marker posts will be provided with identification plates that will include telephone contact numbers for members of the public to use to contact BOTAS in the event of a pipeline incident.

Aerial markers will be installed at intervals of up to 5km along the route to assist in aerial surveillance of the route (see Section 4.6.6).

4.6.2 Leak Detection System (LDS)

The Turnkey Agreement between BTC Co and BOTAŞ (see Appendix D) states that the BTC Project components are to constitute a "*highly reliable and operationally efficient*" system and are required to include a leak detection system capable of "*identifying and shutting down the pipeline system within several minutes of a major leak occurring anywhere on the pipeline system*".

A leak detection system (LDS) will be installed. It will be designed in accordance with the requirements of API 1130 Computational Pipeline Monitoring (Oct 1995) and API 1155 Evaluation Methodology for Software Based Leak Detection Systems.

The system will operate by comparing various combinations of actual profiles of flow, pressure, temperature and density with modelled profiles of the same parameters. Excessive differences between the real-time measurements and the modelled profiles indicate possible leakage. The time taken to detect a leak will therefore be dependent on the size of the leak and the accuracy of the measurement instrumentation.

Several independent leak detection algorithms will be developed to add reliability to the system. These leak detection algorithms will be designed with the aim of identifying any leaks in excess of 1.0% of BTC full pipeline flow rate in the shortest possible time. The system may also be able to identify smaller leaks over a longer period of time.

The system will be capable of identifying the approximate location of the leak and the pipeline section containing the leak will be isolated via automatic activation (closing) of the nearest block valves on either side of the leak.

The LDS will be designed to be effective over the range of flow rates for which the pipeline system is designed to operate. It will also cater for foreseeable abnormal incidents such as pump trips, pig launching, block valve partial stroke testing and any internal wax deposition removal.

The LDS will tie-in to the Supervisory Control and Data Acquisition (SCADA) communication system (see below), facilitating remote control from the Sangachal

(Azerbaijan) terminal control room with full back-up control available from the control centre located at the BTC Marine Terminal at Ceyhan.

4.6.3 Supervisory Control and Data Acquisition (SCADA) System

The basis of the control philosophy for the entire BTC Pipeline system is the Supervisory Control and Data Acquisition (SCADA) system. The pipeline will be supervised and controlled from the manned control room located at the Sangachal (Azerbaijan) terminal. Full backup facilities will be available at the manned control room located at the BTC Marine Terminal (at Ceyhan). Local monitoring and local control will also be available at the manned pump stations along the pipeline route.

4.6.4 Telecommunications systems

The BTC Pipeline will have a dedicated telecommunications system based on a Fibre Optic Cable (FOC) placed within a high-density polyethylene (HDPE) conduit that will run alongside the buried pipeline in the same trench. The FOC will be fully backed up via a satellite communications links system. The FOC will also provide voice and facsimile communication between the Sangachal and Ceyhan terminals and at each of the AGIs along the route.

4.6.5 Emergency Shutdown (ESD) System

The objective of the BTC Pipeline Emergency Shutdown System (ESD) will be to avoid any harm resulting from hazardous situations and to reduce the consequences of such an event on the pipeline or surrounding environment. To fulfil this requirement, the extended functionality of the ESD System will incorporate the following basic attributes:

- monitoring the correct functioning of the SCADA system, Unit Control System (UCS) and Station Control System (SCS) in conjunction with safety relevant key parameters;
- control and monitoring function for safety relevant station equipment units which are without integrated failsafe controllers;
- emergency shutdown function.

In order to monitor the correct operation of the SCADA System, SCS, UCS and equipment without integrated control units, the ESD System will collect safety relevant parameters independently of these systems and will come into action in case of:

- detection of illogical status of station equipment;
- process parameters have reached defined limit values; or
- a manual trip by push button has occurred.

To prevent serious damage to the pipeline facilities, the ESD System will block dangerous actions and shut down station equipment or the relevant section(s) of the station, safely. If the malfunction also affects other local stations of the entire pipeline system (including Azerbaijan and Georgia Sections) then an ESD System with an overall view to the entire pipeline and BTC Terminal will come into operation to cater for this situation.

To provide this function it has been necessary to realise an ESD system with a hierarchical structure of at least two levels:

- overall ESD System;
- station-specific ESD System.

The installation of appropriate transmission facilities with redundant and independent communication lines ensures a safe transmission of information between the individual ESD systems at the station sites and the overall ESD system at the terminal control centres.

4.6.6 Pipeline surveillance

A suite of precautionary measures will be implemented to reduce the risk of damage to the pipeline either from natural causes or from third party interference. An environmental risk assessment has been undertaken to identify potential risks to the pipeline as well as risks posed by the pipeline to the environment (see Section 8). The results of this assessment have directly informed the selection of mitigation measures which have then been incorporated into the design of the pipeline. Such measures have included specification of the LDS and ESD and the selection of block valve locations (Sections 2 and 6 respectively).

These pipeline integrity measures notwithstanding, BOTAŞ will implement a comprehensive surveillance programme over the lifetime of the BTC Pipeline. The surveillance programme will monitor the entire BTC Pipeline length, however particular attention will be paid to the following potential sensitive features along the route:

- river, rail and road crossings;
- stretches where the pipeline crosses over sensitive aquifers;
- protected areas;
- AGIs (comprising pump stations, pressure reducing station and block valve stations);
- stretches of the pipeline in proximity to settlements and villages.

Closed Circuit Television (CCTV) and intruder alarm systems will be provided at the pump stations and pressure reduction station and will tie-in to the SCADA system to facilitate remote monitoring of these locations.

The entire pipeline route will be ‘walked’ periodically and sensitive portions will be patrolled more regularly to ensure that no unauthorised activities are taking place that could damage or otherwise encroach upon the pipeline’s use or access.

Land agents will maintain regular contact with occupiers of land traversed by the pipeline RoW. Change of land ownership or land use along the pipeline corridor will be monitored.

4.6.7 Pipeline condition monitoring

The integrity of the pipeline will be monitored periodically using an intelligent pig (see Section 4.7.6). The intelligent pig is a device that is conveyed within the pipeline between pig launcher/receiver stations via the motive power of the pipeline fluid. As the intelligent pig is thrust along inside the pipeline, a strong magnetic field is applied to the pipeline wall by two poles located on the intelligent pig and a sensor also located on the pig then detects any changes in the induced magnetic field in the pipeline wall. For a uniform pipe, the sensor

would detect only a uniform response, but at sites where metal loss occurs, the sensor detects a leakage in magnetic flux and this is recorded by the pig's onboard computer. In this way the location (to within 1.5 metres) and size of all material defects, wall thickness changes and corrosion can be identified along the pipeline length, thereby enabling the integrity of the entire pipeline to be mapped.

4.7 DESCRIPTION OF ABOVE GROUND INSTALLATIONS

4.7.1 Introduction

The following above ground installations (AGIs) are integral components of the Turkish section of the BTC Pipeline:

- a custody metering station to measure the quantity and quality of oil entering the Turkish section of the pipeline (located at PT1);
- four intermediate pump stations (PT1, PT2, PT3, PT4);
- one pressure reduction station, (IPT1);
- 52 block valve stations (BVSs);
- a fiscal metering station located at the BTC Marine Terminal, for fiscal metering of the quantity and quality of oil exported from the BTC Pipeline system.

All AGIs will be fenced and provided with appropriate security measures to prevent unauthorised access by third parties. The four pumping stations will be permanently manned while the other stations, including IPT1, will be unmanned installations.

All AGIs have been designed to the project seismic specifications, which will enable them to withstand foreseeable seismic events.

Access roads to the various AGIs are still subject to investigation as part of ongoing Detailed Engineering. As far as is practicable, existing roads will be used to access the proposed AGIs. Where required, new access roads will be designed with adequate slope and cross-fall drainage to channel storm water safely to off-road soakaways, thereby preventing erosion or siltation. They will be constructed with a sub-base, an asphalt base and top course in accordance with the Project specifications.

4.7.2 Metering stations

The upstream custody metering station will be incorporated into PT1, located close to the Georgian/Turkish border and the downstream fiscal metering station will be located within the BTC Marine Terminal, upstream of the marine loading facilities. The metering stations will measure the quality and quantity of crude oil entering and leaving the Turkish section of the BTC Pipeline system. The metering systems will comply with the requirements of the *Institute of Petroleum Measurement Manual* with an accuracy of +/-0.25% and a repeatability of +/-0.02%. Metering will be undertaken for custody/fiscal purposes, but will also tie into the SCADA and leak detection systems (Sections 4.6.3 and 4.6.2 respectively).

4.7.3 Pump stations

4.7.3.1 Rationale for pump stations

In order to ensure the required flow of oil through the pipeline, it will be necessary to provide four intermediate pump stations along the Turkish section of the pipeline route between the Georgia/Turkey border and BTC Marine Terminal. The four pump stations will between them provide sufficient pump capacity in order to meet the hydraulic requirements of the pipeline system while delivering the design capacity (50 million tpa). They will also provide facilities for the passage of pigs (see Section 4.7.6) through the stations and for local control of the pump station and for acquisition of data for transmission to the main control centres. The minimum pump suction pressure will be 5 barg and the maximum discharge pressure will be 100 barg. The elevation profile of the BTC Pipeline route is shown in Figure 4.7.

4.7.3.2 Locations of pump stations

The approximate locations for the four pump stations were initially defined by hydraulic analyses. Criteria such as accessibility, water supply, power supply and environmental aspects formed the basis for more detailed site selection. In addition, subsoil investigations were performed to confirm the suitability of each site to support the foundations for the heavy station equipment.

The locations (measured as distances from the point of crossing the Georgia/Turkey border) of the four stations are as follows:

- Pump Station PT1 – KP 21.86;
- Pump Station PT2 – KP 276.26;
- Pump Station PT3 – KP 444.98;
- Pump Station PT4 – KP 741.56.

4.7.3.3 Landtake requirements

Landtake requirements are strongly influenced by local topography and the number and capacity of relief tanks required (stations PT1/3 have more tankage than that required at stations PT2 and PT4). The landtake requirements of the four pump stations, including the helipads, are as follows:

- Pump Station PT1 - 13.4ha;
- Pump Station PT2 - 16.9ha;
- Pump Station PT3 - 18.6ha;
- Pump Station PT4 - 18.7ha.

The layout and design of these stations is described in Section 4.7.14.

A ‘health protection strip’ of 150m will be applied around each station, restricting certain activities that can take place within that zone.

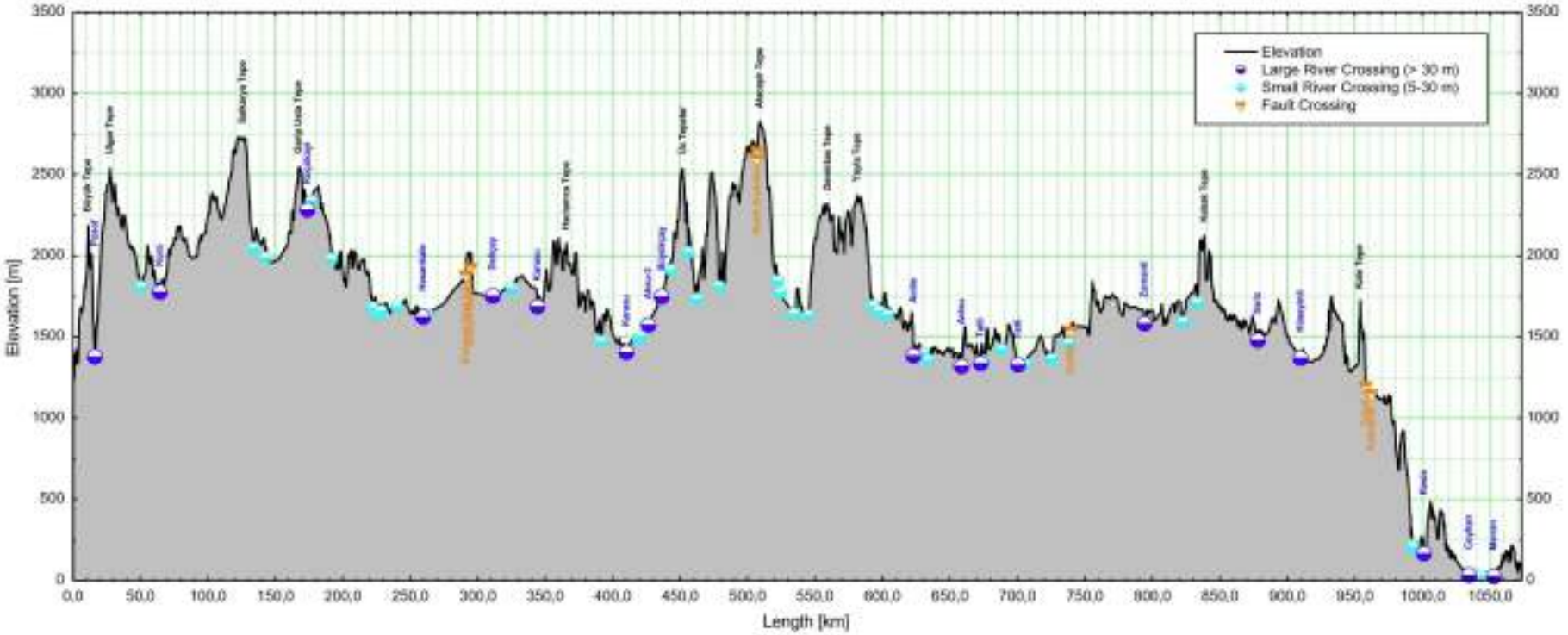


Figure 4.7 Elevation Profile of the Turkish Section of the BTC Pipeline Route

4.7.3.4 Pumps

Hydraulic considerations have determined the type of pump configuration chosen for the four pump stations. Pump Stations PT1 and PT3 will each be 'parallel configuration' pump stations, whilst PT2 and PT4 will each be of 'serial configuration'. A parallel configuration of pumps can generate a higher pressure head than a serial configuration. Therefore, at PT1 and PT3, which are located at higher elevations, parallel configuration of the pumps has been chosen.

Pump Stations PT1 and PT3 will each be equipped with four pumps and one backup, while PT2 and PT4 will each be equipped with three pumps and one backup. The pumps have been designed to accommodate a range of crude oil types and for a wide range of flow rates up to the ultimate 50 million tpa capacity of the pipeline. For lower flow rates, pump speed control and re-circulation has been foreseen.

4.7.3.5 Emissions control at pump stations

The drivers for the BTC Pipeline main pumps have the potential to be the major source of environmental impact during the operational phase of the buried BTC pipeline; this is by virtue of the drivers being a source for both noise and combustion gas emissions. The choice of pump drivers has therefore been the subject of an intensive technology selection process, as discussed in detail in Section 2.3.10.2.

Clean burning gas reciprocating engines have been selected as pump drivers. The engines will be highly efficient to reduce fuel consumption and minimise the release of carbon dioxide to the atmosphere. Emissions will comply with World Bank standards and Turkish regulations (see Appendix D). Exhaust gases will be safely discharged to the atmosphere via dedicated 16 metre high stacks. An inventory of emissions is presented in Section 4.14.2.1.

4.7.3.6 Noise control at pump stations

With regard to the entire Pipeline system, it is only the Pump Stations that present the potential for significant noise disturbance. The pipeline will be buried, the block valve stations will be partly located below ground and the Pump Stations and Pressure Reduction Station will have all their potentially noisy equipment located within buildings. The most significant source of noise at the Pump Stations will be the reciprocating engine drivers for the main pumps sets. The pump houses will be concrete structures and the ceiling and walls will be covered with noise absorbing material. The engine air intakes and exhausts will be fitted with silencers and the engines themselves will be partly encased.

These measures will ensure that noise levels inside the pump houses will not exceed 100dBA. Noise protection will be mandatory upon entering the pump houses, in compliance with EU occupational health regulations. Ambient noise levels at the housing compound within the Pump Station boundaries will comply with World Bank standards and Turkish regulations (see Appendix D). Noise levels at the nearest private (off-site) residential property will be well within these standards.

4.7.3.7 Control of discharges of liquid effluents at pump stations

Each of the four Pump Stations is equipped with an integrated drainage and effluent treatment system, which is described in Section 4.7.13. All discharges will conform to World Bank

standards and Turkish regulations (see Appendix D). An inventory of discharges is presented in Section 4.14.2.2.

4.7.3.8 Waste management at pump stations

A full inventory of the type of waste that is likely to arise during operation of the pump stations is given in the Waste Management Plan (see Appendix C3). Quantities of waste arising during operation of the pipeline are still being evaluated pending vendor selection.

4.7.3.9 Energy recovery measures at pump stations

The reciprocating engines that drive the BTC Pipeline pumps will generate heat and will need to be cooled. A closed loop circulating cooling water system will remove heat from the pump drivers. This heat will be dissipated by a combination of two ways:

- a bank of five fan coolers will dissipate the heat load to atmosphere;
- in winter, heat exchangers will interface with the pump station space heating system to provide a comfortable working environment for operators of the pump station.

4.7.4 Pressure Reduction Station (IPT1)

4.7.4.1 Rationale for pressure reduction station

The final 120km length of the BTC Pipeline will drop from an elevation (altitude) of approximately 1350m above sea level to the coastal location of the BTC Marine Terminal. This drop in elevation over a relatively short distance will have two major implications for the pipeline:

- there will be a need to realign the operating pressure in the pipeline with the hydraulic requirements for conveying the pipeline fluids to the destination at Ceyhan;
- there will be an opportunity to reduce the diameter of the pipeline from 42 inches (1050mm) to 34 inches (850mm) nominal diameter, thereby reducing pipeline material costs.

The steep reduction in line pressure will be achieved by passing the pipeline fluid through two parallel pressure control valves, which are located within IPT1.

The reduction in pipeline diameter will necessitate the use of pigs (see Section 4.7.6) of a correspondingly smaller diameter over the final stretch of the pipeline than that required for de-waxing the upstream stretch. This will in turn require a pig receiver/launcher assembly to be installed at IPT1 at the point of change in pipeline diameter to enable scrapers and other pigs to be changed-out to accommodate the reduced pipeline diameter.

4.7.4.2 Location of pressure reduction station

The Pressure Reduction Station (IPT1) is to be located at KP 951.4 (measured as distance from the point of crossing of the Georgia/Azerbaijan border), at an altitude of approximately 1300 metres. This location has been selected after a site selection exercise with environmental considerations (in particular, visual impacts and groundwater sensitivity) as the major determining factor.

4.7.4.3 Landtake requirements for pressure reduction station

The Pressure Reduction Station occupies agricultural land within a flat valley approximately 2.5km west-south-west of the village of Geben. The station will be developed as a split level (ie two level) site, covering an area of approximately 3.17ha. A minimum 80m wide 'health protection strip' will be applied around the IPT1 site. Temporary landtake will be approximately 3.49ha.

4.7.5 Pipeline pressure relief systems

To safeguard the integrity of the pipeline and the associated AGI components, all pump stations will be fitted with surge pressure relief valves, which will release any excessive pressure caused by transient flow conditions in the pipeline upstream of the stations. The stations will also each be equipped with two surge relief tanks which have the combined capacity to hold the maximum quantity of oil which may be released during any foreseeable transient situation (such as pump failure or unscheduled valve closures). Once normal operations are resumed, the contents of the relief tanks will be re-injected back into the BTC Pipeline for onward transfer.

The capacities of the surge tanks are as follows:

- PT1: 2 X 1,800 m^3;
- PT2: 2 X 4,000 m^3;
- PT3: 2 X 3,200 m^3;
- PT4: 2 X 5,500 m^3.

Pressure Reduction Station IPT1 is fitted with a surge pressure relief system similar to that for the pump stations. However, one single 3,400m^3 storage tank will provide sufficient capacity to capture any releases during transient flow conditions in the pipeline upstream of the station.

4.7.6 Scraper (pig) receiver and scraper (pig) launcher units

The four Pump Stations and the Pressure Reduction Station will each be fitted with pig receiver and pig launcher facilities (see Box 4.1).

Box 4.1 Pig Receiver and Launcher Facilities

Pigs (pipeline inspection gauges) are piston like devices of similar diameter to the internal diameter of the pipe, which are propelled along within the pipeline by the pressure of the pipeline fluid. A number of specialist pigs have been devised.

- **Gauging** or **calliper** pigs can be released down the pipeline during pipeline commissioning (or even prior to pressure testing) to prove the pipeline internal diameter and ensure that there are no internal obstructions.
- **Displacement** pigs can be released down the pipeline during commissioning to remove dirt and extraneous matter.
- **Scraper** pigs (or scrapers) are released periodically during pipeline operations to scrape the sides of the pipeline free of wax which is inherent in the crude being transferred and is continually deposited on the internal walls of the pipe.
- **Product separation** pigs can be used to separate products (ie batches of different crude types or shipments from different petroleum companies).
- **Intelligent** or **inspection** pigs (see Section 4.6.7) can be released periodically to inspect the pipeline for corrosion or other defects in the pipe wall.

A pig launcher is a vessel having a breech loading arrangement, which allows entry to the pipeline for launching the pig. A pig receiver is the corresponding downstream vessel, which allows the pig to be removed from the pipeline.

For the Pump Stations, the pig receiver will be located upstream of the main pump set to facilitate receipt of pigs from the upstream pipeline section, and the pig launcher will be located downstream of the pump set for releasing pigs down the next section of the pipeline. Similarly, in the case of the Pressure Reduction Station, the receiver and launcher will be located upstream and downstream respectively of the pressure reducing assembly.

The pipeline will be designed to run pigs of various types. Calliper and displacement pigs will be run during start-up of the pipeline. Since the ACG crude is a waxy crude, frequent runs (possibly once or twice per week) with scraper pigs are foreseen. At certain time intervals (approximately once every 5-10 years) intelligent pig runs will be performed for integrity assessment purposes (see Section 4.6.7).

4.7.7 Wax Handling System

As identified in Section 4.5.5, ACG crude, which is anticipated to be a major constituent of the material transferred through the pipeline, has a wax appearance temperature of 37.7ºC. Since the temperature of the material in the pipeline will be below this temperature for much of its length, it is anticipated that waxes entrained in the crude oil will solidify and form lumps within the fluid. Also some of the wax may solidify on the internal walls of the pipe, thereby effectively reducing its diameter. For this reason, regular scraping will be required in order to control wax build-up in the pipeline. As set out in Section 4.7.6 above, five pig receiver/launcher facilities are to be incorporated into the design of the Turkish section of the BTC Pipeline (one set at each Pump Station PT1/2/3/4 plus the Pressure Reduction Station IPT1). Wax handling facilities will be incorporated into the design of each of these pig receiver/launcher assemblies to deal with the wax gathered from the scraper traps.

A number of wax handling schemes have been evaluated. The recommended scheme involves re-injecting the wax into the next section of the main crude oil stream for onward transfer along the pipeline before the scraper is removed from the scraper trap. The relatively small quantities of oily water effluent that will arise will be treated in the on-site oily water effluent treatment plant to the Project effluent discharge standards (which encompass World Bank standards and Turkish regulations (see Appendix D).

When the scraper trap is opened, some residual wax will remain. The volume of this residual wax could be as much as 0.1 to 0.2 m^3 per each scraper receiving operation. The scraper and the residual wax from the trap will be dumped into a cleaning pit located immediately below the scraper trap opening and will be pre-cleaned with diesel, which will dissolve any wax that adheres to the scraper as well as the residual wax from the scraper trap.

The dissolved wax/diesel mixture will be drained entirely to the Slop Oil Handling System (see Section 4.7.8) for re-injection back into the pipeline. There will be no residual discharges from this operation.

The final cleaning of the scraper will be undertaken in the same cleaning pit, using a steam cleaner. Oily wastewater arising from this final cleaning operation will be routed to the oily water separation unit for treatment (by closing the valve to the slop oil handling system and opening the valve to the oily water treatment system).

4.7.8 Slop oil handling system

At each of the four Pump Stations and at the Pressure Reduction Station, IPT1, a closed slop oil handling system will enable all equipment and piping within the AGI to be drained down to an underground Slop Oil Tank. The Slop Oil Tank will be conservatively sized to enable it to contain all slops that may be anticipated during normal operation of each station (including the combined drain volume of two scraper traps being simultaneously out of service).

A Slop Oil Pump will route all oil slops from the Slop Oil Tank to the Relief Tanks (see Section 4.7.5) from where the oil will be re-injected into the suction of the Pipeline Main Product Pumps. This will ensure that all ‘waste’ oil arisings will be returned to the pipeline and there will be no residual oily waste streams generated at these sites.

4.7.9 Fuel supply to pump stations and pressure reduction station

4.7.9.1 Natural gas fuel supply to pump stations PT1/2/3/4

As described in Section 4.7.3.9 above, the BTC Pipeline main pumps will be driven by natural gas fired reciprocating engines.

- Pump Station PT1 will be supplied with natural gas via a 3-inch diameter 21.3km long branch line, running parallel to the BTC Pipeline, from the proposed South Caucasus Gas Pipeline (SCP), which will enter Turkish territory in close proximity to the BTC Pipeline. In the event that the SCP does not become operational in time to provide gas for the startup of the BTC Pipeline, natural gas will be supplied from the existing NGP on a temporary basis.

- Pump Stations PT2, 3 and 4 will be supplied with natural gas via 3-inch diameter dedicated branch lines from the existing NGP, measuring 1.5km, 1km and 35.5km respectively. The branch lines to PT2 and 3 will run parallel to BTC, whilst the line to PT4 will follow a new cross-country route.

Maximum use will be made of the existing NGP Right of Way to route the branch line to the Pump Stations and where it is necessary to establish new pipeline corridors for the branch gas supply lines, these will be chosen to avoid sensitive social and environmental features. In each case, the branch lines will either tie-off at the nearest valve station on the SCP or NGP (as appropriate) or will be hot tapped off the pipeline directly. The location of the branch points are still subject to ongoing detailed engineering assessment. An Environmental Appraisal will be undertaken for each branch gas supply line.

Gas treatment and pressure reduction skid assemblies will be installed on each of the branch supply lines within the perimeter of each pump station.

4.7.9.2 Diesel fuel supply to pump stations PT1/2/3/4 and to pressure reduction station IPT1

Diesel fuel will be supplied via road tanker to each of the four Pump Stations for the emergency generator, the fire fighting pumps and the hot water heaters. The diesel system will comprise a horizontal diesel fuel tank and a diesel distribution pump.

As described in Section 4.7.7 above, small quantities of diesel will also be used to clean the pig receiver assemblies following pig retrieval.

4.7.10 Water supply to pump stations and pressure reduction station

Raw water will be supplied to each Pump Station (PT1/2/3/4) and to the Pressure Reduction Station (IPT1) from one of the following sources (in decreasing order of preference):

- supply via the existing municipal water authority supply distribution network;
- groundwater abstraction from wells in the vicinity;
- surface water abstraction from nearest suitable river;
- batch supply via road tanker.

Since the siting of the four pump stations and the pressure reduction station has been subject to extensive review and change in an effort to achieve the optimal configuration, the raw water supply source for each AGI is still subject to ongoing detailed investigations. Key considerations have included reliability and sustainability of supply and the ability to effectively manage associated potential impacts[(1)]. Following completion of these investigations, the selected water supply systems will be subjected to Environmental Appraisal.

[(1)] Water supply will be in accordance with the provisions of the Regulation on Production, Packing and Sales of Natural, Mineral and Potable Water and Medical Water, Official Gazette Pronouncement No 23144 of 18 October 1997 and the terms stated in Circular No 5122 dated 29 April 1999.

Preliminary hydrogeological studies have nevertheless been carried out around the proposed sites for the four pump stations (PT1/2/3/4) to identify feasible water sources. The preliminary findings are as follows:

- For PT1, the most suitable source of water is considered to be a spring located approximately 3km south of the pump station. It is currently utilised by a small number of local people on an irregular basis. Construction of an access road for the water transmission line would not be necessary and gravity transmission of the water to the pump station would be possible. The spring has the capacity to meet the demands of PT1 in addition to those of current users.

- To meet the demands of PT2, it is currently anticipated that a new well (or series of wells) will be drilled in the vicinity of the pump station site, as there are no groundwater capacity problems in the area. This is currently seen as the preferred option, since the water supply from the nearby municipality has shown high nitrate concentrations.

- Investigations in the vicinity of PT3 have indicated a lack of suitable existing wells. A nearby spring is seen to be the most suitable source of water.

- The springs and seasonally flowing creek, in the vicinity of PT4 would not be able to meet the demands of the pump station. It is likely that a new well (or series of wells) will need to be drilled in the vicinity of the station.

The source of water supply for IPT1 is currently under investigation, the site location having been subject to recent changes (due primarily to landscape and visual impacts). Subject to investigations it is currently anticipated that an on-site water well will supply the facility.

Approximately 100m^3/day raw water will be required for each Pump Station, with the demand at IPT1 significantly lower since this station is not permanently manned. Each station will include a water supply, treatment and distribution system comprising the following components:

- two fire water holding tanks and one potable water tank;
- separate site-specific modular water treatment packages for service water, pump engine cooling water make up and potable water respectively.

The fire water holding tanks or reservoirs will be continuously kept full to ensure continuous supply for the treatment facilities.

Service water will be distributed for irrigation and cleaning.

Potable water will be distributed for drinking and cooking, sanitary and washing and for equipment and material cleaning. Potable water will be treated to comply with the World Health Organisation (WHO) Guidelines for Drinking Water Quality and Turkish Standard TS266 Water Intended for Human Consumption (see Appendix D). The construction and operational phases of the Project will comply with the following legislation:

- "Regulation on Production, Packing and Sales of Natural, Mineral and Potable Water and Medical Water" (Official Gazette dated October 18, 1997 and numbered 23144) while using potable and utilization water;

- the terms stated in the circular dated April 29, 1999 and numbered 5122 while supplying water by means of tankers.

At each Pump Station, a circulating cooling water system with fan air cooling will be in operation to cool the engine drivers of the main pipeline pump sets. This arrangement of a closed loop, fan cooled system will reduce significantly the consumption of raw water required.

4.7.11 Power supply to pump stations and pressure reduction station

Power supply to each Pump Station as well as the Pressure Reduction Station will be via a connection to the national electricity grid. Route alignments of the power supply is subject to ongoing detailed engineering studies; in each case, the selected alignment will be subjected to Environmental Appraisal. An outdoor substation with transformers, switch gear and protection will ensure electricity supply at the correct voltage at each AGI.

At each AGI, a fully contained diesel emergency generator system will provide power backup in the event of outages in the normal supply network. At the Pump Stations, the generator will have sufficient capacity to keep the pump house operational, thereby contributing towards a reliable and smooth operating pipeline system.

4.7.12 Fire fighting system at pump stations and pressure reduction station

A fire fighting system will be provided at each of the four Pump Stations (PT1/2/3/4) as well as at the Pressure Reduction Station (IPT1). It will comprise a fixed foam system for the pump houses and the relief tanks. A fire ring main line with a sufficient number of hydrants will surround the process areas and the tank areas. Fixed foam/water monitors will be installed at the tank bund areas. Fire protection measures (including minimum safety distances) will be designed in accordance with relevant provisions of NFPA, ASME and Turkish codes[(1)] (see also Section 9.4.3).

The following components will be provided at each AGI:

- two fire water tanks of the vertical fixed cone roof type, each with a working capacity of 1,500m³;
- two fire water pumps, each of them designed for 100% of the required flow rate, one with electrical motor driver, and one with diesel engine driver;
- foam storage and dosing unit;
- hydrants, monitors and connecting lines.

In the event of a fire, any oil-contaminated firewater will be drained to the primary withholding pond upstream of the storm water pond (rather than directly to site effluent discharge). This will enable the plant to retain any oil-contaminated firewater for subsequent treatment in the site effluent treatment plant before discharging from the site.

[(1)] 'Charter on the Measures to be taken at the Works and Businesses which Utilise Flammable, Explosive, Hazardous and Detrimental Materials' issued by the Ministry of Labour and Social Security.

An automatic fire detection system will be connected to the emergency shutdown system (see Section 4.6.5).

4.7.13 Drainage and effluent treatment and control

The four Pump Stations (PT1/2/3/4) and the Pressure Reduction Station (IPT1) will each be fully contained with regard to drainage and effluent treatment and each AGI will be fitted with near identical facilities, as described below. The integrated treatment system to be installed at each site is illustrated in Figure 4.8.

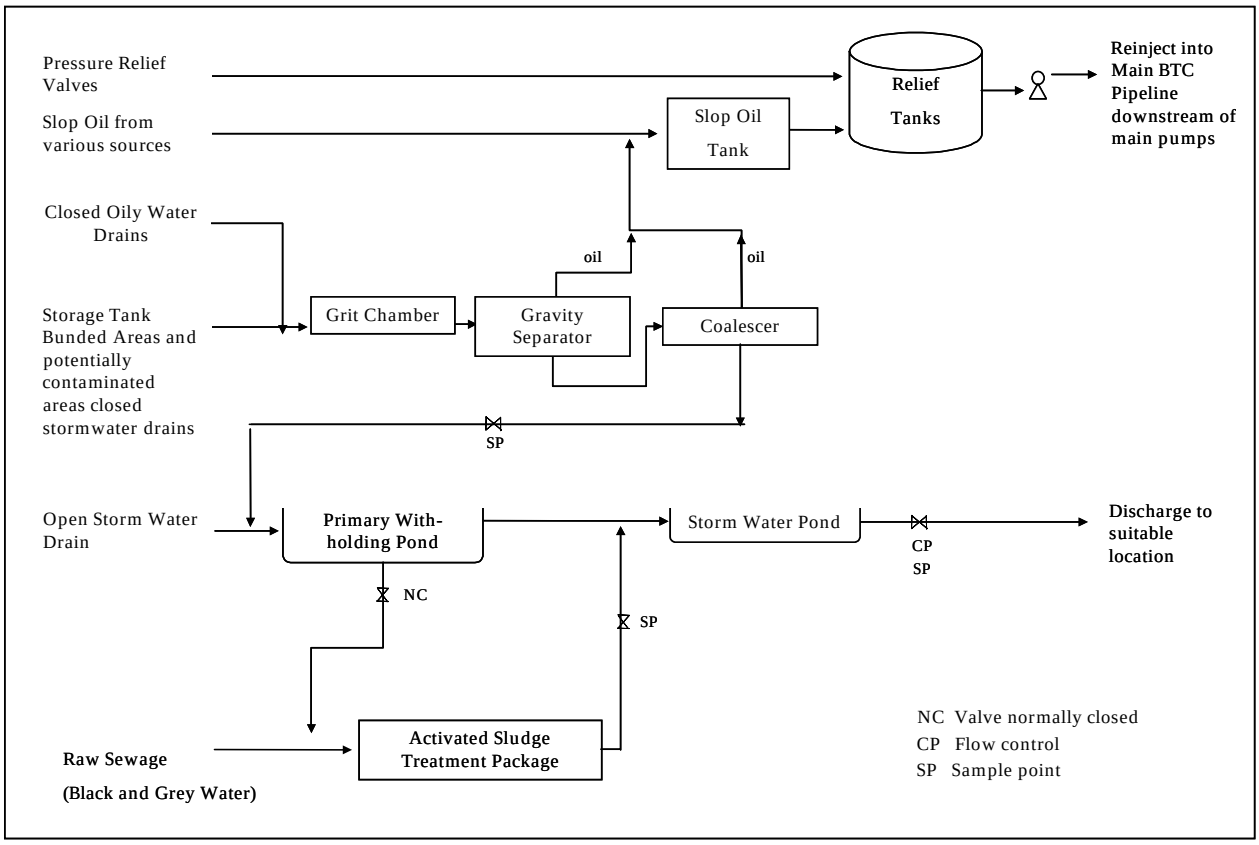


Figure 4.8 Integrated Treatment System at AGI Sites

4.7.13.1 Sewer Systems

Stormwater, oily water and sewage will be collected in separate sewer systems.

- All stormwater arising from areas of the AGI site, which are normally unlikely to be contaminated, will be collected via open culverts and routed in the first instance (the first flush) to the primary withholding pond.

- A closed stormwater sewer will collect rainwater from those areas of the AGI site where contamination is more likely, such as the areas within the storage tank bunds, helipad and car park. This drainage will be routed via the oily water treatment plant.

- A closed oily water sewer system will collect all oily water arisings, mainly effluent arising from equipment washing, and route it to the site oily water treatment plant.

- A closed sewer system will collect black and grey water from across the AGI facility and route it to a dedicated activated sludge treatment package plant.

4.7.13.2 Surface drainage treatment and control

The primary withholding pond will overflow to a stormwater pond. This two-pond arrangement will provide each AGI site with a significant degree of flexibility and control in how drainage and effluent is managed or treated prior to discharge from the site.

The first flush of all stormwater will be routed to the primary withholding pond. The site operator will have the facility to either route this material to the sewage treatment plant (should it not be suitable for discharge) or via the stormwater pond for settling prior to discharge from the site.

In prolonged storm events, drainage after the first flush will be uncontaminated and therefore will be routed to the primary withholding pond and then directly to the stormwater pond for settling prior to discharge from site.

The site operator will have control of the final discharge from the site; discharge will only be initiated in the event that the operator is satisfied that the contents of the stormwater pond meets the Project effluent discharge standards (see Section 4.7.13.6 below).

4.7.13.3 Oily water

The oily water treatment plant will treat all material from the closed drains oily water sewer system and the closed stormwater sewer. The plant will be installed below ground and will comprise three stages of treatment in concrete tanks in series:

- a grit chamber for solids removal by gravity separation;
- a gravity oil separator whereby surface oil separates out from the denser aqueous phase;
- a coalescer for accumulating dispersed oil droplets from the residual aqueous phase.

The treated aqueous phase will then be routed to the primary withholding pond prior to onward routing/treatment options as described above. The oil phase streams from the separator and coalescer stages will be routed to the site slop oil handling system (see Section 4.7.8). Solids collected in the grit chamber will periodically be collected, washed and spread onsite.

4.7.13.4 Sewage treatment plant

The sewage treatment plant will treat all black water and grey water arisings on the AGI. The plant will be a self-contained activated sludge package unit and will discharge via the stormwater pond. Treated effluent will meet the requirements of World Bank guidelines and Turkish Regulations (see Appendix D).

4.7.13.5 Fire water

As discussed in Section 4.7.12, in the event of a fire, potentially contaminated firewater will be drained via the site drainage system to the primary withholding pond and then onward to the stormwater pond prior to discharge.

4.7.13.6 Discharge of treated effluent

All liquid effluent leaving the AGI site will be discharged via the stormwater pond and then through a single discharge location. All effluents will meet the requirements of World Bank guidelines and Turkish Regulations (see Appendix D).

The stormwater pond will be designed to hold approximately 30 days effluent and surface drainage at normal flow rates. The philosophy will be to maximise ullage within the withholding pond and stormwater pond such that the plant operator will be able to discharge effluent from site under (semi-batchwise) controlled conditions according to the quality of treated effluent within the stormwater pond.

Both the contents of the stormwater pond and the site effluent outfall will be fitted with spot sampling facilities. The activated sludge treatment and oily water separator outlets will also be amenable to sampling. A sampling regime will be established for routine on-site determination of oil-in-water and coliforms. The operator will therefore have the facility to control release of treated effluent from the site according to effluent quality.

Irrigation is the preferred option for treated effluent. The feasibility of this is subject to ongoing evaluation. In any event, each discharge will be fitted with a tilebed seepage shaft unit. These shafts have been located to minimise the likelihood of contamination of groundwater (see Section 7.2.3).

4.7.14 Layout and design of pump stations and the pressure reduction station

4.7.14.1 Layout of AGIs

The layout of the stations is influenced by the topography of the sites on which they will be located.

- The proposed site for PT1 is very steep, therefore the station facilities will need to be built over three levels with the helipad on a fourth level.
- The proposed site for PT3 is relatively steep and this site will need to be built over several levels.
- The PT2 and PT4 sites comprise flatter terrain and a single level design is foreseen for these Pump Stations.
- The IPT1 site will need to be built over two levels.

The general layout and location of the Pump Stations and the Pressure Reduction Station is shown in Figures 7.1 to 7.5 in Section 7.

By way of example, representative general and aerial views of PT1 are shown in Figure 4.9 and Figure 4.10 to give an impression of the visual appearance of the Pump Station buildings:

4.7.14.2 Buildings on pump station sites

The four Pump Stations will be permanently manned 24 hours per day. The main buildings at these stations will be as follows:

- operation building (including control room, offices);
- pump house;
- piping house;
- utility buildings (3-off separate buildings for fire fighting, utilities etc);
- workshop/garage;
- security building;
- canteen;
- guesthouse;
- housing compound.

In addition, a helipad will be provided at each pump station.

4.7.14.3 Pressure reduction station buildings and facilities

Unlike the Pump Stations, the Pressure Reduction Station will not be permanently manned, although it will be regularly visited by maintenance workers and operations personnel involved in pigging operations. It will have the following buildings:

- piping house;
- utility and operations building;
- scraper building;
- fire fighting building.

4.7.14.4 Visual profile of AGI buildings and facilities

The buildings within each of the AGI installations will be between 8 and 14m in height. The relief tanks that will be provided at all stations will have a height of 15m, the exhaust stacks at the four Pump Stations will each have a height of 16m, making these the tallest structures on the sites.

All buildings will comprise brickwork with metal-sheeted roofs. The pump and the piping houses will have aluminium facades. The five AGI stations will all be surrounded by security fences and gates. Landscaping and carefully considered tree planting will be undertaken to minimise any visual impacts. This will be augmented by a careful choice of colours for the buildings.

By virtue of its location in an area of outstanding natural beauty, IPT1 has been the subject of a dedicated siting study.

Figure 4.9 General 3-D View of PT1

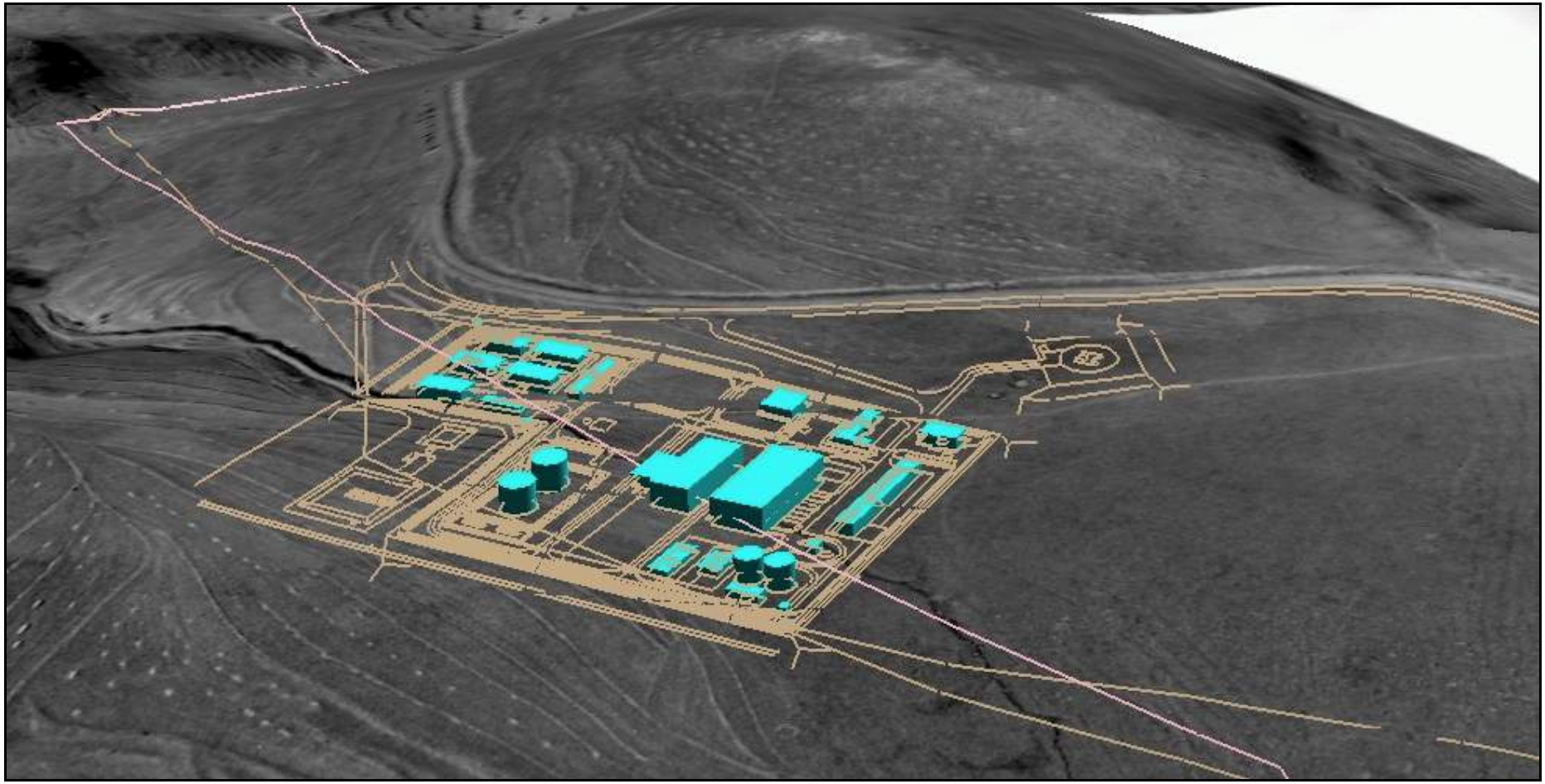


Figure 4.10 Aerial 3-D View of PT1

4.7.15 Block valve stations (BVSs)

4.7.15.1 Rationale for BVSs

It may become necessary at certain times during the operation of the BTC Pipeline to isolate a section of pipeline. This could be in response to a leak, in which case the objective is to limit the quantity of pipeline fluid that can be leaked to the environment. It could also become necessary in cases where maintenance work on the pipeline means that the contents of the line in the vicinity of the work have to be drained to enable safe working, without the need to empty the entire contents of the pipeline.

Block Valves are devices in the pipeline which, when open provide no restriction to flow through the pipeline, but when closed provide total (100%) impedance to flow. They are intended to operate in two modes only, either fully open (normal mode) or fully closed (activated mode). Their only function is to isolate sections of a pipeline. In this way they differ in function from control valves, which are line devices that regulate flow through the line by the extent of restriction they offer (ie the percent that they are open) and which are linked to control systems to enable them to do this automatically and continuously in response to changes in flow conditions in the pipeline.

4.7.15.2 Design and layout of BVSs

There will be a total of 52 block valve stations (BVSs) in the Turkish section of the BTC Pipeline. They will be unmanned installations, equipped with appropriate security measures to prevent unauthorised access by third parties. The landtake for each BVS will be approximately 350m^2, with the following principal components at each station:

- mainline valve (ball valve) with electro-hydraulic operator;
- nozzles with isolation valves on either side of the mainline block valve (to enable maintenance work to be performed on the valve);
- building unit for electrical equipment, telecommunication and SCADA interfaces (approximately 6m x 2.4m x 2.4m);
- cathodic protection equipment, including anodes (and a possible transformer rectifier unit; this is still the subject of detailed engineering design);
- power supply from the national grid.

The block valves will be located underground and the buried pipeline will not need to be routed to the surface at the BVSs. The unit for electrical equipment will be located underground as well for security purposes. A stem extension from each block valve will lead above ground, where the hydraulic actuator will be mounted. This will enable each block valve to be operated (opened/closed) manually in addition to the facility to actuate each valve remotely from the central control room.

A minimum 20m wide ‘health protection strip’ will be applied around each BVS.

4.7.15.3 Safety and reliability of BVSs

The block valves will be designed to be failsafe in that in the case of power failure, each valve will remain open or closed, depending on the last modus prior to power failure. If the failed valve remains open (owing to a local loss of power, for example), operators will still have the opportunity to monitor and control the flow of oil through the pipeline and, in the event that it becomes necessary to isolate the section of line in the vicinity of the failed valve, the block valves immediately upstream and downstream of the failed valve can be closed to isolate that section of the pipeline.

4.7.15.4 Location and site selection of BVSs

A pipeline environmental risk assessment has been undertaken to determine the environmental risk posed by the pipeline along its entire length in Turkey (similar assessments have been undertaken for the Azerbaijan and Georgia sections). This assessment (which is described in Section 8) has combined an analysis of probabilities of a spill occurring, the likely magnitude of such a spill and the environmental sensitivities along the pipeline route to develop a composite assessment of environmental risk along the entire route of the Pipeline. The results of this assessment have provided a logical and consistent rationale, based on protection of sensitive receptors, for location of block valves along the pipeline route.

Factors that have been considered in the determination of block valve location include the following:

- the likely quantity of oil that would be spilled in the case of a pipeline leak (which depends on the topography/hydraulics in the section of pipeline under consideration);
- the sensitivity of the surrounding land use (for example, low-grade grazing land is considered to be less sensitive than irrigated crop land);
- the sensitivity of groundwater resources and soil permeability in the areas traversed by the pipeline;
- the proximity of surface watercourses;
- the proximity of villages and towns;
- the location of particularly sensitive environmental receptors such as wetlands or terrestrial habitats of value;
- the location of archaeological sites;
- the location of fault areas.

In addition to the factors listed above, it was also considered preferable, to the extent feasible, to locate the BVSs as close as possible to the BVSs of the existing NGP (see Section 4.4.1) because these existing NGP stations have access to electricity supply and are served by access roads and other essential infrastructure which the proposed BTC Pipeline could utilise.

The outcome of this analysis is that 52 block valves will be located in the Turkish section of the BTC Pipeline, and these locations are depicted in Figure 1.3 and on the route maps presented in Supplement 2 of Volume 2.

4.7.15.5 Interface of BVSs with the leak detection system (LDS)

The BTC Pipeline Leak Detection System (LDS) has been described in Section 4.6.2. It will interface with the Pipeline SCADA system (see Section 4.6.3) to provide early detection and location of pipeline leaks and will, via the Pipeline's distributed control system, enable the section of pipeline containing a leak to be isolated, either locally or remotely, via closure of the upstream and downstream block valves for that section of pipeline.

Primary control of the pipeline LDS and the 52 BVSs will be exercised from the Sangachal/zerbaijan Terminal, with back-up control available from the BTC Marine Terminal at Ceyhan.

4.7.15.6 Utility and infrastructure requirements for BVSs

While Detailed Engineering is currently in progress, preliminary investigations into the availability of power supply from the national grid to each of the 52 proposed locations for the BVSs have been undertaken. It has been demonstrated that grid supply is available within a reasonable distance for all but two of the stations (BVS 009 and 041). As these remaining BVSs are located at some distance from the nearest point of the national grid. Negotiations with the power supply company are underway with the objective of securing power supply from the grid to these locations as well; if this is not feasible, then a local electricity generator system will need to be incorporated into the design of both these BVSs.

It will also be necessary to provide vehicular access to each BVS. As discussed in Section 4.7.1, maximum use will be made of existing roads. The requirements for additional access roads are currently the subject of ongoing investigations. All new access roads will be designed and built in accordance with the project design specifications. Upon completion of detailed engineering, all new access roads and power supply corridors will be subjected to Environmental Appraisal.

4.8 CONSTRUCTION OF THE PIPELINE

4.8.1 Number of spreads

The Turkish section of the BTC Pipeline has been divided into three Lots (Lots A, B and C) as follows:

- Lot A: Georgian/Turkish border to PT2 (KP 0 – 278);
- Lot B: PT2 – PT4 (KP 278 – 738);
- Lot C: PT4 – BTC Marine Terminal (KP 738 – 1076).

It is currently anticipated that a separate Contractor will be responsible for pipeline construction in each Lot and that each contractor will mobilise two spreads at the same time. This would result in a total of six spreads being mobilised along the entire route at any one time.

A construction spread comprises all the personnel and equipment necessary to undertake construction of a section of a pipeline - from start of clearing the working strip to its provisional reinstatement. The length of a standard spread will vary from one location to another, usually within a range of is approximately 15-20km. The actual length will depend

principally on the topography and the number of areas requiring special construction techniques (such as road and river crossings).

The overall duration of a local construction spread from the preparation of the working strip to the preliminary restoration is expected to be between 2-4 months again, depending on local conditions and the requirements of the Reinstatement Plan which include the following with respect to Special Areas:

> "*Construction planning shall achieve a 21 day period from the time when a Special Area is entered to the completion of reinstatement measures unless otherwise approved by BOTAŞ.*"

The division of the spread into sequential working phases and crews will be as follows:

- site survey and centreline staking;
- preparation of the working strip, including topsoil removal;
- transportation of pipe lengths from the pipe storage areas;
- pipe stringing along the route;
- excavation of pipe trench;
- bending crew undertaking the production of the required 'cold bends' in accordance with the topography of the terrain and the route alignment;
- welding crew responsible for welding the joints subsequently and testing them (radiographic and/or, ultrasonic testing);
- coating crew responsible for coating the welded joints and testing the coating;
- lowering of the pipeline section into the excavated trench;
- installation of Fibre Optic Cable (FOC) conduit;
- backfilling of the trench (except at the 'tie-ins' where the lowered pipeline sections are to be joined and at the FOC splicing locations);
- completion of tie-in welds and backfilling of tie-ins;
- attachment of cathodic protection test points;
- FOC installation;
- establishment of special construction sites (eg at crossings), which can be erected ahead of the main sites and independently of the progress of the main pipeline construction;
- temporary reinstatement (levelling of working strip);
- final reinstatement of the working strip: this includes deep ripping of the subsoil, spreading of topsoil and reseeding.

4.8.2 Temporary Construction Facilities

4.8.2.1 Introduction

The main temporary construction facilities will comprise pipe storage areas and construction camps.

Project specifications for these camps have been developed by BOTAŞ and will be issued to the Construction Contractors. They describe the requirements for provision, operation, security and decommissioning of the camps. Whilst the Contractor will be responsible for designing and setting up these camps, they will be required to comply with these specifications.

4.8.2.2 Temporary pipe storage areas

Pipe lengths will be transported from the receiving port(s) and stockpiled at one or more main pipe storage areas. The preferred means of transportation is by rail to the nearest rail yard and thereafter by road haulage. Box 4.2 provides further details on the ports and railways anticipated to play a role in the transport of materials and equipment for construction of the Turkish section of the BTC Pipeline.

Box 4.2 Transport Nodes and Routes in the Vicinity of the Pipeline Route

The principal transport nodes and routes in the vicinity of the pipeline.

Ports
Five ports in Turkey may be used to receive pipe and other pipeline materials and equipment:

- **Iskenderun** – this port is considered a vital port due to its proximity to Ceyhan and the size of its open storage area. This port also has a railway connection.
- **Isdemir** – this port, located on the eastern coast of the Gulf of Iskenderun, can be used as both a loading and unloading port, due to its geographical location. It has a railway connection.
- **Samsun** – this port also has a railway connection. This port is considered a vital port due to its proximity to Lot A.
- **Trabzon** – this port has no railway connection.
- **Hopa** – this port has no railway connection.

Isdemir, Iskenderun, Hopa, Trabzon and Samsun ports are considered to be used for import/unloading purpose in the Project. From these ports, it is planned to transport the materials to the respective Lots with a combination of railways and motorways.

Road versus Rail
The project is committed to maximising the use of rail to transport pipe and other construction materials to the pipeline route. A combination of railways and roads will be used to deploy equipment and materials to the camp locations in each Lot. There are 88 railway stations along LOTs A and B that will be used for transportation of materials to the construction sites or camps. For LOT C, the extensive use of rail is less viable owing to the absence of rail facilities in the vicinity of the pipeline route; instead, motorways and roads will be the preferred option for transportation.

Railway Stations
The following railway stations may be used to transport materials to the pipeline route. Although the dimensions of the pump prevents these options, the other materials may be transferred via the stations listed below:

- Kahramanmaras – close to the Pressure Reduction Station (IPT 1).
- Ulas – close to Pump Station 4 (PT4) and to the stockyard;
- Erzincan – close to Pump Station 3 (PT3);
- Uzunahmet – close to Pump Station 2 (PT2);
- Kars – close to Pump Station 1 (PT1);
- Koprukoy – close to the stockyard.

From these pipe storage areas, the pipe will most likely be hauled to smaller storage sites near the working width in preparation for stringing. The location for these additional storage sites will be identified by the Construction Contractor within 90 days from Award of Contract. Factors that will be taken into account, apart from placing them at suitable intervals along the pipeline route, are the drainage characteristics of the respective sites and, more importantly, the availability of rail sidings (if the pipe is to be transported by rail) and suitable access for the heavy pipe hauling vehicles as well as the cranes, which are needed to lift the pipes onto the vehicles.

The size of the pipe storage areas will depend on the rate of delivery of the pipe from the receiving port(s), as well as the rate at which it is used. However, an approximate area of 0.5ha (about the size of a football field) can be envisaged in most cases. The pipe sections, which have an average length of 12.5m, can be stacked on top of each other up to a maximum of three tiers. Suitable interface padding will be placed between the tiers to prevent coating damage.

Part of the pipe yard area will be set aside to store damaged pipe and coating. These quarantined zones will be clearly marked and located away from other pipe storage to avoid mixing of damaged and good pipe.

As the spread moves on and the individual laydown area is no longer needed, remaining pipe will be hauled along the working width and the site will be reinstated to its previous condition.

4.8.2.3 Construction camps

It is estimated that there will be a total of approximately 3000 workers for the entire length of the route, ie approximately 1,000 per Lot. There will be one primary camp in each Lot, ie three primary camps in total.

While the precise locations of the three primary camps are still being finalised, the tentative locations are presented in Table 4.2.

Table 4.2 Primary Camp Station Locations

NAME	PROVINCE	DISTRICT	VILLAGE	KM	EASTING	NORTHING	AREA
Lot – A	Erzurum	Pasinler	Cakirtas	255.5	485031,00	4426862,00	15.14ha
Lot – B	Sivas	Zara	Tekkekoy	640.7	396590,00	4412183,00	14.12ha
Lot – C	K.Maras	Goksun	Mahmutbey	908.5	540970,00	4219360,00	16.74ha

Each Contractor is likely to set up two or three additional satellite or temporary camps near the pipeline work front for ease of access of material and workers. These camps will typically be located at a maximum driving distance of one hour from the pipeline working width and will cater for the temporary accommodation of up to 40% of the Lot workers (up to 300 workers per temporary camp).

Construction camps will also be established alongside the site earmarked for the AGIs. These camps will be established to accommodate approximately 300 workers (in addition to the Lot workers) at each of the five locations.

The construction camps will accommodate permanent workers, with some local workforce will be bussed to the working corridor from their villages and towns on a daily basis. It is estimated that some 30% of the lot workers and 20% of the AGI construction workers will be recruited locally (ie approximately 300 per Lot and 60 per AGI).

Each of the three primary camps will include the following:

- offices;
- accommodation;
- all relevant utilities (water supply and treatment, electricity, sewerage treatment and disposal, waste disposal etc);
- medical facilities;
- laundry;
- an equipment and vehicle maintenance building;
- communications facilities;
- recreational areas.

It is likely that the camps will consist of pre-fabricated modules that will be brought in by trailer. They will remain in place for the duration of the construction activities and will then be disassembled and removed.

The Construction Contractors will ensure that all camps (primary and satellite/temporary) are equipped with appropriate sewage collection facilities. The sewage will be tankered away from these facilities and delivered to municipal sewage treatment systems in compliance with the provisions of Regulation on Control of Water Pollution. In remote areas, where such municipal systems are not available and the need for sewage treatment exists, the Construction Contractors will set up appropriate treatment systems (either septic tank units or activated sludge package units followed by tiled bed seepage pits) to be agreed with the local authorities and the State Directorate of Hydraulic Works (DSI). These systems will ensure that the sewage generated by the construction camps is treated and disposed of to a standard, which is acceptable to DSI and local authorities and is in compliance with the provisions of Turkish Regulations and World Bank standards (see Appendix D). While these sewage treatment systems will initially serve to treat sewage generated by the construction camps,

they could (if appropriate) be handed over to the local community following project completion.

An inventory of the type of wastes that are likely to arise at the construction camps is given in the Waste Management Plan (refer to Appendix C3) and summarised in Table 4.11.

All waste will be collected and separated out for recycling, re-use or disposal. The camps will be equipped with semi-mobile or mobile incinerators for non-hazardous waste. Their emissions will be in compliance with the most stringent of Turkish and World Bank standards (see Appendix D). Suitable disposal sites for non-combustible and hazardous waste are currently being identified in discussion with local authorities. Handling and disposal of wastes will be carried out in accordance with the requirements given in the Waste Management Plan (refer to Appendix C3).

A stormwater drainage system will be provided at each of the three primary camps.

Power to the camps will be provided via the national electricity grid, where possible. In remote (satellite) camps power will be provided by diesel generators.

Water will either be tankered in from near-by towns[(1)] or abstracted from local wells with the permission of the DSI[(2)].

Prior to commencement of construction activities, the camp office will be registered and subject to inspection under Article 88 of the Labour Law (Law Number 1475) regarding Work and Labour Health and Safety. Inspections will be carried out by the Ministry of Labour and Social Security, Department of Labour Audit Groups (see Appendix A8). Subject to the findings of these inspections, Certificates for operation of Construction Facilities will be issued.

If explosives will be used or stored on any site, it will be necessary to obtain a permit in accordance with the "Charter on the Procedures and Principles of the Production, Importation, Transportation, Preservation, Storage, Sales, Usage, Demolition and Supervision of Explosives Excluded from the Monopoly and Hunting Materials and Equivalents" issued by the Ministry of Interior and furthermore, to get a license according to the 'Non-Hygienic Establishments Regulation for the depots of explosive materials'.

4.8.2.4 Authorisations required prior to commencement of temporary construction

Each Construction Contractor will, upon award of Contract (currently envisaged to be in Autumn 2002), be required to undertake the necessary field investigations and consultations to enable them to develop plans that identify:

- any additional temporary easement requirements;
- pipe storage areas;
- quarries to be utilized;

[(1)] Water supply will be in accordance with the provisions of the Regulation on Production, Packing and Sales of Natural, Mineral and Potable Water and Medical Water, Official Gazette Pronouncement No 23144 of 18 October 1997 and the terms stated in Circular No 5122 dated 29 April 1999 when supplying water by means of water tankers.

[(2)] In compliance with the Groundwater Law, Law Number 167, 23 December 1960.

- location for temporary/satellite camp sites;
- areas requiring extra working width.

This package of information will be submitted to BOTAŞ for assessment and approval. The Construction Contractor will not be permitted to commence work until such approval is given.

4.8.3 Land acquisition

Land acquisition is anticipated to commence in Autumn 2002 and will continue throughout much of the construction period.

The Designated State Authority (DSA) will be responsible for all permanent and temporary land acquisition on behalf of BOTAŞ.

Within 90 days from the effective date of the Contract the Contractor will be required to provide information outlining all additional temporary land acquisition requirements, which are needed for the construction period. This will include local storage sites, temporary access roads, extra laydown areas and construction camps. These additional requirements will be presented to BOTAŞ/DSA for approval.

4.8.4 Standard construction of the pipeline – the spread technique

4.8.4.1 Introduction

Cross-country pipeline construction is a well-established process, which incorporates environmental management and mitigation measures as standard practice. Precise construction methods will differ according to the nature of the terrain and the environment within which the pipeline is laid. Of particular importance are the underlying soils and strata, the topography, the existence of physical constraints such as other pipelines, services and infrastructure and environmental constraints such as environmentally sensitive areas of proximity to housing. Special construction techniques are necessary where the pipeline crosses railways, roads and significant watercourses. All of these techniques are well established and proven and, provided appropriate care is taken, construction should be completed without undue disturbance or long term damage to the environment.

For the construction of the Turkish section of the BTC Pipeline, each Construction Contractor will be responsible for working out the details of construction works for the section of the pipeline for which they are responsible. Prior to the commencement of each element of the construction programme, the Construction Contractor will develop construction details and method statements for the work, which will require BOTAŞ' prior approval. These method statements will incorporate the reasonable requirements of landowners and occupiers and the environmental mitigation measures to be applied. These mitigation measures will incorporate all the mitigation measures specified in this EIA and the associated Management Plans (to the extent that they are applicable).

Before construction begins the route will be surveyed and staked to establish precise route alignment, particularly in relation to important environmentally, archaeologically or socially sensitive sites.

4.8.4.2 Third party safety

During construction, appropriate measures will be undertaken to ensure the safety of people and livestock with regard to the operation of construction machinery and the opening up of lengths of pipeline trenches. The Contractor and BOTAŞ will be responsible for demonstrating that all practicable steps have been taken to ensure the safety of both employees and local residents. Hazards will be dealt with on an a case-by-case basis by carrying out a risk assessment for all construction activities prior to starting the activity, in particular where heavy equipment is involved, and ensuring that appropriate safety measures are taken to reduce the risks to as low as reasonably practicable levels. Reasonably practicable measures will include the following:

- the length of trench open at any one time on each spread is planned not to exceed 20km or a forty day construction time, whichever is shorter;
- erecting stock-proof fencing in areas of danger for livestock (as agreed between the Community Liaison Officer (CLO) and communities in advance of construction);
- agreeing on crossing points for livestock with communities prior to construction;
- erecting protective barrier fencing (sufficient to impede young children) on sections that come within 500m of residential areas and in areas where the trench is deeper than 2.5m;
- fencing all crossing points over open trenches;
- securing heavy machinery in an agreed location overnight;
- storing wastes properly overnight to avoid attracting animals in the case of organic wastes and causing a hazard to people.

4.8.4.3 Adhering to the working width

The working width will be determined by the minimum width required for construction operations to be able to proceed smoothly and safely and by a number of environmental constraints and landtake requirements. The normal working width will be 28m. This working width will be adhered to for the majority of the pipeline corridor.

In some areas, however, a narrower working width will be applied, such as where the pipeline is laid along ridges or if fixed objects, such as large boulders, need to be avoided. A narrower working width will also be adhered to in pre-identified areas of environmental sensitivity and forested areas. In these locations, a reduced working width of 22m has been set. In certain selected areas of particular environmental sensitivity, an even narrower working width has been specified (refer to the environmental impact tables in Supplement 1 of Volume 2). For example, in densely forested areas of the Posof Wildlife Protection Area, the working width will be reduced to 8m. This is a measure to reduce adverse impacts of the construction of the pipeline to the Caucasian Black Grouse, an endangered species that has been recorded in that area.

Similarly, a wider working width will be necessary in some areas, such as at larger river crossings or pipe lay-up areas.

4.8.4.4 Preparing the working width – clearance of vegetation

The first activity will be to clear the working width of all vegetation. The Construction Contractor will ensure that vegetation is cleared in such a manner that it remains within the Right of Way (RoW) or approved working space boundaries and does not fill or block off any watercourses, rivers, irrigation channels, streams or drainage systems.

4.8.4.5 Topsoil stripping

Depending upon local conditions, topsoil to a depth of approximately 0.15m to 0.30m will be removed from the working corridor and stored separately along the ROW. Following the stripping of topsoil, the working corridor may be levelled where necessary so that the pipeline construction can be carried out.
Error! Reference source not found. and Figure 4.12 illustrate a normal working strip and a working strip on a side slope.

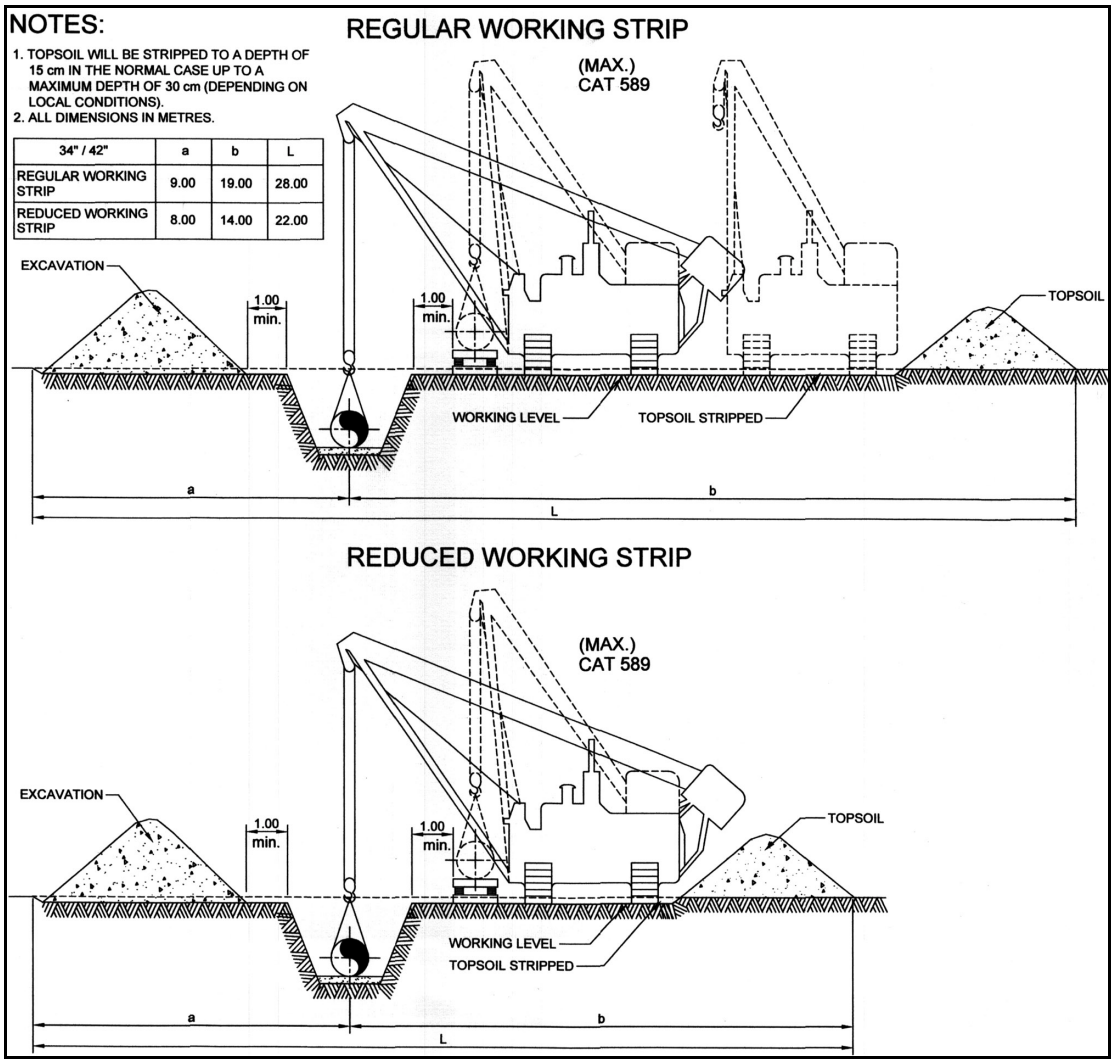


Figure 4.11 Normal / Reduced Working Strip [Ref 4]

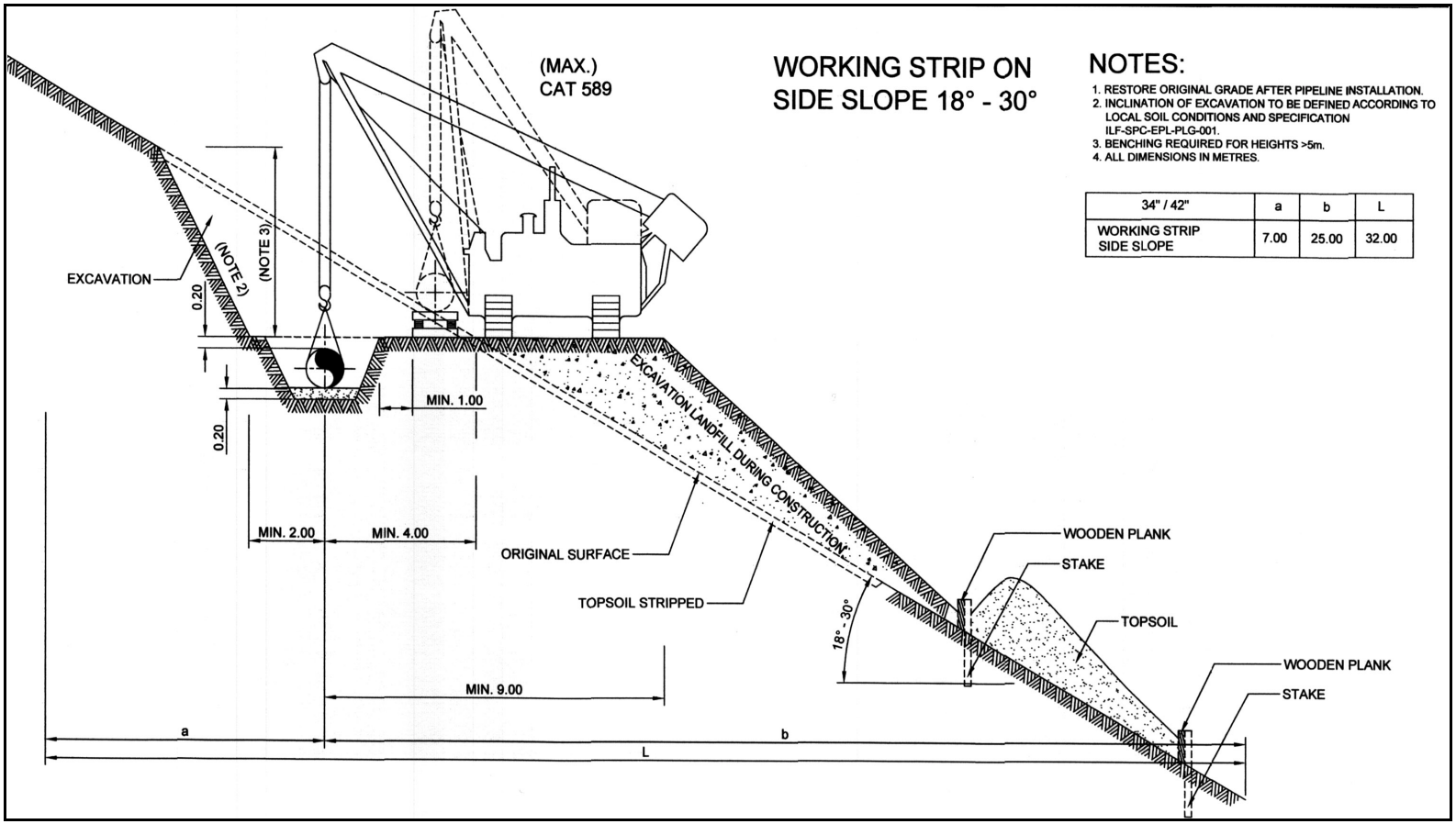


Figure 4.12 Working Strip on Side Slope 18° - 30° [Ref5]

4.8.4.6 Stringing and welding the pipeline

The pipe lengths will be strung consecutively along the route. The Construction Contractor will establish a stringing list, taking into consideration the specifications and instructions concerning pipe wall thickness provided on the project drawings developed during the Detailed Engineering phase. The pipe lengths will be clearly colour- coded by appropriate marking on their external surface to ensure pipes of different wall thicknesses do not become mixed.

The pipe lengths will be strung on sand bags or wooden cribbing to avoid damage to the pipe coating. Pipe bevel end covers will remain on the pipe ends until the commencement of each individual weld (see Plate 4.1). This will serve to minimize the exposure of the pipe sections and damage to the bevel.

The pipeline will be laid in such a way that it follows the terrain as closely as possible. Field bends, factory-made bends and elastic bends will be used for this purpose.

- Field bends will be formed using a BOTAŞ approved type of bending machine. The minimum bend radius of the bend will be 40 times the nominal diameter of the pipeline for the particular route section. Bends will be made in such a manner as to preserve the cross section and shape of the pipe. The pipe will need to remain free of buckling, cracks or other evidence of mechanical damage. The final wall thickness on the outer radius will, after bending, remain within the minimum thickness tolerance of the pipeline itself.
- Where physical constraints preclude the use of large radius field bends, factory-made bends (hot bends) of a smaller radius will be used.
- Elastic bends will be used for minor changes in direction and elevation where space within the Right of Way is available to accommodate these types of bends.

The welding of the line pipes (see Plate 4.2) and the associated inspection will be in accordance with API 1104 and BOTAŞ specifications. The two principle technologies for carrying out non-destructive testing are radiography and ultrasonics. Mechanised Ultrasonic Testing, which provides instantaneous results, will be used as the means for Non-Destructive Testing (NDT) on the pipeline, including all tie-in welds, while radiography will be used within the AGI station areas.

Plate 4.1 Photograph of a Pipe Stringing along the RoW

Plate 4.2 Photograph of Pipe Welding Operations

If a weld is shown to be defective and out of specification, the Construction Contractor will make a repair. However, if after the repair the weld shows signs of further defects outside of the specified limits, the entire weld will be removed and the adjoining pipes rewelded. After each weld has been certified as acceptable, each pipe joint will be coated in a manner that is compatible with the factory coating of the rest of the pipe. Prior to field coating, the areas of pipe to be coated will be grit-blasted and thoroughly cleaned to near white metal condition. The Construction Contractor will electrically test the complete coating in accordance with the coating manufacturer's instructions. Such testing will be undertaken twice, once immediately upon completion of the field joint coating work and once during lowering of the pipeline into the trench.

4.8.4.7 Trenching and laying

Excavation of the trench will be carried out by mechanical trenchers, excavators and/or backhoes. If necessary, the bottom of the trench will be levelled after excavation. Padding will be added, when required, in order to ensure an even support of the pipe and/or to protect the pipe coating.

In certain areas with a high groundwater table, the pipeline trench will need to be de-watered prior to, and possibly during, backfilling of the trench. The type of dewatering and the amount of water generated will depend on the permeability of the soil and the depth of the groundwater table. In areas of high groundwater tables and wherever the pipeline crosses wetland areas, rivers, streams etc, concrete coating will be applied to the entire length of pipeline crossing these locations to achieve negative buoyancy of the pipe (see Section 4.5.11).

Prior to the commencement of construction, the Construction Contractor will be responsible for identifying those areas of the route where de-watering will be necessary and for ensuring that permits for water discharge have been obtained. Copies of these permits will be provided to BOTAŞ prior to commencement of construction.

The following methods of dewatering may be used, depending on local terrain and hydrological conditions:

- wells - particularly in connection with deep excavations;
- well point dewatering – for short and shallow excavations;
- suitable sump area using container/pipe etc surrounded by gravel and installing major dewatering pump at main areas of groundwater;
- drainage pipes along the trench bottom;
- open pumping.

The bottom of the trench will be thoroughly graded and freed from rocks, stones and other objects, which might damage the pipeline. All material thus generated will be disposed of in accordance with the project Waste Management Plan (see Appendix C3).

A 20cm thick sand layer will be placed on the bottom of the trench as padding in areas where remaining stones or other objects could cause damage to the coating of the pipe and where the surrounding soils are considered unsuitable for padding purposes. It is emphasised that there will be no need to pad the entire pipeline trench.

Sources of material for padding are still being identified subject to further detailed geological investigations. In principal, imported material will only be used if the surrounding soils are considered unsuitable for padding. As discussed in detail in Section 4.8.5, all materials that need to be imported to the working corridor, including aggregates from quarries, will only be sourced from (other existing or new) licensed and authorised sites or sources. Riverbeds will not be used for borrow materials.

Significant efforts will be made to ensure that materials will be conveyed to the construction sites in such a way that their transport does not cause significant or undue adverse environmental impacts. All such traffic movements will be carried out in accordance with the project Traffic Management Plan (see Appendix C5). The Project will maintain all roads to the standard at least equal to their pre-project condition.

An estimate of the likely volume of material required for padding the trench in areas where suitable excavation material is not available is given in Section 4.8.6.5.

The pipeline will be laid into the trench by lifting it off the supports using machines (known as side booms) equipped with wide, non-abrasive belts (see Plate 4.3). As the pipe is elastically deformed during the lifting, a sufficient number of side booms will be used to ensure that the pipe is not subjected to unacceptable stresses. During the lowering in of the section pipe, its coating will be checked for damage. After repair of any damaged coating, the pipe section will be carefully placed in the trench.

Plate 4.3 Photograph of Laying a Pipe into a Trench [Source: ILF]

Tie-ins will be required within the trench to join the welded pipe sections into a continuous pipeline. Prior to backfilling, the tie-in joint will be NDT tested, coated and inspected in the same manner as that described above.

4.8.4.8 Land drainage and erosion control

The Construction Contractor will be responsible for taking appropriate measures for land drainage and erosion control as specified in the Reinstatement Plan (RP) (Appendix C2). These specifications will form part of the construction contract to which the Contractor will be required to comply. BOTAŞ will inspect the Contractor's performance in this regard and the work will not be considered complete until BOTAŞ is satisfied that all control measures are in place and that they are appropriate for the terrain.

4.8.4.9 Clean-up and reinstatement

The trench will be backfilled with the previously excavated spoil, which will have been stored for that purpose. This will generally be undertaken using back excavators or bulldozers.

After clearing and removal of all material and waste, the topsoil, which will have been stockpiled separately, will be replaced over the working corridor.

Reinstatement of land drains will be undertaken and approved and in accordance with the Reinstatement Plan (RP) contained in Appendix C2.

4.8.4.10 Pressure testing during construction

Once backfilling and initial reinstatement is completed for each section of pipeline, the integrity of the completed section will be ascertained by means of pressure testing. This will involve sealing off a complete section of pipeline with pre-tested end caps that contain various fittings to facilitate filling with water, pressurising with a pump and pressure and temperature measurement. After welding on the test ends, the section of the pipe to be tested will be filled with water, then pressurised for 24 hours. Throughout the test process the pipeline section will be monitored for leaks. Any leaks that are detected will be investigated and appropriate repair works will be undertaken after the respective pipe section has been depressurised. Once the repairs have been completed, the testing procedure will be repeated. After successful conclusion of the test, the line will be dewatered and the test ends removed. The length of the individual sections to be tested will depend on topographical and hydraulic constraints, but a typical length can be assumed to be around 50km.

In this way the entire pipeline will be hydrotested, section by section.

The Construction Contractor will be required to prepare a comprehensive Plan for the Implementation of Hydrostatic Testing, which will include information on the quantity and quality of water needed, the proposed use of any chemical additives, an evaluation of available water resources in the relevant regions and proposed abstraction points, as well as a discharge proposal in accordance with the requirements of the Host Government Agreement (HGA). This Plan will be submitted to DSI the project for approval before any hydrostatic test activities commence. BOTAŞ is fully cognisant of the importance of rigorous planning of the entire hydrotest water programme, particularly with regard to sustainable abstraction, water conservation, and treatment and disposal of spent hydrotest water.

The volume of water required for hydrotesting a 50km section of pipe is approximately 43,000m^3. To the maximum extent feasible, water will be passed along from test section to test section, and topped up where required to minimise the volume of water that needs to be abstracted and consequently to reduce the volume of discharge following test completion.

Before the line is filled with water, it will be cleaned thoroughly by a cleaning pig and checked for internal damage, including excessive weld penetration and dents (see Section 4.7.6). This damage check will be done by a gauging pig equipped with an aluminium gauge plate that is forced through the pipeline either by compressed air or water.

For the hydrotest, the pipe is filled with water in such a way as to evacuate all air. The section to be tested is filled from the lowest to the highest point. When the test pressure is reached, the section is isolated and the pressure is maintained and kept under observation for a minimum period of 24 hours. If any leak is discovered during the test, it is located, the pressure is reduced to ambient and the fault is repaired. Thereafter the test process is repeated.

On completion of the pressure test, the pipe will be dewatered by several scraper runs and dried by foam pigs. Following dewatering of the pipe, the test sections will be joined together by tie-ins.

Depending on the quality of the water sources selected for abstraction, the following additives may be required in the hydrotest water:

- oxygen scavengers;
- corrosion inhibitors; and/or
- biocides.

The use of any such additives will be clearly identified in the Hydrostatic Testing Plan described above which (as stated previously) will be subject to the prior approval of BOTAŞ, DSI and BTC Co.

If additives are used, the Hydrostatic Testing Plan will specify the procedure for testing and treatment of spent hydrotest water prior to discharge once testing has been completed. The discharge will meet Turkish Regulations and World Bank standards (see Appendix D).

It should be noted that all water discharged from a pipeline following hydrotesting would be expected to be discoloured/stained. Although visible, the concentrations of contaminants are normally very low and as such can usually be safely discharged to the environment (ie via irrigation or directly to watercourses). The level of iron in the discharged water will be determined and in the event that it is above DSI approved water quality parameters, one of two actions will be undertaken:

- either the hydrotest water will be diluted prior to discharge; or
- the hydrotest water will be treated to precipitate out excess iron prior to discharge.

4.8.5 Construction methods at crossings

4.8.5.1 Types of crossing

The crossings along the Turkish section of the BTC Pipeline route fall into the following categories:

- watercourses (rivers, streams, creeks, and artificial channels);
- railways;
- roads;
- faults;
- third party crossings (water, sewage, gas, telecommunications, power).

These generic crossing types have been investigated during detailed engineering and appropriate design specifications and associated design drawings have been developed. Based on these design specifications, the Construction Contractors will be required to prepare a site specific Construction Method Statement for each crossing within their Lot. These statements will describe the detailed methods to be employed for each specific crossing and will address timing, to take account of seasonal sensitivities (refer to the EMMP, Appendix C1), any special conditions, measures for sedimentation and erosion control, areas required for construction activities such as boring pits and lay down areas, dewatering of trenches and excavation, supply of materials to the site of the crossing, removal of excess material from the site, backfilling and re-instatement of surfaces and all associated temporary works to ensure a safe installation of the crossing. They will be required to include a detailed account of the environmental protection measures that will be put in place. These method statements will each require prior approval from BOTAŞ who will subsequently audit the implementation of the provisions in the field.

4.8.5.2 Crossings of Watercourses

Table 4.3 presents the classification system for watercourse crossings that has been developed for this project. These have been established with reference to the regulations of the General Directorate of State Hydraulic Works (DSI).

Table 4.3 Classifications of the River and Stream Crossings

TYPE OF WATERCOURSE CROSSING	SIZE	CLASSIFICATION CODE
Large river	> 30m width	RVX1
Medium river	5 > 30m width	RVX2
Small river, creek	< 5m width	RVX3
Small river, creek	<5m width (not subject to erosion, catchment <1km^2)	RVX4

Details of individual watercourses crossed by the pipeline are provided in Section 5.6.

For the main river crossings (all RVX1, RVX2 and for several crossings of RVX3 type which require special attention for construction purposes, see Figure 4.7), detailed crossing drawings have been prepared. Figure 4.13 illustrates a typical crossing drawing.

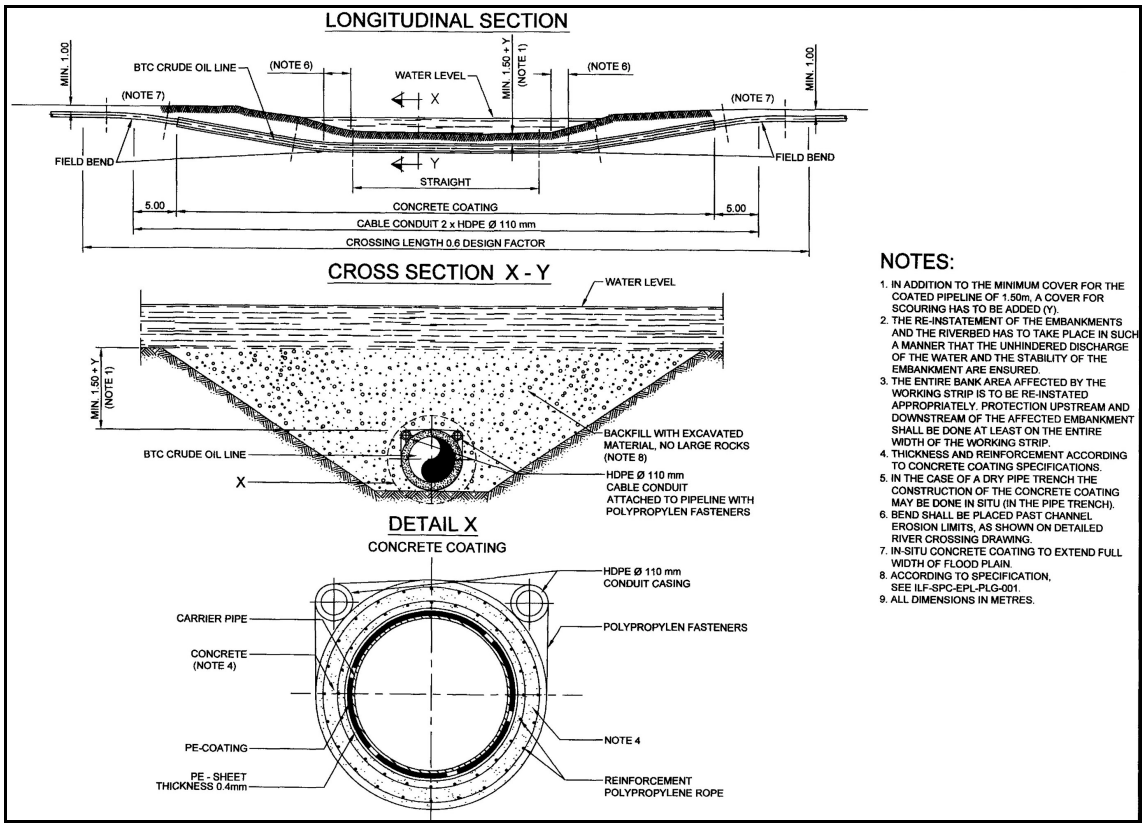


Figure 4.13 Typical Installation Details for a River Crossing [Ref 6]

It is anticipated that all river crossings will be open-cut trenched and that none will be directionally drilled. This strategy is feasible because the watercourses along the BTC Pipeline route are generally relatively slow-flowing. In addition, crossings of major (fastest flowing) rivers will be scheduled to take place when water levels are at their lowest. The crossings will be performed by dedicated crews, allowing the Contractor to schedule these activities independent of the mainline spread. Thus, even the major crossing of the Ceyhan River (see Section 4.5.12.1) is planned to be open-cut.

Careful attention has been paid to seasonal sensitivities that need to be considered if environmental damage is to be minimised. In this regard, the timing of construction of river crossings will be such that fish spawning seasons are avoided.

The appropriate permissions stated above will be obtained prior to undertaking any river crossing activities.

The principal steps in construction of waterway crossings are as follows:

- The first step will be the preparation of the working strip and the areas where the pipeline section is to be prefabricated and pre-tested. The width of the working strip for river crossings will be larger than the normal working width, due to the need for spoil storage and prefabrication areas to prepare the pipeline sections for the crossing.

- Following preparation of the working strip, the pipeline trench will be excavated. For large rivers, the pipe trench will be excavated by means of bucket ladder excavators or hydraulic excavators operating from pontoons in the river as well as from the riverbanks. Sedimentation caused by the trenching activities will be controlled by the use of cofferdams or sediment fences and/or by placing straw bales downstream from the construction area.

- In some areas, sheet piling may be required to temporarily shore-up the sides of the excavated trench. Sheet piling will also be used in places to facilitate dry works. These piles will be removed following construction of the crossing.

- In some cases, barriers may need to be constructed behind the riverbanks to prevent river water from flowing into the oncoming trench. These barriers will compromise earthen dams with some clay lining. Alternatively, trench boxes may be used to maintain the trench walls and protect personnel.

- The defined height and width of the pipe trench will be regularly monitored and documented. The excavated material will be stored temporarily in designated and approved areas for subsequent backfilling.

- The prefabricated pipeline sections of pre-tested pipe to be used for the larger river crossings will be assembled in a suitable prefabrication area in the vicinity of the crossing and will subsequently be pulled into place using a winch or suitable pontoons. As previously stated, to increase the negative buoyancy of the pipe, as well as to give mechanical protection, the pipe will be enveloped in a reinforced concrete coating.

- The extent of excavation required will depend on the width and depth of the river and its potential to scour (see Section 4.5.11), and the slope of the riverbanks. If necessary, excavation will be kept to a minimum via the use of so-called ‘swan necks’. ‘Swan necks’ are bent pipe sections, which are constructed to follow the actual inclination of the riverbank. Swan necks used on both sides of the crossing serve to avoid exceeding the minimum bending radii of the pipe.

- In some cases, normal trench excavation may not be possible, such as in rivers with flood protection dams or steep banks. In this case, too, ‘swan necks’ would be used on both sides of the river. Here, the pipe cannot be pulled in along a defined path, but must be supported when crossing the riverbank and then lowered. In this case the pipe will be made positively buoyant with floats and lowered using side booms and cranes.

- After checking the position of the pipeline, the pipe trench will be backfilled using the previously excavated material. Backfilling of the trench will inevitably cause sedimentation of the watercourse. The measures discussed above will be employed to reduce this effect.

- The final step will be the restoration of the bed of the river and its banks. In some cases, the riverbank slopes will need to be stabilised (see Section 4.5.11).

The method described above is essentially the ‘wet’ method of river crossing, whereby construction is undertaken in the water. For the crossing of smaller streams, creeks and

irrigation channel the 'dry' method may be chosen, which involves the temporary diversion of flow of the watercourse, so that the pipeline can be laid under near normal conditions.

Water flows in the small crossings (including streams, creeks and irrigation channel) will be maintained by the use of flume pipes and gravel materials. Trenching equipment can be placed on top of these materials and take advantage of them as a platform for undertaking the pipe construction activities.

Apart from rivers and streams, the pipeline will cross several concrete irrigation channels (see Box 4.3).

Box 4.3 Irrigation infrastructure Crossings

There are a total of 26 crossings along the route of planned or completed General Directorate of State Hydraulic Works irrigation projects. These are mostly in the Pasinler, Erzurum, Gőksun and Adana Plains. These crossings comprise:

- three crossings of irrigation projects in operation;
- one crossing of an irrigation project under improvement;
- nine crossings with projects which are under construction;
- ten potential 'crossings' of projects with the design completed or under design;
- three potential 'crossings' with projects which are in the preliminary study phase;

The route intersects with two groundwater resources that are managed by the General Directorate of State Hydraulic Works. The route crosses a total of 54 main irrigation channels, which were designed in the framework of irrigation development projects. The route also crosses 11 irrigation projects managed by the General Directorate of Rural Services. Of this total, five projects are in the design phase and the remaining six are in operation.

For irrigation infrastructure crossings, protocols will be signed with the General Directorate of State Hydraulic Works.

4.8.5.3 Railway crossings

Railway crossings will be constructed by auger boring or pipe jacking. The following requirements of the General Directorate of State Railways (TCDD) (see Appendix A8) have been taken into account during design:

- the minimum pipeline cover will be 1.5m (see below);

- all railway crossings will be horizontally drilled and cased to add to the mechanical protection (eg against pressure and corrosion) of the pipe. This means that a casing pipe, which is dimensioned accordingly, is thrust bored under the railway first. Then the pipeline section is subsequently pulled in with spacers to keep it central within the casing.

Plate 4.4 illustrates a typical railway crossing.

Plate 4.4 Typical Railway Crossing

A crossing protocol is being agreed between BOTAŞ and TCDD and a crossing fee will be payable. Details on TCDD requirements, protocol preparation and application to the regional directorates of state railways are presented in a letter from TCDD (see Appendix A8).

Pre-tested pipe with a 0.6 design factor will be used for all railway crossings. All railway crossings along the pipeline route have been classified in accordance with the system presented in Table 4.4.

Table 4.4 Classifications of Railway Crossings

TYPE OF RAILWAY CROSSING	CLASSIFICATION CODE
Railways – One track	RWX1
Railways – Two tracks	RWX2

The design and installation of the railway crossings will be in accordance with the requirements of API RP1102 and the General Directorate of State Railways. The principal steps in constructing railway crossings are as follows:

- Clearing of the working strip – because of the increased space needed for the entrance and exit pits for thrust boring, the width of the working strip at the crossing is likely to be increased by 10m, from 28m to about 38m. Sediment barriers will be built on the down gradient side of soil piles to control sediment-laden runoff.

- The next stage will be the construction of the entrance and exit pit for boring. A bore pit will be dug on one side of the railway (entrance pit) and a receiving pit (exit pit) on the other. The pits will be excavated to the depth of the trench. The dimensions of the pit will be dictated by the dimensions of the boring machine, which will be lowered to the bottom of the bore pit and placed on supports. The machine will cut a horizontal shaft using a cutting head mounted on an auger. The spoil from the boring will be extracted and stored for later backfill.

- The casing pipes used at railways crossings will be adequately designed for the expected external loads and thrust forces, which occur in boring type installations. The casing pipe will be externally coated for corrosion protection.

- The minimum depth of cover from the bottom of the rail to the top of the casing pipe will be 2.0m crossing through the expropriation border or under the railroad, which exceeds the requirements of the General Directorate of State Railways, which dictate a minimum depth of 1.5m.

- As a minimum, the casing pipe will be extended starting from the TCDD expropriation limit to a point further beyond the right of way of the TCDD.

- The slope inclinations of the crossing will be chosen such that the structure to be crossed is not affected. Depending on local soil and groundwater conditions, sheet-piling walls may need to be erected.

- The railway crossing works will be scheduled to ensure that the installation of the casing pipe is completed between scheduled train runs to avoid disruption. If sheet piling is required, consideration will be given to the potential effects of vibration to any adjacent buildings or structures.

- After installation of the casing pipe, the product pipe will be inserted within the casing pipe. To provide electrical insulation of the product pipe, isolating spacers will be inserted in the annular space between the two pipes.

- The product pipe will be connected to the rest of the pipeline by means of a tie-in weld. The trenches will be backfilled, with the stockpiled spoil material being placed in the original layers. The surface will then be compacted.

- Sign posts, which cannot be readily removed, will be placed at the IPs at the entry and exit points and within the expropriation border.

- Finally the surface will be restored and revegetated to its original state.

- During railroad crossings, an expert from TCDD will be present during the construction.

Box 4.4 provides further details of both rail and road infrastructure crossings.

Box 4.4 Transport Infrastructure Crossings

There will be three lots (ie from north to south; LOT A, B and C) where construction activities will be conducted along the whole route. In this regard, the information in this box was assessed and presented in terms of relation to the proposed BTC Project.

This section summarises the infrastructure facilities in the vicinity of, or to be crossed by, the proposed route of the BTC Pipeline. A total of 410 road crossings (not including tracks) are made along the Turkish section of the BTC Route – 351 (86%) are village roads, 36 (9%) are municipal roads, 23 (5%) are highways and main roads. The roads have been classified in accordance with the requirements of General Directorate of Highways. The BTC Route also intersects with six one-lane railways. The national highways, motorways and railways crossed (some crossed more than once), from north to south, are:

- Posof-Ardahan Highway;
- Ardahan-Erzurum Highway;
- Kars-Gole Highway;
- Kars-Agri Railway;
- Erzurum-Artvin Highway;
- Erzurum-Horasan Highway;
- Erzurum-Erzincan Highway;
- Erzincan-Trabzon Highway;
- Erzincan-Sivas Highway;
- Erzurum-Erzincan Railway;
- Sivas-Malatya Highway;
- Malatya Highway;
- Sivas-Malatya Railway;
- Adana-Osmaniye Railway;
- Adana-Gaziantep Highway;
- TEM Adana-Osmaniye Motorway.

For highway crossings, protocols will be signed with General Directorate of Highways and for railway crossings, protocols will be signed with General Directorate of State Railways.

4.8.5.4 Road crossings

The road crossings along the pipeline route have been classified with reference to the regulations of the General Directorate of State Highways (TCK) and in accordance with the system presented in Table 4.5.

Table 4.5 Classification of Road Crossings

TYPE OF ROAD CROSSING	CLASSIFICATION CODE
Highways and Main Roads	RDX1
Municipal roads – paved	RDX2
Municipal roads – unpaved	RDX3
Village roads – surfaced	RDX4
Village roads – unimproved	RDX5
Tracks – unimproved	RDX6

The design and installation of all categories of road crossings will be in accordance with the requirements of API RP 1102 and in conformance with the requirements of TCK. Pre-tested pipe with a design factor of 0.6 will be used for all road crossings except for very minor roads.

Highway crossings (RDX1) will be constructed by boring and casing and the minimum depth of cover from the pavement surface to the top of the casing pipe will be 1.5m.

In general, municipal roads and surfaced village roads (RDX2, 3, 4) will be crossed by the open cut method, unless required otherwise by the General Directorate of Highways. In the event that boring is required by the Directorate, then for the crossing of paved municipal roads (RDX2), it will be done through auger boring with casing. While for crossings of RDX3 and RDX4 roads, uncased boring will be employed. Crossings of roads and tracks classified RDX5 and RDX6 will be via open cut method.

Detailed design information for road crossings will be prepared and submitted to the relevant regional directorate of TCK for prior approval to ensure that all the technical requirements of TCK are met (see Appendix A8). In summary, the following actions will be undertaken.

- All necessary precautionary measures will be put in place, such as the erection of temporary warning signs, fences, closing of roads, detouring traffic, provision of traffic control devices, adequate shoring up of excavations etc. This will be carried out in accordance with the safety regulations of TCK.

- During open excavation works, all road diversions will employ traffic control devices to warn and protect the public and construction personnel. These diversions will be constructed to specifications approved by the applicable road authority. The diversions will be maintained in good drivable conditions until completion of the re-instatement work.

- All excavated material, if suitable for backfilling, will be neatly stacked outside the roadway. Material unsuitable for backfilling will be removed from the site immediately after excavation and transported to a suitable disposal site in accordance with the Project Waste Management Plan (see Appendix C3).

- Casing pipes used at highway/road crossings will be adequately specified for the expected external loads and thrust forces that occur in boring type installations. The casing pipe will be externally coated to protect against corrosion.

- Every effort will be made to ensure that all existing structures, utilities and road drainage facilities within the road right-of-way will be undisturbed. Any drainage to these facilities will be repaired or replaced.

- When the construction of the crossing is complete, the road surface will be restored to its original contour.

- In order to stabilise the construction entrances, minimise road damage by the construction machinery and reduce the amount of spoil being brought onto the road, the Construction Contractor will ensure that rocks are used to surface all paved road crossings. A stockpile of graded rock of an appropriate size will be maintained on the construction site for this purpose.

- Construction entrances/exit locations will generally be constructed to the minimum width and length with consideration to existing topography, change in road edge height, existing soil geography including compaction characteristics, right-of-way constraints etc.

- The off-road section of the corridor will be restored to its original contour and seeded and mulched for revegetation as required.

Finally, the Construction Contractor will ensure that all sediment deposited on public roadways is removed and returned to the construction site prior to re-opening of the road for public access. Sweeping of sediment deposits into roadway ditches, sewers, culverts, or other drainage will not be permitted.

4.8.5.5 Fault crossings

A total of five major fault zones are crossed within the Turkish section of the BTC Pipeline. These have been subjected to detailed investigations and comprehensive design, as described in Section 4.5.12.2.

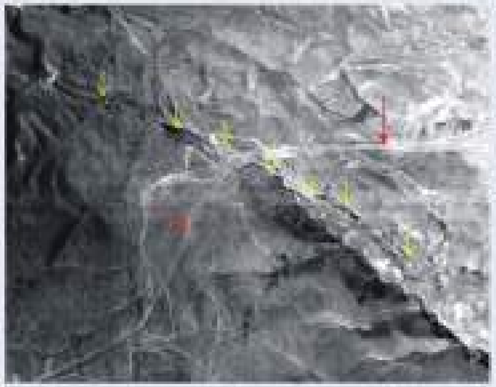
The design effort has focused on development of crossing specifications that will ensure that the integrity of the pipeline is returned in the event of a seismic incident, the emphasis being to ensure that the pipeline is not restricted in any movements that are induced during a seismic event. The surrounding terrain should absorb these displacements. This is achieved through the pipeline being placed in wide trenches with loose granular (non-cohesive) backfill to prevent the pipe from being bedded too firmly in the trench, thereby enabling pipeline movement to be accommodated without failure of the pipe. The design principles are discussed in section 4.5.12.2.

A typical trench for fault crossings is illustrated in the North Anatolian Fault crossing attached here as a case study.

Construction of the five active fault crossings will be supervised in the field by an experienced seismologist who will confirm the location, width and style of deformation of the fault at the crossing. If there is any indication of a variance in the width of the fault zone to that which has been predicted, the seismologist will have the responsibility and the authority to recommend modifications to the construction specifications for consideration of the design team.

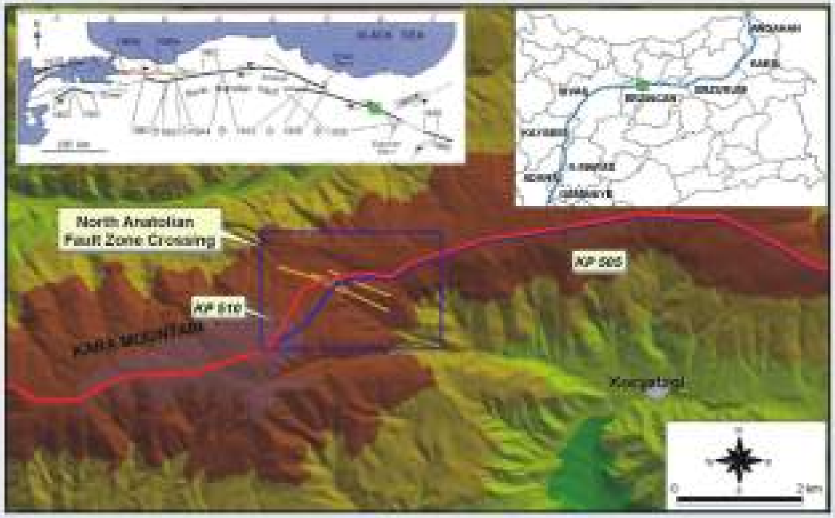
NORTH ANATOLIAN FAULT ZONE

The pipeline intersects the **North Anatolian Fault Zone** in Karadag, a high mountain range approximately 30 km NW of Erzincan. The main geological units in this area are ophiolitic melanges and Mesozoic and Tertiary sediments. The fault is a major active fault with four main fault splays which are considered to be synthetic faults that will slip only during an earthquake on the main fault trace (i.e. they are not likely to produce a seismic event independently). The expected design displacement has been determined to be 3 metres. The route crosses the fault zone twice in an area that has a series of well developed pressure ridges approximately 490 metres in width. In summary the fault zone at the pipeline crossing point is approximately 500 metres in width.



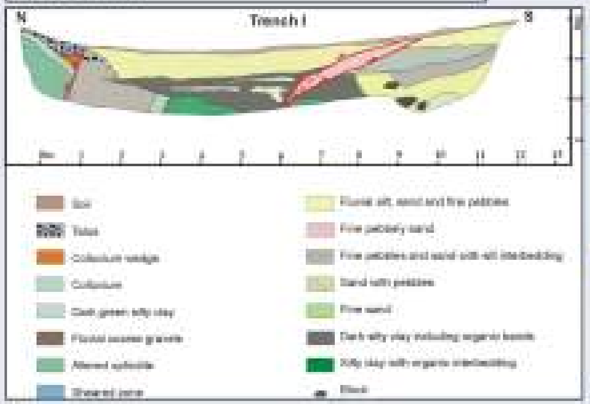
Yellow arrows show the main trace of the North Anatolian fault Red arrows show the Gas Pipeline.

The **North Anatolian Fault** is a right-lateral strike-slip fault, however, trench studies have revealed that the dextral strike-slip is combined with a reverse component. 2.95 m strike-slip and 0.52 m reverse-slip displacements were estimated for the main fault.



The investigation included the following activities:

- field observations and interpretation of 1:60,000 and 1:16,000 aerial photographs, satellite images and topographic maps;
- development of geological and geomorphological maps of fault crossings;
- paleoseismological trenching; and
- Very Low Frequency (VLF) measurements.



LOCATION OF TRENCH 1 ON THE MAIN FAULT

The fault crossing will be supervised by an experienced geologist during pipeline construction activities in order to confirm the location, width and style of deformation of the fault at the crossing point. During the construction period, the geologist will recommend modifications to the pipeline trench excavation, if observations indicate a difference in the width of the fault zone from that predicted.

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4.8.5.6 Third party crossings

There will be numerous crossings of water pipes, sewage pipes, gas lines, telecommunication lines and power lines along the route of the pipeline (see Box 4.5 and 4.6). A complete list of such crossings for the Turkish section of the BTC Pipeline has been completed and is available for inspection in BOTAŞ offices (see Box 1.2 or Section 1.7).

Box 4.5 Telecommunication Infrastructure Crossings

The pipeline crosses nine fibre optic cable lines, seven underground telecommunication cable lines, 22 network lines, 20 overhead network lines, 10 underground network lines and 13 underground telecommunication cable lines owned by Turk Telekom and an integrated communication systems of the Turkish Armed Forces.

Box 4.6 Water and Wastewater Infrastructure Crossings

Potable water transmission pipelines are crossed by the BTC Pipeline in five of the ten provinces that the route traverses, namely Ardahan (two pipelines), Kahramanmaras (five), Kayseri (one), Sivas (two), and Adana (one).

The route intersects with eight potable water transmission pipeline projects that are managed by the Provincial Bank, and another five potable water provincial master plans being developed by the same institution.

The route intersects with six potable water transmission pipeline project boundaries, three proposed potable water transmission lines, 30 potable water transmission lines, one settlement area, one potable water network and twice with the Kucuksu Irrigation Project boundaries that are all under the responsibility of the General Directorate of Rural Services.

The pipeline route intersects one sewer system within the boundaries of the province of Sivas.

The Project will endeavour to avoid disruption to these third party pipes and lines wherever feasible. Unavoidable disruption will only be undertaken with prior agreement by the affected parties in each instance. In the case of any accidental disruption of water supplies, repairs will either be undertaken immediately or alternative water supplies will be provided by the Project.

In response to consultation discussions, the General Directorate of the Turkish Electricity Distribution Corporation (TEDAS) has stated that any displacement or modification works required in relation to TEDAS facilities will be carried out in the context of a protocol. This protocol will be agreed prior to field work and in accordance with the Turkish High Voltage Regulation. The technical details of the relevant crossings protocol are specified in a letter from TEDAS, which is included in Appendix A8. The General Directorate of the Turkish Electricity Transmission Corporation (TEIAS) has advised that coordination should be undertaken with Erzurum, Keban and Kayseri regional directorates of the Corporation in order to avoid any possible impact on electricity transmission facilities along the route (see Appendix A8). The General Directorate of Electricity Generation Corporation (EUAS) has

given its clearance to the BTC route in terms of energy generation transmission facilities under their responsibility (see Appendix A8).

The opinion of the Governorships of the ten provinces along the BTC Pipeline route has been established, with regard to routing constraints presented by existing or known future infrastructure. Reponses from these Governorships are presented in Appendix A5. In addition, applications to the municipalities where the route traverses contiguous areas (eg Ulas District Municipality of Sivas) have been made to determine their perceived infrastructure constraints to routing (see Appendix A5).

Further details regarding electricity infrastructure crossings are provided in Box 4.7.

Box 4.7 Electricity and Fuel Infrastructure Crossings

The route crosses the following electricity infrastructure:

- Turkish Electricity Generation and Transmission Corporation (TEAS) – 35 electricity transmission lines of capacity 154kV and 380kV and one substation;
- Turkish Electricity Distribution Corporation – 186 electricity transmission lines under 154kV capacity and four electricity transmission lines of 154 kV - 380 kV capacity;
- Çukurova Electricity Inc. – one electricity transmission line with a capacity less than 154kV;
- Kayseri and Environs Inc – 14 electricity transmission lines under 154kV capacity and one electricity transmission line with 154kV - 380kV capacity.

The BTC Pipeline route also crosses three pipelines supplying aviation fuel to military airfields that are under the responsibility of NATO's Infrastructure Department. The NATO liquid fuel pipeline crossings will be made in accordance with the requirements of NATO Infrastructure Department from the Ministry of National Defence.

4.8.6 Requirements for borrow material

The project recognises that, in the absence of appropriate management measures, sourcing of borrow materials has the potential to present a significant indirect impact. For this reason, the Project will ensure that all borrow materials (rocks, gravel, sand) will only be sourced from either existing or new licensed or authorised sources. Suitable existing quarries in the vicinity of the pipeline route are currently being identified. Further details on existing quarries and estimated project quantities are detailed in Appendix C10, Aggregates Management Plan.

The Construction Contractor will be required to demonstrate authorisation before procuring any materials. Where new quarries are foreseen, the Project will be responsible for obtaining the necessary permits and licences, as well as undertaking an EIA for prior approval in accordance with the Turkish EIA Regulations.

Reinstatement of any quarries specific to the BTC Project will be carried out to the satisfaction of the respective landowners and local authorities.

Likely quantities of sand, gravel, stones and riprap material required for the construction of the pipeline have been estimated for resource planning purposes. This estimate has been based on the anticipated requirements of the following construction factors:

- fault crossings;
- protection of river crossings;
- access roads to BVSs;
- access roads and foundations for pump stations and pressure reduction station;
- sand bedding and sand fill around the pipe.

It should be emphasised that these are approximate estimates for resource planning purposes only, and will be firmed up as detailed engineering develops further.

4.8.6.1 Fault crossings

For the crossing of the faults a selected backfill comprising a round sand/gravel mix will be needed. No broken material can be used.

The cross-sectional area of the trench will be approximately 16m^2 due to the required flat-sloped sidewalls of the trench (see Figure 4.6). In total five fault zones have to be crossed. The estimated total length of where special trench backfilling needs to be applied is 3,500m. This implies an estimated quantity of 58,000m^3 of gravel mix required at the fault crossings.

4.8.6.2 Protection of River Crossings

All rivers and erosion ditches will be protected along the entire width of the working strip. The mean length of protection is assumed to be 50m for large rivers (>30m width), 30m for medium rivers (5-30m width) and 10m for small rivers, creeks and erosion ditches. The mean thickness of the protection is estimated as 0.7m for large rivers and 0.5m for medium to small rivers, creeks and erosion ditches.

There are 17 large river crossings (RVX1), 34 medium river crossings (RVX2), 120 small river crossings (RVX3) and between 300-400 crossings of temporary rivers, creeks and erosion ditches.

Based on a conservative approach to the above assumptions, the required volume of stones and riprap is estimated to be 90,600m^3.

4.8.6.3 Access roads to BVSs

There will be 52 BVS's. The quantity of gravel needed for construction of permanent access roads to the BVS's is estimated at 16,200m^3. In addition, approximately 591,000m^3 of gravel will be required for construction of temporary access roads.

4.8.6.4 Pump stations and pressure reduction station

The need for gravel for the construction of the station foundations and access routes has been estimated as follows:

- PT1: 23,000 m^3;
- PT2: 45,000 m^3;

- PT3: 29,000 m^3;
- PT4: 23,000 m^3;
- IPT1: 8,670 m^3.

The total requirement for gravel for construction of the stations is therefore estimated at 128,600m^3.

4.8.6.5 Sand bedding and sand fill around pipe

The quantities of sand required for the bedding of pipes, and to provide fill around them is estimated to be approximately 4,785,000m^3**.** It should be emphasised that sand will only be imported where the excavated material is not deemed suitable.

The Construction Contractor will ensure that all borrow material will only be sourced from (both existing and new) licensed and authorised sites or sources. BOTAŞ is in the process of identifying suitable existing quarries in the proximity of the pipeline route. Where new quarries need to be opened, the Contractor will obtain the necessary permits and licences and conduct any necessary EIAs.

Materials will not be transported to the construction sites in such a way that their transport causes significant adverse environmental impacts. All such traffic movements will be carried out in accordance with the project Traffic Management Plan (see Appendix C5). The Contractor will maintain all roads to the satisfaction of the authorities, landowner and BOTAŞ.

Reinstatement of the quarries will be carried out to the satisfaction of the respective landowners and local authorities.

4.8.7 Construction access and traffic

4.8.7.1 Construction access

Access routes are currently being defined in line with the Traffic Management Plan (see Appendix C5). During construction, the use of existing access routes will be maximised, supplemented by temporary access roads, if required.

If the Construction Contractors requires additional access routes, they will apply for approval from BOTAŞ. In identifying suitable permanent access routes and constructing temporary ones, the Contractor will comply with the specifications detailed in the Traffic Management Plan (Appendix C5). These specifications will form part of the construction contract.

4.8.7.2 Personnel movements during construction

For each spread, the daily transportation of approximately 300 workers from the camps and villages to the construction sites will be accomplished primarily by the use of buses. Approximately 10 buses will be required to distribute workers along a 20-30km construction area. A further 25 light trucks, such as pick-ups, may be required for transporting personnel within the spread.

4.8.7.3 Plant and materials deliveries

It is assumed that approximately 100 pieces of construction equipment will be required per construction team or spread. The equipment required will be a mix of heavy and medium construction equipment, light construction equipment and vehicles such as buses, pickup trucks and 4W drive cars.

All non-mobile equipment will be transported to the construction site by rail, where appropriate, and using the existing roads and highways system.

The most significant transportation requirement during the construction phase will be the transportation of the 12.5m long steel pipe sections from the receiving ports to the temporary laydown yards. The preferred means of pipe section transportation will be by rail with road haulage being employed between the nearest railyard and the laydown areas. Further details regarding the location of the rail yards in relation to key points on the pipeline route are provided in Section 5. From the temporary laydown yards the pipe sections will be transported to the actual point of construction along the working corridor. It may be possible in some areas to minimise handling of materials by direct delivery to the construction areas. Traffic movements may also be reduced should the Contractor elect to double joint (by welding two 12.5m lengths together) although this will depend on the weight of the pipe and applicable loading limits. For the 42" pipe, the weight will range from around 3.6 tonnes to just under 7 tonnes per 12.5m length subject to pipe wall thickness. The weight of the 46" pipe sections will be proportionately more and for the 34" pipe section it will be proportionally less.

For the pipeline length of 1076km, based on 12.5m pipe lengths, approximately 8,600 pieces of pipe will be moved during construction of the entire pipeline. Once bends etc are factored in, the likely number of pieces of pipe is likely to be of the order of 100,000. Each joint of pipe will weigh approximately 3.5–7 tonnes and if transported by road, would be limited to typically four joints per load, depending on highway weight restrictions and, transport hazard considerations. It should be emphasised that loads will be considerably reduced when hauling along the RoW due to unimproved temporary access roads, higher altitudes and steeper slopes.

Further traffic movements are likely to be generated in certain areas, where no suitable fine materials can be found locally for pipeline bedding and padding purposes (refer to Section 4.3.4).

Movement to address the increased traffic flows associated with the delivery of plant, pipe materials and personnel are provided in the Traffic Management Plan (Appendix C5).

4.9 REINSTATEMENT FOLLOWING CONSTRUCTION

4.9.1 Introduction

The Reinstatement Plan (Appendix C2) will form part of the Construction Contract and details the requirements for reinstating the working width following pipeline construction.

The objective of the Reinstatement Plan is to re-establish a vegetative cover that is compatible with the surrounding environment. From an erosion prevention perspective establishing a vegetative cover in the most effective means to combat erosion. This is a fundamental aim of the Plan and will be achieved thorough implementation of the following engineering and bioengineering methods:

- soil reinstatement;
- erosion control;
- riverbank restoration;
- bio-restoration;
- special areas;
- handover and post-construction maintenance.

A brief outline of these requirements follows. For further details, reference should be made to Appendix C2.

4.9.2 Soil reinstatement

The protection of soils and their subsequent use in reinstatement is a vital aspect of mitigating environmental impacts arising from pipeline construction.

During construction, the topsoil will have been carefully stripped to a depth of 15-30cm (or as appropriate for local conditions) and stored separately from the subsoil, where it cannot be compacted by vehicles or become spoiled or mixed with other materials. Subsoil will be removed in such a way so as to avoid excessive erosion.

Following construction these soils will be reinstated as follows:

- subsoil returned to the trench it will be compacted to a state similar to that in the adjacent undisturbed areas.
- topsoil will be spread to an even depth and matched to the surrounding ground on both sides of the working width.

The activities described above will be undertaken in accordance with the Reinstatement Plan and to meet the requirements of the Ministry of Agriculture and Rural Affairs, and General Directorate of Agricultural Production and Development. The Ministry requirements are described in a letter received from the General Directorate (see Appendix A8).

4.9.3 Erosion control

Inadequate restoration and reinstatement measures will result in soil erosion on sites laid bare by construction.

Erosion stabilisation methods will be applied to all sloping lands disturbed by construction activities. The methods used to control runoff will comprise graded channels constructed across and down slopes. Graded slope breakers (interceptor cross drains) will contain and remove runoff from the working width and other disturbed areas. These will discharge into natural channels, vegetated waterways or lined chutes, depending on local topography.

4.9.4 Riverbank restoration

The Project will be responsible for implementing the protective measures outlined in Section 4.5.11 to safeguard watercourses during and following the completion of pipeline construction.

The backfill over the pipe will be at least as scour-resistant as the original bed material and the disturbed portion of riverbeds will be returned to pre-construction contours to the extent practicable. Riverbanks will be restored to their original condition and contours.

Erosion and sediment control devices will be installed and maintained until revegetation is sufficiently established.

4.9.5 Bio-restoration

As required by the provisions of the RP (see Appendix C2), construction areas will be reforested and reinstated to their original state by the Contractor following completion of the works. In particular, all disturbed slopes will be planted and a layer of mulch will be applied to protect seeded areas. The type of mulch will vary with the time of seeding, the slope and the soil conditions.

Until such time as vegetation becomes firmly established, the Contractor will make regular visits to assess and monitor the effectiveness of revegetation. Where seeding or replanting has failed to establish itself, further appropriate measures will be applied.

4.9.6 Special areas

A number of Special Areas have been identified along the pipeline route that will require particular attention throughout the construction and reinstatement phases. These Special Areas include:

- side slopes;
- steep slopes;
- ecologically sensitive areas;
- karstic areas;
- areas of volcanic tuff;
- AGI sites.

The Contractor will prepare site specific method statements for each of these Special Areas, which will demonstrate how reinstatement standards and requirements of the RP will be achieved. These statements will include strategies to ensure that construction and reinstatement in these areas is completed within periods of minimum duration.

An increased level of inspection and audit of Contractor performance will be undertaken by the Project during construction and reinstatement in these areas.

4.9.7 Handover and post-construction maintenance

The Contractor will carry out the necessary aftercare (watering, further application of fertiliser, replanting etc) in order to ensure successful re-vegetation and will regularly monitor the progress of bio-restoration.

Before site demobilisations, the reinstatement efforts of the Contractor will be inspected and, if found to be satisfactory, will be provisionally accepted project management. This provisional acceptance will be provided on the basis of the Contractor providing a reinstatement warranty for a minimum period of 12 months. Prior to the end of the warranty period, a final reinstatement inspection will be undertaken and any necessary corrective measures will be instigated until the state of the reinstatement meets the requirements of the Project. Upon final approval of the reinstatement works, the responsibility for the future management and maintenance of the reinstatement programme will reside with BOTAŞ Int on behalf of BTC Co. These responsibilities will be assigned as part of the ongoing operation and maintenance programme for the pipeline (see section 4.12).

4.10 CONSTRUCTION OF THE AGIs

4.10.1 General

The AGIs will be constructed in accordance with the specifications and reference drawings that have been developed during Detailed Engineering.

The main items of work will comprise the following:

- pre-construction surveys;
- earthworks;
- construction of access roads and traffic areas;
- provision of water supply systems;
- construction of wastewater treatment and discharge systems;
- construction of fences and gates;
- preparation of foundations;
- erection of buildings;
- installation of plant and equipment;
- hook-up of equipment, control and utility interfaces;
- grading, reinstatement and landscaping.

Section 4.7 provides a full description of the components and facilities to be provided at the Pump Stations and Pressure Reduction Station.

In the subsections that follow, additional information is provided in relation to pre-construction surveys, earthworks, access roads and foundation preparation.

4.10.2 Pre-construction surveys

The Construction Contractor will conduct field surveys to verify site alignment and condition demarcation stakes will be placed for construction reference, benchmarks will be established and the final site layout will be determined.

4.10.3 Earthworks

Excavation and backfill works will be carried out to establish and contour appropriate terrace levels for each of the facilities, as well as for establishing the base for the access roads, the internal roads and traffic areas. The earthworks required for the helipad which is to be provided at each of the four pumping stations, will also undertaken including establishment of a sub-base, an asphalt base and top course.

The entire bunded area of the tank yard housing the Relief Tanks at the Pump Stations and the Pressure Reduction Station will have a subsoil liner installed to serve as protection against oil spillages.

The earthworks will include the excavation and backfill works for all piping systems, including the land drains, the stormwater systems, water supply, sewers, wastewater treatment and disposal facilities and for all cable conduits.

4.10.4 Construction of roads and traffic areas

All access roads (where appropriate) and internal roads of the stations will be constructed with appropriate slope and cross fall. All roads, and vehicular areas will be provided with a sub-base, an asphalt base and top course. De-watering will be achieved via a drainage system comprising road gullies and piping, routed in such a manner as to avoid erosion or inundation of the adjacent off road land areas.

4.10.5 Preparation of foundations

Reinforced concrete foundations with frost barriers are to be constructed for each of the following associated facilities:

- relief tanks;
- fire water tanks;
- re-injection pumps;
- utility tanks;
- transformers;
- high voltage switch gear;
- lighting and fencing posts;
- pumps and drivers at the pump stations.

For the helipads at the pumping stations a concrete landing area with a diameter of 30m will be built.

4.11 COMMISSIONING

Following mechanical completion and hydrotesting of the pipeline and AGIs (anticipated in October 2004), commissioning activities will commence. It is planned that commissioning of the BTC Pipeline System will take approximately four months to complete and will essentially ensure that the pipeline system is fit for operation.

The main commissioning steps will be as follows:

- confirmation that construction activities have been satisfactorily completed;
- inspection of plant controls, and monitoring facilities to achieve the desired level of environmental management;
- calibration of instrumentation;
- mechanical and electrical equipment checks;
- telecommunication checks;
- SCADA system checks;
- ESD and LDS system checks
- start-up of pumps;
- start-up of power equipment;
- initial filling of the pipeline;
- system proving.

Finally a Work Completion Certificate will be issued and the pipeline will be declared ready for operation.

4.12 ROUTINE OPERATION AND MAINTENANCE

4.12.1 Routine operation

As has been emphasised throughout this Project Description Section, the BTC Pipeline will represent the culmination of more than five years of focused investigation aimed at providing a high integrity pipeline designed to world-class standards with respect to safety, operability and environmental protection.

Routine operation of the pipeline will benefit from this extensive and thorough design effort. The features of the pipeline, which ensure its integrity and, by direct implication, its ability to operate for the design life of 40 years with only minimum impact on the environment, have been presented in Sections 4.6 and 4.7.

Automatic monitoring and distributed control of the entire pipeline, will be undertaken through the Supervisory Control and Data Acquisition (SCADA) system. Monitoring and control of the various facilities will be available locally and remotely from the pipeline control centres. The primary control centre will be located in Sangachal, Azerbaijan and the back-up control centre will be located at the proposed BTC Marine Terminal at Ceyhan. The facility will exist to switch between local and remote modes of control.

Numerous measures have been built into the design of the pipeline to enhance the level of safety of the routine operation. These measures include an increased design factor at all crossings, increased pipe wall thickness in sensitive areas, the strategic location of BVSs, which serve to isolate sections in the case of pipeline rupture, and the burial of the pipe in sufficient depth to avoid third-party and environmental damage. The detailed attention that has been paid to delineation and characterisation of the five active faults along the route and the design of the pipeline fault crossings to accommodate foreseeable seismic events at these crossings will further enhance the integrity of the Pipeline.

A 7m wide Health Protection Zone has been defined on either side of the pipeline in consultation with the Ministry of Health (MoH). Similarly, a Health Protection Zone of 150m for PT1/2/3/4; 80m for IPT1; 50m for the metering station: and 20m for each BVS has been defined around the facility centres of these locations. These Zones will be clearly marked on 1:1000 maps. Agricultural activities will be permitted within these zones, but no planning permission for construction of buildings will be issued within these protection areas.

4.12.2 Maintenance

A maintenance programme will be implemented to sustain smooth operation and to preserve the integrity of the physical assets.

All maintenance will be undertaken in accordance with the requirements of the BTC Pipeline Operations and Maintenance Manual, which is currently being finalised, as well as the provisions of the suite of Management Plans presented in Appendix C.

Regular pipeline surveillance will be undertaken which will include line walking, periodic aerial surveys and liaison with owners/occupiers, tenants and local other authorities.

The surveillance programme will monitor the entire pipeline length with particular attention paid to sensitive locations including river, road, rail and fault crossings.

Intelligent pigging will be carried out (approximately every five years) to check the integrity of the pipeline. This will entail recording any changes (from the baseline installation case) in the pipeline thickness and shape and inspecting for defects and cracks.

4.12.3 Contingency planning

A detailed Emergency Response Plan (ERP) is currently being prepared by the project to identify and plan the response effort that will require mobilisation in the event of any major incident associated with the BTC Pipeline.

A framework Oil Spill Response Plan (OSRP), which will form a specific component of the broader Emergency Response Plan, has been developed (see Appendix C6) and provides the response strategy and key considerations for a major oil spill from the Pipeline, the AGI stations or the BTC Marine Terminal. This framework OSRP will be developed into a detailed contingency plan. The framework includes a schedule of required activities to ensure an effective plan is in place with trained personnel and the necessary equipment prior to oil entering the Turkish section of the pipeline. Exercises will be held prior to first oil.

4.13 DECOMMISSIONING

ASME B31.4, the main code under which the BTC Pipeline has been designed, stipulates the following:

"In the event of abandoning a piping system, it is required that:

a) facilities to be abandoned in place shall be disconnected from all sources of the transported liquid, such as other pipelines, meter stations, control lines, and other appurtenances;
b) facilities to be abandoned in place shall be purged of the transported liquid and vapour with an inert material."

The Host Government Agreement (HGA) requires the MEP Participants (whose obligations will be adopted by BTC Co) to submit an Abandonment Plan at the end of the Agreement period, which describes the proposed action in relation to:

- the removal of all surface installations;
- the clearance of all waterways and marine areas from objects posing navigational hazards;
- the drainage and disposal of any remaining crude oil from the facilities;
- disconnection of the system from sources and supplies of petroleum;
- filling and sealing of abandoned pipelines;
- filling of all trenches, holes and other surface depressions left by the removal of surface installations.

The BTC pipeline and associated AGIs have a design lifetime of approximately 40 years. It is currently envisaged that they will be decommissioned and abandoned thereafter. The likely measures to be undertaken are outlined below.

If feasible, above ground facilities will be left in place for further use. In those locations where this is not appropriate, facilities will be decontaminated before being abandoned in situ or entirely dismantled and removed. Wherever practicable equipment and materials will be collected for reuse, recycled or material recovery.

Pending governmental approval, buildings will be provided to local organizations for reuse. Otherwise, they will be demolished and properly disposed of according to the Project's Waste Management Plan (see Appendix C3).

Demolished sites will be cleaned up and land will be reclaimed, if unused.

In most cases, project-improved roads and railroad sidings will be left in place for continued use unless deemed environmentally or socially undesirable.

The pipeline itself will be cleaned, filled with an inert gas, air or water and capped. It is likely that it will be abandoned *in situ* in the ground in a condition that is acceptable to the responsible authorities. This is likely to be the preferred option in environmental terms – the alternative, namely removing the pipe would involve excavation of the reinstated alignment with the attendant environmental disturbance.

The need to maintain a functional cathodic protection system will be assessed to prevent corrosion in critical areas as corrosion could lead to subsidence. In some particular sections the pipeline may be filled with concrete to prevent collapse.

The approach described above presents the possible scenario decommissioning which is not anticipated until 2045 at the earliest, and norms for decommissioning could change during this period. Details of how the BTC facilities will be abandoned will be determined prior to decommissioning and agreed with the Government at that time in accordance with the HGA. Therefore it is not possible, at this stage, to determine exactly what steps will be taken, other than to state that decommissioning will be in undertaken in accordance with international standards applicable at the time of end of life of the Project.

4.14 INVENTORY OF WASTES AND EMISSIONS

4.14.1 Inventory of wastes – construction phase

4.14.1.1 Emissions to atmosphere

The principal sources of air emissions during construction will be as follows:

- vehicular emissions associated with transportation of pipes, equipment and materials and workers to the main construction laydown areas and onward to the ROW;
- emissions from plant (generators, cranes etc) and vehicles along the pipeline ROW;
- emissions from power generation at the worker camps along the ROW.

The work programme for import and delivery of pipe and materials is still the subject of an ongoing Logistics Study (see Traffic Management Plan, Appendix C5). There is currently insufficient detail to quantify emissions during the Construction Phase.

4.14.1.2 Discharges of liquid effluents

The principal sources of discharge during construction and commissioning will be:

- sewage (grey and black water) arising from construction camps;
- hydrotesting water discharges.

Again, development of these inventories is awaiting greater definition of the overall construction programme.

4.14.1.3 Waste arisings

Solid waste arisings from pipeline and AGI construction may be predicted to reasonable levels of certainty on the basis of waste arising on previous (similar) pipeline construction projects. Based on past experience, amended to accommodate key project variables (pipeline length, diameter, design details etc) it is feasible to develop an estimated inventory of construction waste arisings. These are presented in Table 4.6. The total waste arisings during construction is estimated at 2,650,000 tonnes. Waste related to the BTC Marine Terminal construction is detailed in Section 9.

4.14.2 Inventory of wastes – operations phase

4.14.2.1 Emissions to atmosphere

The principal sources of emissions associated with the operation of the pipeline are combustion gases associated with exhausts from pump drivers at the four pump stations. These drivers will all be fuelled by low sulphur natural gas and hence emissions of concern are principally nitrogen oxides with regard to local air quality and carbon dioxide and methane with regard to greenhouse gas emissions. Quantified estimates for these emissions are provided in Table 4.7.

4.14.2.2 Discharges of liquid effluents

Liquid effluent arisings during the operational phase of the pipeline are limited to those associated with the four pump stations (PT1, 2, 3, 4) and the pressure reduction station (IPT1). Effluents will comprise:

The provision of slop oil handling systems at each AGI will ensure that oily wastes (including wax arising from operation of the pig receiver/launcher assemblies) will be recovered and reinjected into the pipeline.

Effluents will comprise:

- treated sewage (grey and black water) effluents associated with operators of the facilities;
- treated oily water (equipment washing and contaminated drainage);
- (potential contaminated) fire water discharges in the event of a fire.

Estimated quantities are presented in Table 4.6.

4.14.2.3 Solid waste arisings

Solid waste arisings during the operational phase will be limited to relatively small quantities of domestic refuse and operational works. Indicative types and quantities are estimated in Table 4.15 from a number of sources. These values will be fully quantified during preparation of the operational Waste Management Plan, at which time options for minimisation, recycling, treatment and disposal will be evaluated taking due account of experience gained during the construction phase.

Table 4.6 Provisional Waste Inventory for Pipeline RoW

WASTE STREAMS	SOURCES	CLASSIFICATION (I, H or NH)*	MANAGEMENT OPTION	QUANTITY (TONNES) ***			
				LOT A	LOT B	LOT C	TOTAL
Construction							
Activated carbon	Spent fines from filtration systems	H/NH	Landfill	6	10	7	23
Aerosol cans	Empty containers, principally from personal use of deodorants and some chemical usage during construction	H	Pierce mechanically and recycle	2	3	2	7
Aluminium cans	Largely empty beverage cans	NH	Crush and recycle	55	2	67	124
Batteries Wet	Depleted cells used in vehicles and machinery	H	Recycle	3	5	4	12
Batteries Dry	Depleted cells used for personal stereos and other portable equipment, such as torches	H	Recycle	1	2	1	4
Bitumen	Residues from road making. Mostly reused at the sites in road making	H	Incinerate	82	136	99	317
Black water				37834	62878	45735	146447
Blasting rubble	From areas where the geology requires blasting	NH	Off-load at designated spoil disposal sites (locations to be provided); or where practical as a secondary option - crush and use as building aggregate	TBD	TBD	TBD	TBD
Bricks and building materials		I	Landfill	17	29	21	67
Cables / copper	Off-cuts from construction of the facilities and temporary camps, plus removal during decommissioning	H	Recycle	<1	<1	<1	>1
Cement dust		NH	Landfill	<1	2	1	3
Chemicals	Spent chemicals and residues from all project phases, such as pipe coating, bleaches	H	Physical/chemical treatment; evaporate in drums; residue to landfill	TBD	TBD	TBD	TBD
Acids			Physical/chemical treatment; residue to landfill	TBD	TBD	TBD	TBD
Adhesives			Incinerate	<1	<1	<1	>1
General Chemicals			Special treatment - disposal to a suitably licensed facility	11	18	13	42
Firefighting foam			Evaporate in drums; residue to landfill	<1	1	1	2
Glycols			Evaporate in drums; residue to landfill	5	8	6	19

WASTE STREAMS	SOURCES	CLASSIFICATION (I, H or NH)*	MANAGEMENT OPTION	QUANTITY (TONNES) ***			
				LOT A	LOT B	LOT C	TOTAL
Solvents			Evaporate in drums; residue to landfill	<1	1	1	2
Concrete / foundations	Deconstruction of facilities during reinstatement and site restoration	I	Crush and use as building aggregate	33	54	39	126
Containers (large size)	Empty steel drums	NH	Recycle	TBD	TBD	TBD	TBD
Containers (other)	Empty steel and plastic containers of varying sizes	NH	Landfill	TBD	TBD	TBD	TBD
Contaminated soils	Largely from spills and other accidental releases	H	Wash, fix and use as aggregate	TBD	TBD	TBD	TBD
Contaminated water	Rainwater accumulated in fuel tank storage bunds	H	Special treatment - disposal to a suitably licensed facility	TBD	TBD	TBD	TBD
Drum cleaning waste	From cleaning steel drums of residual materials so that they may be re-used for other applications	H	Special treatment - disposal to a suitably licensed facility	727	1208	879	2814
Electrical/electronic comps		NH	Landfill	<1	<1	<1	>1
Electrical (eg switchgear)		H/NH	Landfill	<1	<1	<1	>1
Exhaust catalysts			Landfill	<1	<1	<1	<1
Filters air/oil	Spent filters from machinery and vehicles	H	Incinerate	<1	2	1	3
Filters (water)		NH	Incinerate	2	3	3	8
Food	Scraps and other organic waste	NH	Incinerate	274	456	332	1062
Diesel, Fuel and Oil Wastes	Oil absorbers, grab packs and granules	H	Incinerate	TBD	TBD	TBD	TBD
Diesel		H	Incinerate	9	16	11	36
Diesel generator lube oil		H	Incinerate	24	40	29	93
Misc oils (incl hydraulic)		H	Incinerate	2	3	3	8
Vehicle & equip lube oil		H	Incinerate	12	20	15	47
Glass	Empty bottles, largely from domestic use	I	Recycle	329	547	398	1274
Glycol sludge		H	Incinerate	<1	<1	<1	1
Greases	Residues of lubricating products, plus some domestic greases	NH/H	Incinerate	TBD	TBD	TBD	TBD
Greywater				88279	146716	106714	341709
Hydrotest water	Discharges from hydrostatic testing of pipelines (may contain chemicals, such as biocides and oxygen scavengers)	NH	Tested prior to discharge at a controlled rate to a site agreed with the MoE	19916	33099	24075	77090
Incinerator ash		H/NH	Landfill	360	598	435	1393
Insulation	Offcuts from installation of insulation materials to piping and plant	H	Landfill	<1	2	1	3

WASTE STREAMS	SOURCES	CLASSIFICATION (I, H or NH)*	MANAGEMENT OPTION	QUANTITY (TONNES) ***			
				LOT A	LOT B	LOT C	TOTAL
Light bulbs	Spent incandescent and fluorescent bulbs	H	Recycle - (fluorescent bulbs if in v. large quantities may require special treatment)	<1	<1	<1	<1
Medical	Hazardous clinical waste, including sharps, needles, swabs, etc	H	Incinerate	<1	1	1	2
Packaging materials	Plastics, paper, cardboard, etc	NH	Recycle	TBD	TBD	TBD	TBD
Paint sludge		H	Incinerate	1	1	1	3
Paint and cans/brushes	Residues and discarded wastes from construction and maintenance activities, both oil and water based	H	Incinerate	<1	<1	<1	<1
Paper and card	Wastes from office and domestic use	NH	Recycle/incinerate	277	460	334	1071
Pipe-bands and end caps	Pipe-string and bending	NH	Recycle (metal and plastic)	12	20	15	47
Pipe dope	Residues from pipeline construction	H	Incinerate	TBD	TBD	TBD	TBD
Pipeline coating chemicals:	Spray residues from coating of pipeline during construction	H	Specific management options depending on chemical component	14	24	18	56
Dust and grit	Open abrasive grit blasting	NH	Waste material must be packed to avoid release of dust. Dispose at an appropriately licensed waste facility.	TBD	TBD	TBD	TBD
Solid tar-urethane	Automatic (machine) and manual spraying	NH/H	Mix small quantities of polyol and isocyanate together and allow to solidify. Dispose of solids as non-hazardous. Any liquid waste to be disposed of as hazardous.	TBD	TBD	TBD	TBD
Solid urethane	Manual application of liquid systems (by brush, pad or spatula)	NH/H	Mix small quantities of polyol and isocyanate together and allow to solidify. Dispose of solids as non-hazardous. Polyol waste to be disposed of as non-hazardous and isocyanate waste as hazardous.	TBD	TBD	TBD	TBD
Methylene chloride/ Dichloromethane	Automatic (machine) and manual spraying	H	Allow evaporation from empty drums before sealing them. Disposal of hazardous liquid waste to a suitably licensed facility.	TBD	TBD	TBD	TBD
Xylene	From cleaning oil and grease deposits from the substrate, particularly steel, prior to grit blasting	H	Allow evaporation from empty drums before sealing them. Disposal of hazardous liquid waste to a suitably licensed facility.	TBD	TBD	TBD	TBD
Plastic bottles	Mostly discarded water containers and other domestic supplies; some industrial supplies	NH	Recycle	276	459	334	1069

WASTE STREAMS	SOURCES	CLASSIFICATION (I, H or NH)*	MANAGEMENT OPTION	QUANTITY (TONNES) ***			
				LOT A	LOT B	LOT C	TOTAL
Plastic 'epoxy' drums		H/NH	Incinerate	32	52	38	122
Polystyrene	Objects such as stem protective caps	NH	Incinerate	11	18	13	42
PPE and clothing	Discarded personnel protective clothing, overalls, boots, rags, etc	H/NH	Incinerate	9	15	11	35
Radioactive		H	Return to supplier	<1	<1	<1	<1
Rags and oil absorbents		H	Incinerate	30	50	36	116
Refuse type wastes		NH	Incinerate	TBD	TBD	TBD	TBD
Sewage	Sewage from construction camps and temporary facilities	NH	Primary treatment of waste on site, then disposal of treated waste by appointed waste management contractor in agreement with local water authority	TBD	TBD	TBD	TBD
Sewage sludge	Hazardous residues from the sewage treatment facilities	H/NH	Special treatment - disposal to a suitably licensed facility	110	182	133	425
Site Drainage Water	Accumulation of rainwater and percolating groundwater in pipe trench.	NH	Pump into adjacent ditch using suitable filtration/settlement techniques in accordance with the requirements of MoE	TBD	TBD	TBD	TBD
Soil and gravel	Surplus excavated soils and imported fill	NH	Use as aggregate	TBD	TBD	TBD	TBD
Solvents	Residues from construction and maintenance activities	H	Evaporate in drums; residue to incineration	TBD	TBD	TBD	TBD
Steel	Offcuts from construction of pipelines and plants; removal of equipment during decommissioning	NH	Re-use - store useful components for future work and recycle remainder	499	830	603	1932
Stone / fencing / gates / troughs	Temporary stone roads; temporary fencing, gates, troughs etc.	I	Re-use elsewhere within landholding if possible	TBD	TBD	TBD	TBD
Surplus spoil and rock	Backfilling and grading	NH	Re-use if possible/take to licensed waste disposal site	286497	476147	346326	1108970
Tank sludge	Sediments from the bottom of tanks	H	Incinerate	TBD	TBD	TBD	TBD
Transformer oils	Spent oils from transformers	H	Incinerate	TBD	TBD	TBD	TBD
Tyres	Worn discarded tyres from vehicles	I	Recycle	12	20	15	47
Washdown water	Runoff from cleaning vehicles, plant and other washing activities	H	Special treatment - disposal to a suitably licensed facility	244962	407118	296118	948198
Welding materials	Spent welding rods, grinding wheels, visors, shot-blast	NH	Recycle	5	9	6	20
Wood:	Crates, pallets, sleepers, etc from supply of materials			TBD	TBD	TBD	TBD

WASTE STREAMS	SOURCES	CLASSIFICATION (I, H or NH)*	MANAGEMENT OPTION	QUANTITY (TONNES) ***			
				LOT A	LOT B	LOT C	TOTAL
Timber		NH	Re-use	162	269	195	626
Trees, shrubs, branches		NH	Use as fuel (domestic etc)	4500	7479	5440	17419
TOTAL							2652936

* I = Inert; H = Hazardous; NH = Non-Hazardous

**These waste streams are included where the pumping stations will be manned

*** TBD = To be determined

Table 4.7 Emissions Inventory for BTC Pipeline - Operational Phase

Waste Stream	Source	Pollutant	Management Option	Quantity
Emissions to Atmosphere	Pump Stations (combined)	NOx	Atmosphere	740 te per year
	PT1	NOx	Atmosphere	6.72 g/s
	PT2	NOx	Atmosphere	5.04 g/s
	PT3	NOx	Atmosphere	6.72 g/s
	PT4	NOx	Atmosphere	5.04 g/s
	Pump Stations (combined)	CO_2	Atmosphere	448,776 te per year
	PT1	CO_2	Atmosphere	134,633 te per year
	PT2	CO_2	Atmosphere	89,755 te per year
	PT3	CO_2	Atmosphere	134,633 te per year
	PT4	CO_2	Atmosphere	89,755 te per year
Effluent Discharges	Treated Wastewater	oil, coliform, BOD	irrigation, seepage	154,000m^3 per year
	PT1	oil, coliform, BOD	irrigation, seepage	36,500m^3 per year
	PT2	oil, coliform, BOD	irrigation, seepage	36,500m^3 per year
	PT3	oil, coliform, BOD	irrigation, seepage	36,500m^3 per year
	PT4	oil, coliform, BOD	irrigation, seepage	36,500m^3 per year
	IPT1	oil, coliform, BOD	irrigation, seepage	<10,000m^3 per year

Table 4.8 Indicative Operational Wastes for Pump Stations (PT1-PT4)

Type	Approximate Amount pa [1]
Domestic:	
• paper wastes	35 tonnes
• putrescible	25 tonne
• glass	<15 tonnes
• plastic	<15 tonnes
• metallic	<15 tonnes
• textiles	<3 tonnes
• miscellaneous combustible	<15 tonnes
• miscellaneous non-combustible	<3 tonnes
• sewage sludge	<20 tonnes
• black water	6000m^3
• grey water	14000m^3
Operational:	
• office	<1000m^3
• waste oil	TBD
• interceptors	TBD
• scrap metal	<50m^3
• filters	TBD
• batteries	TBD
• inert wastes	<100m^3
[1] Data derived from a number of sources and factored for scale and number of pump stations and staff complement	

BIBLIOGRAPHY

Ref 1 "*Techniques for identifying faults and determining their origins*", edited by Geomatrix Consultants, Inc and, William Lettis & Associates, Inc. This document was prepared for the US Nuclear Regulatory Commission Office of Nuclear Regulatory Research, Washington, DC 1999.

Ref 2 BOT (2002). Logistic Study (BOT-REP-LAC-GEN-004).

Ref 3 ILF (2002). System Flow Diagram (ILF-DPF-ENG-GEN-001)

Ref 4 ILF-DGA-ESE-SP1-007-B

Ref 5 ILF (2001). Pump Station PT1 3D-General View Plan (ILF-DGA-ESC-PT1-005)

Ref 6 ILF (2002) Working Strip Regular/Reduced (ILF-DRG-EPL-PLG-800)

Ref 7 ILF (2002) Working Strip on Side Slope 18-30 Degrees (ILF-DRG-EPL-PLG-801)

Ref 8 ILF (2002) River Crossing With Concrete Coating Pipe (ilf-DRG-EPL-PLG-822)

Ref 9 ILF-DRG-EPL-PLG-810

Ref 10 ILF (2002) Highway and Main Crossing with Casing (ILF-DRG-EPL-PLG-815)

Ref 11 ILF (2002) Typical Trench for Fault Crossings (ILF-DRG-EPL-PLG-806)

5 BTC PIPELINE – BASELINE CONDITIONS

5.1 INTRODUCTION

5.1.1 The baseline

5.1.1.1 Objectives

The approach adopted for the environmental and socio-economic data collection was designed to fulfil the following objectives.

- To *understand* key environmental, social, cultural, economic, and political conditions in areas potentially affected by the pipeline.
- To *provide data* to enable the prediction and evaluation of potential impact.
- To *understand* the expectations and concerns of a range of stakeholders (eg impacted communities, authorities and NGOs) regarding the development of the pipeline, associated above ground installations (particularly the pump stations) and temporary facilities (particularly the construction camps).
- To *inform* the development of mitigation measures.
- To *benchmark* future environmental and socio-economic change/ impacts and assess the effectiveness of mitigation measures.

Whilst the collection and evaluation of baseline data is sufficiently robust to enable significant environment and social impacts to be predicted, it is acknowledged that additional data collection (through site-specific surveys, analysis of monitoring records, etc) will be required as an ongoing activity throughout the project life cycle. The extent, means and objectives of additional data collection are defined in the impact sections of this document (principally Sections 6, 7, 12 and 13) and in the supporting appendices. The baseline conditions described in the subsections that follow will, therefore, be expanded to provide sufficient data for assessing and benchmarking the environment and social performances of the BTC Project as the project programme progresses.

5.1.1.2 Methodology

A detailed outline of the methodology and assessment methods adopted for environmental and socio-economic baseline data collection is provided in Section 3 and Appendix A5. To summarise, the key information sources included:

- published literature;
- desk top studies;
- specialist environmental surveys undertaken along the pipeline route;
- on-site observations at the marine terminal;
- community meetings with local settlements;

- questionnaires administered with the Muhtar[1] (or other key representatives) of each settlement (also referred to as 'settlement level questionnaire');
- questionnaires administered at the household level (also referred to as 'household level questionnaire').

The start of each baseline environmental section includes a description of the specific information sources (both desk based and field survey), and touches briefly upon assessment methods. All socio-economic information is derived from consultation and the surveys, with the exception of national and provincial level data derived from Census collection and reports. These are appropriately referenced. This removes the need for an individual description on information sources.

5.1.2 The Study Area

The geographical scope of the environmental and social impact assessments varied according to the particular context within which impacts were considered and the technical area of investigation. For example, information on ecological resources ranged from the global status of identified species to the site specific surveys of potentially impacted habitats, whilst the socio-economic survey area encompassed the provinces through which the pipeline route passes, and more specifically, a 4km corridor along the route of the pipeline[2].

The geographical scope of the EIA Study is further discussed in Section 3.

5.1.3 Section contents

This section describes the relevant biophysical and socio-economic baseline characteristics along the pipeline corridor under the following headings:

- climate;
- topography and landscape;
- soils;
- geology and geohazards;
- surface and groundwaters;
- biological environment;
- cultural heritage;
- air quality and noise;
- national socio-economic overview;
- administrative structure;
- route socio-economic overview;
- demographic;
- land ownership and use;
- livelihoods, employment and skills;
- infrastructure, utilities and services;
- attitudes and perceptions towards the pipeline.

Site specific baseline information is included in the **Impacts Tables** in Supplement 1 to Volume II.

1 A Muhtar is the village head responsible for overseeing village affairs. He or she is elected by the Village Assembly for a term of five years, is responsible for handling local administrative issues and represents the local government at the settlement level.

2 The 4km consultation corridor was determined in alignment with the surveys in Georgia and Azerbaijan and assumed a sufficient width to capture the majority of impacted settlements.

5.2 CLIMATE

5.2.1 Sources of information

Climate data were gathered through literature surveys and the data bank of the General Directorate of State Meteorological Works (DMI) in Turkey. DMI holds extensive meteorological data gathered from its established stations in each of the provinces through which the BTC Pipeline passes.

For the classification of the climate areas along the route, climate related websites[Ref 1 and Ref 2] were visited.

5.2.2 Climatic areas

5.2.2.1 Overview

Scientists classify climate based on two key variables: temperature and precipitation. Climate classification is not straightforward and there are several different classification systems, such as Koppen's classification. Koppen's classification separates climates arbitrarily on the basis of temperature, although other factors are also important.

The project area contains two broad climatic groups:

1. **Middle Latitude Semi-Arid Climate** (Koppen class BS), covering much of central Anatolia;

2. **Warm Temperate Dry Climate** (Koppen class Csa), occupying a narrow strip of coastal Turkey.

In Turkey, warm temperate dry climates have a mean annual temperature higher than 18 °C; middle latitude semi-arid climates have a mean annual temperature that is lower.

5.2.2.2 Middle latitude semi-arid climate

Anatolia's semi-arid climate occupies a transition between the severe deserts of lower latitudes and continental humid climates further to the north. This type of climate is characterised by dry summers, cold winters and low rainfall. In addition, the high average altitude of 1,200m and the land-locked location of the region due to the coastal mountain ranges prevent this area benefiting from the moderating effects of the sea. Within the interior climate type there are two distinct climatic regions:

- the north eastern region between Posof and Erzurum, which is subject to high diurnal temperature fluctuations, and wet summers;
- the south-western region between Erzincan and Pinarbasi, which has similar characteristics, but summers are significantly drier.

5.2.2.3 Warm temperate dry climate

South of the Taurus Mountains the route corridor passes through this warm temperate to sub-tropical climatic type, which is characterised by hot, dry summers with abundant sunshine

followed by mild winters with moderate rainfall. The Taurus Mountain ranges protect this area from the more extreme climatic variations experienced in the north.

5.2.3 Temperature

5.2.3.1 Overview

Mean annual temperatures along the route corridor increase generally from north to the south. During winter, extreme cold temperatures are similarly lower to the north-east and increasing to the southwest. The two climatic groups that characterise the Pipeline alignment are outlined in Section 5.2.2.1 above and are discussed in relation to temperature below.

5.2.3.2 Middle latitude semi-arid climate

Mean annual temperatures in the project area vary between 3.2°C at Sarikamis and 10.6°C at Erzincan; temperatures fall below freezing between December and March with the coldest month being January. Temperatures peak during July and August with the highest absolute temperature recorded along this section of the route is being 42.4°C at Erzincan and the lowest is minus 45°C.

5.2.3.3 Warm temperate dry climate

South of the Taurus Mountains, the annual mean temperature is approximately 17.3°C at Ceyhan with the highest temperatures recorded as 44.8°C at Adana and the lowest recorded as minus 11.3°C in upland areas. Generally, conditions causing ground freezing are infrequent within this area; for example, there are no records of ground freezing at Ceyhan.
Soil temperature along the route of the pipeline is discussed in Section 5.4.7.

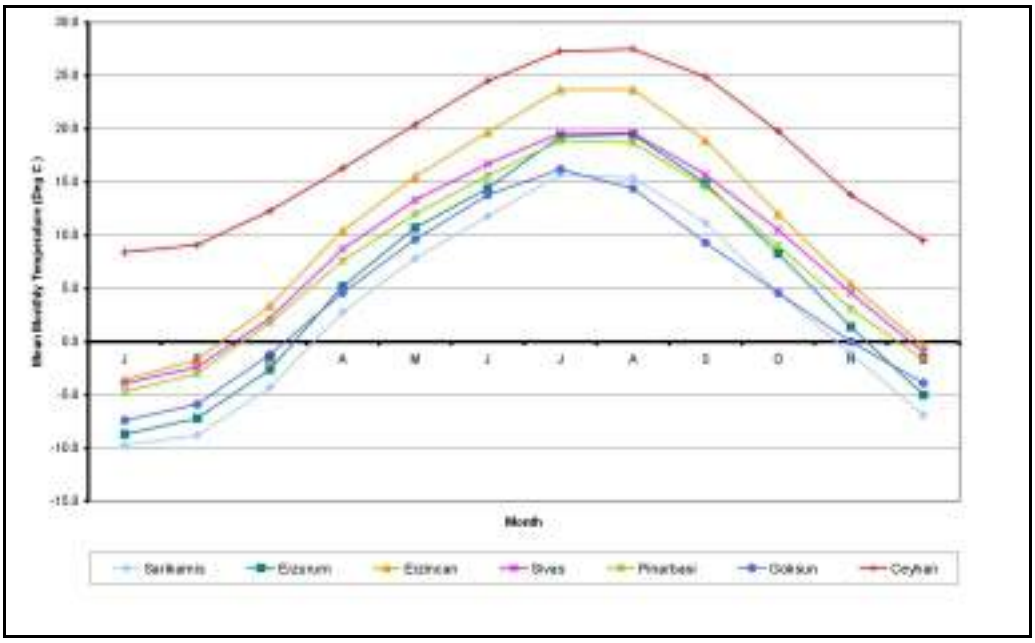


Figure 5.1 Mean monthly temperatures at meteorological stations along the BTC Pipeline Route

5.2.4 Precipitation

5.2.4.1 Middle latitude semi-arid climate

Total annual precipitation varies from 367mm (Erzincan Province) to 582mm (Sarikamis District) with much of the total falling predominately as snow. Snowfall is experienced mainly between November and March and averages from 12.7 (Erzincan Province) to 61.3 (Kars Province) days per year, with snow cover between 35 and 153 days per year. May is the wettest month. The north-eastern section of this climatic region experiences much higher levels of snowfall and summers are much wetter.

5.2.4.2 Warm temperate dry climate

Rainfall occurs largely between October and May, peaking in December, with the total annual precipitation varying from 601mm (Goksun District) to 672.4mm (Ceyhan District). Snow is confined to the upper southern slopes of the Taurus Mountains and is not experienced at the coast (Table 5.1).

Rainfall intensity information, along the BTC Pipeline Route is presented below.

Table 5.1 Mean monthly precipitation at meteorological stations along the BTC route

PIPELINE SECTION (KM)	RAINFALL INTENSITY (MM/HR)
0-150	85
150-300	75
300-407	50
407-700	60
700-800	60
800-900	90
900-1060	110

Source: [Ref 3**]**

5.2.5 Wind direction and velocity

High winds are generally an uncommon occurrence in Turkey and wind velocities rarely exceed 11 ms^{-1} (39.6km/h). However, at specific locations wind velocity has been recorded in excess of 28ms^{-1} (100km/h).

5.2.5.1 Middle latitude semi-arid climate

Wind direction is very variable within this area with south-westerlies and westerlies prevailing during winter and north-easterlies dominating in summer at Erzurum. Towards the west, at Sivas, northerly winds prevail in all seasons except winter, which is dominated by north-easterlies. At Kayseri, wind blows from the north-east during spring and summer and from the northeast and south-west during autumn and winter. Wind velocities vary between 2.0 and 3.3ms^{-1} (7 to 12km/h) and reach up to maximum velocities of 35.7ms^{-1} (128km/h) to the north-east near Kars. Velocities at Sivas and Kayseri vary between 1.9 and 2.9ms^{-1} (7 and 10.5km/h).

5.2.5.2 Warm temperate dry climate

Light winds of velocities between 1.5 and 2.0ms^{-1} (5.4 to 7km/h) blow in from the Taurus Mountain ranges to the north across the coastal plain throughout the year except in summer, when stronger winds of 2.1 to 4.3ms^{-1} (7.5 to 15.5km/h) blow in from the south from the Mediterranean.

The influence of wind erosion within the project area is discussed in Section 5.4.6.

5.3 TOPOGRAPHY AND LANDSCAPE

5.3.1 Sources of information

The description of the topography and landscape along the BTC Pipeline Route was compiled on the basis of the following information sources:

- topographical maps with a scale of 1:25,000;
- photographs taken during field studies for the purpose of route narrowing in the BE and DE phases;
- field observations regarding the terrain features in the context of geological surveys.

Commencing in north-east Turkey, the BTC Pipeline follows a sinuous route that crosses half the length, and nearly the entire breadth, of Anatolia before crossing the Taurus Mountains and descending steeply to the Cukurova Plain on the northern shore of the Gulf of Iskenderun. The principal landscapes comprise the broad plains and upland mountains that form the Anatolian Plateau. These are interrupted by high mountains and broad valleys that contribute to a wide range of habitats and land uses, reflected by variations in population densities and local economies. The following description is based largely on direct field observation during site surveys along the route of the pipeline. The photographs used in this Section illustrate the types of landscape present in the wider project area and are not all necessarily affected directly by the Project.

5.3.2 Georgian border to Ardahan

The greatest landscape variation along the route occurs on the northeastern sections of the route from the Georgian Border to Horasan. The pipeline enters Turkey near the village of Turkgozu at 1,232m above sea level (asl) and passes through an area of small market gardens, arable and grazing fields separated by tall hedges and small copses. The route climbs steadily into rolling, forested hills interspersed by sub-alpine meadow clearings (2,100m asl) (Plate 5.1, Photo 1), north of Posof. Passing west of the town, the pipeline crosses the Posof River, a wide, fast-flowing, river with shingle shoals and passes through a steep valley of mixed broad-leaved and coniferous forests (Plate 5.1, Photo 2). It then climbs steeply into the southern part of the Yalnizcam Mountains to above the treeline, reaching altitudes of 2,500m asl where, in spring, wildflowers and the adjacent mountain ranges provide a high level of scenic value (Plate 5.1, Photo 3). From here it descends steeply to the gently-rolling plateau of Ardahan where the treeless steppe, dotted with small occasionally farmed plots, is backed intermittently by distant rounded mountains (Plate 5.1, Photo 4), and is dissected by steep river gorges. Small villages in this area are largely dependent upon cattle grazing (Plate 5.1, Photo 5). Elsewhere, the steppe is crossed by clear rivers flowing fast across shingle beds set in broad marshy floodplains (Plate 5.1, Photo 6). Finally, the route rises and passes through a gap in the mature Scot's Pine forest near Ardahan (Plate 5.1, Photo 7), before crossing the broad, slow-flowing Kura River near a rocky gorge north-east of the town (Plate 5.1, Photo 8).

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photos 1-8 © Phillip J. Edwards

Plate 5.1 Landscape photographs of the route from the Georgian border to Ardahan

5.3.3 Ardahan to Horasan

South of Ardahan the route crosses open, gently-rolling plateau country, backed by high, steep, but broadly rounded mountains. The plateau, (largely) comprising grassland with frequent rocky exposures, is partly cultivated and has small streams or rivers flowing through wide flat, often marshy valleys, which are, in spring, rich in flowers (Plate 5.2, Photo 9). South of the Kars-Gole road, the land begins to climb towards the Allahuekber Mountains. The foothills are generally still gently rolling, but the vegetation changes to a dry, short sub-alpine meadow with flat rocky outcrops, flower-rich but very different in character from that present in the Yalnizcam Mountains near Posof (Plate 5.2, Photo 10, cf. Plate 5.1, Photo 3). The mountains themselves are high, reaching 2,650m asl, but broad and rounded and, between May and October, are used by summer migrant herders as pastures (Plate 5.2, Photo 11), although many of the summer villages now lie abandoned, often as a result of overgrazing. The route descends from the mountains and as it does so the small, compact, permanent agricultural villages increase in number. Houses are adapted for life in a cold climate with small windows and narrow doorways, roofs of thick turf, and hay stacked alongside outside walls as insulation (Plate 5.2, Photo 12). The route passes along a broad marshy valley (Plate 5.2, Photo 13) then rises through bushy country (Plate 5.2, Photo 14) to skirt around the edge of Sarikamis Forest (Plate 5.2, Photo 15). At this point (approximately 2,400m asl) it passes along the edge of two very different landscapes – to the south the broad rolling mountain pastures where snow lies until June (Plate 5.2, Photo 16) and to the north the deep valley of the Bardis Creek and the arid, angular mountains beyond (Plate 5.2 Photo 17). Once over the pass, the landscapes change dramatically from green montane grazing land to cultivated arable land with occasional trees on an undulating plateau (Plate 5.2, Photo 18) edged by more jagged, barren mountains (Plate 5.2, Photo 19). Many of the river valleys remain as wet meadows, rich in flowers and bushes, in contrast to the agricultural landscape surrounding them (Plate 5.2, Photo 20).

Photo 9

Photo 10

Photo 11

Photos 9-11 © Phillip J. Edwards

Plate 5.2 Landscape photographs of the route from Ardahan to Horasan

Photo 12

Photo 13

Photo 14

Photo 15

Photo 16

Photo 17

Photo 18

Photo 19

Photos 12-19 © Phillip J. Edwards

Plate 5.2 Landscape photographs of the route from Ardahan to Horasan (continued)

Photo 20 © Phillip J. Edwards

Photo 20

Plate 5.2 Landscape photographs of the route from Ardahan to Horasan (continued)

5.3.4 Horasan to Askale (Kars Plateau)

The Kars Plateau extends from Horasan to near Askale, some 50km west of Erzurum. The landscapes here are less varied than the previous route sections. Agriculture dominates throughout the area despite the limitations of moderate rainfall, a short growing season, and in the eastern part, soils with low inherent productivity. Between Horasan and the Hasankale River the route crosses elevations of 1,625 to 1,725m asl, with gently rolling, rounded hills and ridges, cultivated in small to medium-sized fields with boundaries unmarked by fences, walls, or hedges, and dotted with occasional trees (Plate 5.3, Photos 21 and 22). This part of the plateau lies north of, and above, the wide floodplain of the Aras River, which is just visible in places from the pipeline route some 2-3km away (Plate 5.3, Photo 23).

The route crosses the Hasankale River and follows it westward past Pasinler. The landform here is markedly different being a broad river plain passing between banks of angular eroded mountains (Plate 5.3, Photo 24). The land is farmed intensively through irrigation for vegetables, root crops and cereals. Villages and towns occur only along the edge of the plain. Groups of mature trees and a number of electricity pylons are prominent. About 13km northeast of Erzurum the route crosses the southernmost extremity of the Kargapazari Mountains, a barren, treeless, rock-strewn plateau (Plate 5.3, Photo 25). It descends from here onto the broad flat plain north of Erzurum. This was formerly marshland (Plate 5.3, Photo 26), but most has been converted to intensive irrigated agriculture, primarily cereals, although city edge development, villages and the airport all contribute to the urban-edge character of the area. A number of large trees are present. West of Erzurum, the route crosses gently undulating ground, still agricultural but poorer and more arid, and two rivers – the Pasayurdu Creek, a small river in a broad wet marshy valley (Plate 5.3, Photo 27), and the Karasu, a wide, fast-flowing river in a broad shingle bed with grass banks subject to overgrazing by cattle (Plate 5.3, Photo 28).

Photo 21

Photo 22

Photo 23

Photo 24

Photo 25

Photo 26

Photo 27

Photo 28

Photos 21-28 © Phillip J. Edwards

Plate 5.3 Landscape photographs of the route from Horasan to Askale

5.3.5 Askale to Refahiye

The pipeline route passes west from Askale and begins to ascend the southern foothills of the Otlukbeli Mountains – a series of rolling hills with patchy oak scrub woodlands (Plate 5.4, Photo 29), remnants of extensive Scot's Pine forest that once clothed these hills. It crosses numerous small streams feeding the Euphrates River just to the south, and west of Tercan descends to agricultural land on the broad river terraces of the Karasu River which it crosses a second time north of Caykent Village. The broad river valley comprises numerous shingle ridges and pools, heavily vegetated with willow trees. Passing north of Cayirli, the pipeline crosses flat agricultural land passing between both villages with their poplar trees, and mountain peaks (Plate 5.4, Photo 30). It weaves along the fairly narrow arid valley of the Aksu River, a broad fast-flowing, shingle-bedded river which it crosses twice (Plate 5.4, Photo 31), before this opens out into a wide, flat-bottomed, valley where the route crosses the Aksu for a third time (Plate 5.4, Photo 32).

It ascends gradually along the valleys of tributaries of the Aksu, largely semi-arid areas with subsistence crops and sheep-grazing, before climbing sharply, west of the village of Baskoy from about 1,750m to about 2,300m asl into the Otlukbeli Mountains north of Erzincan. The eastern parts of these mountains are broadly rounded and deeply dissected, almost plateau-like with grassy sub-alpine meadows and montane steppe (Plate 5.4, Photo 33), used in places for summer grazing. The landscapes here have been scarred by the unsuccessful reinstatement of the recently constructed East Anatolian Natural Gas Pipeline (NGP) (Plate 5.4, Photos 34 and 35).

An inspection survey of the NGP pipeline route where it parallels the proposed BTC Route was undertaken in November 2001. This inspection indicated that topsoil and vegetation had not been successfully reinstated along the majority of NGP Right of Way (RoW). In addition, much of the original topsoil was lost or had been mixed with subsoil and large piles of stones/rocks had been placed either over the NGP or placed in piles on, or near, the NGP Right of Way. To compensate for settling, the crown over the pipeline is 0.5m m to 2m m high in some areas and this is expected to impede water natural flow, with resultant erosional impacts, as well as being an impediment to farming activities. It should be noted, however, that the Reinstatement Plan prepared for the BTC Project will bring benefits through the proper reinstatement of the NGP in the areas where it parallels the BTC Pipeline.

Further west, the mountains rise higher and the route passes into the true alpine zone peaking at 2,810m asl, where the snow still lies late into June. The landscapes here are barren, sparsely vegetated, and angular (Plate 5.4, Photos 36 and 37) with distant views to neighbouring mountain ranges (Plate 5.4, Photo 38). From here, the pipeline descends sharply along gravely hillsides and grassy valleys (Plate 5.4, Photo 39) to the flat valley of Ilgar Creek at about 1,600m asl. Here, as the route swings south of Refahiye, the valley bottoms are a mixture of cropland and wet meadows with broad-leaved trees and the hills on the southern side are densely forested with Scot's Pine (Plate 5.4, Photo 40).

Photo 29

Photo 30

Photo 31

Photo 32

Photo 33

Photo 34

Photos 29-34 © Phillip J. Edwards

Plate 5.4 Landscape photographs of the route from Askale to Refahiye

Photo 35

Photo 36

Photo 37

Photo 38

Photo 39

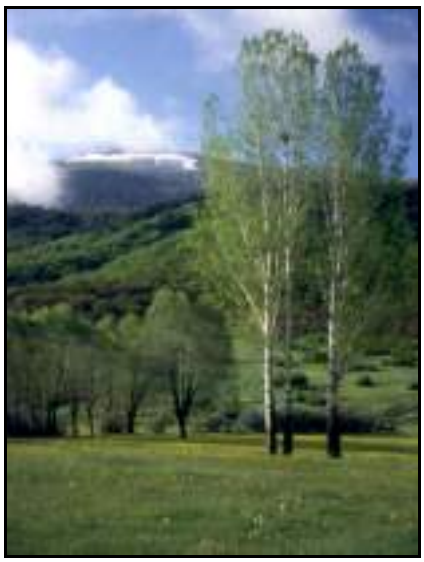


Photo 40

Photos 35-40 © Phillip J. Edwards

Plate 5.4 Landscape photographs of the route from Askale to Refahiye (continued)

5.3.6 Refahiye to Ulas

The route continues south-westwards past Refahiye across flat plateau lands and rolling hills used intermittently for arable crops before ascending sharply from the valley floor at about 1,650m m asl into the Tecer Mountains at 2,100m asl and then less steeply to above 2,300m m asl. The mountains are rounded and craggy, with broad grassy valleys, occasionally scattered with pines (Plate 5.5, Photo 41). Occasional summer migrant herder's villages are present (Plate 5.5, Photo 42). Further west the mountains are sharper ridged, the montane steppe interspersed with exposures of the whitish underlying marl. (Plate 5.5, Photo 43) where the vegetation becomes sparser, but more flower-rich (Plate 5.5, Photo 44). The route rises again to peak at 2,370m m asl passing briefly back into the alpine zone (Plate 5.5, Photo 45) with extensive views of neighbouring mountains (Plate 5.5, Photo 46). From here the route descends sharply into the Kizilirmak valley at about 1,700m asl and follows Sivas Provincial Highway 2 westwards to Imranli, crossing a number of small rivers on the way – each with dense scrub and scattered trees in contrast to the grassy, grazed, gently-rolling valley land beyond (Plate 5.5, Photo 47).

West of Imranli, the route climbs into the markedly different landscape of polygonal gypseous karst. The narrow ridges of crystalline gypsum enclose small basins of gypsic soils that resemble, when seen from the air, a honeycomb and, on the ground, stony hummocks in a rolling grassy plain (Plate 5.5, Photo 48). Surface drainage is absent here since the drainage is internal, especially through sinkholes and subterranean passages. The gypsum karst in this region is one of the largest, most mature and spectacular in the world. The Turkish Association of the Protection of Archaeological Heritage has proposed a section of this formation as a Natural Site Area, however the BTC Route avoids the area proposed for designation. Small-scale cereal production and beekeeping occur in some of the larger internal basins.

The route descends steeply to cross the meandering Acioz River, its valley forming a green band of meadows and trees in an otherwise more barren landscape (Plate 5.5, Photo 49), but here as elsewhere, the un-reinstated NGP forms a visible scar across the landscape (Plate 5.5, Photo 50) and associated quarries and tracks can be seen on nearby hills and plains (Plate 5.5, Photo 51).

The pipeline continues across a broad generally flat karst plain, lacking trees and surface drainage, largely cultivated for non-intensive cereal production, and with views of distant mountains (Plate 5.5, Photos 52 and 53). It crosses the Acisu River, a wide meandering river with stony riffles and deep pools and sandy river cliffs, continues west along the north side of Kuru Lake (Plate 5.5, Photo 54) before turning sharply south-westwards and crossing Tuzla Creek, another river where evidence of the NGP construction can be seen (Plate 5.5, Photo 55). From here to Sivritepe village the route traverses rugged karst land with many rocky outcrops from whence it crosses the Tatli River, a broad, stony-bedded river in a wide floodplain with trees and agriculture (Plate 5.5, Photo 56). From here it traverses flat or slightly rolling terrain, still on gypseous soils, which are used for non-intensive cereal production. North of Ulas, particularly around Bestepe Village, the flat landscapes are interrupted by a series of rocky ridges rising sharply from the plain, and closer to the town the route passes between a number of shallow gypseous lakes fringed with reedbeds and trees.

Photo 41

Photo 42

Photo 43

Photo 44

Photo 45

Photo 46

Photos 41-46 © Phillip J. Edwards

Plate 5.5 Landscape photographs of the route from Refahiye to Ulas

Photo 47

Photo 48

Photo 49

Photo 50

Photo 51

Photo 52

Photo 53

Photo 54

Photo 55

Photo 56

Photos 47-56 © Phillip J. Edwards

Plate 5.5 Landscape photographs of the route from Refahiye to Ulas (continued)

5.3.7 Ulas to Pinarbasi

South of Ulas, the route crosses a flat area of intensive but non-irrigated arable land before it ascends very gradually through a series of plateaux that are stepped, so that abrupt scarps separate one elevation from the next. Their elevation varies between about 1,400 and 1,700m m asl with occasional ridges exceeding 1,800m m asl. This area is the Uzun Plateau, founded mostly on marl, which is largely made up of heavily grazed grassland (Plate 5.6, Photo 57) and montane steppe (Plate 5.6, Photo 58) although scattered areas are cultivated for cereals. The undulating plains are treeless and villages are small and well scattered.

South of the Sekerpinar Creek (c.27km south of Ulas), the route picks its way between a series of small rivers flowing through wide, flat-bottomed, green valleys, bounded either side by very steep, almost cliff-like, scarp slopes of exposed marl that show white in the landscape (Plate 5.6, Photo 59). These valleys are covered with buttercups during the spring, and small groups of trees, mostly poplars and willows, are present. Larger settlements are present along the valley edges (Plate 5.6, Photo 60). The route keeps to the higher ground where the plains are stony, open, sparsely-vegetated, and largely featureless, about 68km south of Ulas it crosses the Zamanti River just west of the village of Ucpinar, one of the widest of these valleys, which is rich in orchids and wildlife. From there it runs south across more stony rolling plain, crosses the Asmacasuyu and Kirkpinar Creeks and their heavily-cultivated valleys, and comes to the base of the Tahtali Mountains c.15km east of Pinarbasi.

Photo 57

Photo 58

Photo 59

Photo 60

Photos 57-60 © Phillip J. Edwards

Plate 5.6 Landscape photographs of the route from Ulas to Pinarbasi

5.3.8 Pinarbasi to Kadirli

South of Pinarbasi, the route originally passed through a very narrow, steep-sided, rocky canyon at about 1,750m m asl (Plate 5.7, Photo 61), with a small river with trees and meadows in the bottom (Plate 5.7, Photo 62). This narrow valley has subsequently been avoided by shifting the route to the top of the ridge towards the west of the initially defined route. The route climbs over a ridge at 1,960m m asl (Plate 5.7, Photo 63) before descending onto a broad flat upland plain at about 1,700m m asl used extensively for growing cereals (Plate 5.7, Photo 64) and into the richer agricultural lands around Sariz (Plate 5.7, Photo 65). From there it proceeds along the western side of the Sariz River valley, largely agricultural land with scattered trees and bushes especially along the small creeks flowing down to the main river. The route crosses the Sariz River just east of the village of Kurudere at 1,480m m asl, in a pretty valley of water-meadows lying between steep rocky slopes (Plate 5.7, Photo 66). It then climbs up across an uncultivated rocky area with juniper scrub and wildflowers, and across a wide, rolling agricultural plain near Yesilkent with scattered trees (Plate 5.7, Photo 67) and steep mountains with exposed folded strata (Plate 5.7, Photo 68).

The route crosses gently undulating arable land interspersed with more hilly steppe used for grazing before passing along the Goksun Valley used for irrigated crops at its southern end. It passes west of Goksun across the intensive irrigated croplands of the flat plain and then ascends over another smooth ridge (1,700m asl) through mixed forests, and then along the side of a 10km-long upland valley. The valley sides and the steeper slopes of limestone mountains beyond are covered in juniper scrub and Cedar of Lebanon, while the small river meanders through water-meadows in the flat valley bottom (Plate 5.7, Photos 69 and 70). At the southern end, the limestone mountains have eroded into huge rounded blocks and the first of the Black Pine forests, characteristic of the Taurus mountains, appear (Plate 5.7, Photo 71). Here the river plunges down a steep rocky gully (Plate 5.7, Photo 72), while the route descends sharply past the mediaeval Meryemcil Castle on an exposed peak that dominates the views onto the plain around Geben below (Plate 5.7, Photo 73).

The route skirts west of the town through the head of an intensively farmed and irrigated basin, before climbing back into the pine forest-clad mountains, over a pass at 1,730m asl, and down again along the valley of the Karapinar Creek with broad-leaved trees and bushes (Plate 5.7, Photo 74). The route then heads south-westwards through more pine-clad mountains (Plate 5.7, Photo 75) up to 1,600m asl before descending sharply into a broad flat-bottomed valley (1,200 m) used primarily for mixed crops but retaining a significant cover of broad-leaved trees (Plate 5.7, Photos 76 and 77). The route descends around the eastern edge of Andirin, a small mountain market town at 1,000m asl, and then descends sharply down hillsides clothed in trees and bushes with small terraced fields (Plate 5.7, Photo 78), the greenery of these south-facing slopes reflecting the humid influence of the Mediterranean Sea. Further south, the landscapes are harsher where the forests have been felled and replaced by juniper scrub and maquis on the thin limestone soils between rocky outcrops (Plate 5.7, Photo 79).

The route emerges onto the plain (200m asl) at the northern end of the Aslantas Barrage Lake and turns westwards crossing the Kesis Suyu River (a tributary of the lake), a fast-flowing clear river passing through a steep limestone canyon (Plate 5.7, Photo 80). It then passes west and south across the much gentler and more heavily populated landscapes of the Taurus foothills to Kadirli, a mixture of rolling rain-fed agricultural land, olive groves, and heavily wooded gulleys (Plate 5.7, Photos 81 and 82).

Photo 61

Photo 62

Photo 63

Photo 64

Photo 65

Photo 66

Photo 67

Photo 68

Photos 61-68 © Phillip J. Edwards

Plate 5.7 Landscape photographs of the route from Pinarbasi to Kadirli

Photo 69

Photo 70

Photo 71

Photo 72

Photo 73

Photo 74

Photos 69-74 © Phillip J. Edwards

Plate 5.7 Landscape photographs of the route from Pinarbasi to Kadirli (continued)

Photo 75

Photo 76

Photo 77

Photo 78

Photo 79

Photo 80

Photo 81

Photo 82

Photos 75-82 © Phillip J. Edwards

Plate 5.7 Landscape photographs of the route from Pinarbasi to Kadirli (continued)

5.3.9 Kadirli to the BTC Marine Terminal

Near the village of Asagi Bozkuyu, c.10km south of Kadirli, the route emerges onto the Cukurova Plain (c.40m asl), a wide, flat fertile plain, which is largely utilised for irrigated arable agriculture. Landscapes in the northern part are expansive and mostly featureless – large fields of cereals with occasional scattered trees or small copses interspersed with irrigation canals. One notable feature is the castle sited on the top of Hamidiye Mountain, an isolated rocky outcrop just north of the village of Gokcedem, and visible from miles around. Just to the west of here, the route crosses the Ceyhan River, a wide, partly braided river flowing in a wide floodplain of shingle islands and marshland (Plate 5.8, Photo 83). South of the river, smaller fields are more common and these are sown with row crops, mainly vegetables and melons, irrigated through a network of small, raised concrete irrigation aqueducts (Plate 5.8, Photo 84).

Further south, the route crosses the main Adana-Osmaniye highway and the Karacay River in quick succession, the latter a wide, deep, slow-flowing river with dense emergent vegetation along its banks (Plate 5.8, Photo 85) a contrast to the fast-flowing mountain rivers seen along the majority of the route. The final section of the pipeline rises over a series of low rounded hills running more or less parallel to the coast (130m asl), the tops and valleys of which are cultivated with cereals and the steep sides remain covered with maquis (Plate 5.8, Photo 86). The route then descends into an area disseminated by the existing BOTAŞ Marine Terminal.

Photo 83

Photo 84

Photo 85

Photo 86

Photo 83-86 © Phillip J. Edwards

Plate 5.8 Landscape photographs of the route from Kadirli to BOTAŞ Marine Terminal

5.4 SOILS

5.4.1 Sources of information

Information on soil groups has been obtained from desktop studies and verified during field investigations along the route. The principal literature sources used for the classification of soils are as follows:

- Soil Survey Staff. 1960. Soil Classification: A Comprehensive System - 7th Approximation. US Department of Agriculture. Wa DC. 265pp. [Ref 4]
- US Department of Agriculture. 1983. Keys to Soil Taxonomy. Technical Monograph No. 6. Wa. DC. [Ref 5]

On-site soil investigations along the pipeline route took place in July and August 2001. The methods employed relied on visual observation of soil depth and colour; soil texture was measured using hand texturing and soil reaction was estimated by exposing soil to dilute hydrochloric acid. Terrain class was evaluated using categories recommended by the UN Food and Agriculture Organisation. At some locations, measurements and visual assessments were made of depth to groundwater, parent material, soil structure, soil boundaries, cementation, consistence, permeability, ease of infiltration and stonieness.

Tentative classification of soils were made using the Soil Taxonomy of the US Department of Agriculture and approximate equivalents to the Turkish taxonomy, which uses the pre-1966 American taxonomic system, were made where appropriate. Soil moisture and temperature regimes were adopted from Soil Management Services, 1985. In addition to field surveys, the assessment also estimated soil-related impacts from aerial photographs and 1:25 000-scale alignment maps of the pipeline route.

In addition, a soil survey of sites along the pipeline route was conducted in July and September 2001 (see Sections 5.4.7 and 5.4.8). There were two main components of this survey as follows:

- fertility analysis of agricultural soils;
- analysis of sites potentially affected by existing petroleum contamination.

Agricultural soil samples were collected at 29 locations from the topsoil (upper 60 cm) of agricultural lands neighbouring the pipeline corridor. These soil samples have helped to establish the current capability classes and quality of agricultural areas.

Soils samples were also collected at nine locations identified as potential sites of existing petroleum contamination. The collected soil samples were screened for petroleum hydrocarbons using a portable photo ionisation detector (PID). In addition, all collected soil samples were analysed for arsenic, cadmium, total chromium, lead, mercury and vanadium.

5.4.2 Soil classification used in this Report

The soils of the BTC Pipeline corridor can be classified according to the principal factors that determine the arrangement and complexity of their diagnostic horizons, namely climate, topography, and, to a much lesser extent, parent material. Three broad temperature regimes — cryic,[1] mesic, and thermic[1] - dominate the processes of soil formation in Turkey[2]. Soil moisture,

1 Cryic is used here instead of frigid, the usual taxonomic term, because of its use as a descriptor in soil names of the project area.

while also important, is so monopolised by a xeric[3] regime that its alternative, aquic, occurs only in valleys with a high water table. Cryic (cold) soils occupy the upland plateaux of Kars and the mountains bordering Erzincan; mesic soils occupy much of the remainder of the project area, except the Cukurova Plain near Adana and the foothills of the Taurus Mountains to its north where thermic (warm) soils occur. Table 5.2 lists the taxonomic names of soils in the project area and their Turkish taxonomic equivalents.

1 Thermic means an average annual soil temperature at 50cm depth of between 15 and 22°C; mesic is between 8 and 15°C; frigid (cryic) is below 8°C.

2 Soils in this document are classified according to soil taxonomy, the soil classification scheme developed in the United States during the 1950s and early 1960s, and now adopted worldwide as an international system. For convenience, soil names in the Turkish taxonomy, which borrows largely from the pre-taxonomic scheme used in the United States before 1966, are given in parentheses.

3 Xeric means the soil is generally dry for 90 consecutive days; aquic means a reducing regime that is free of dissolved oxygen because the soil is saturated.

Table 5.2 Approximate equivalents between soil names used in Turkey and soil taxonomy

TURKISH TAXA	DESCRIPTION	SOIL TAXONOMY
Alluvial soils (azonal)	An azonal great soil group of soils, developed from transported and relatively recently deposited material.	Entisols
Brown soils	A great soil group of the temperate to cool arid regions, composed of soils with a brown surface and a light-coloured transitional subsurface horizon over calcium carbonate accumulation.	Mollisols, Alfisols
Chestnut coloured soils	A zonal great soil group consisting of soils with a moderately thick, dark brown. A horizon over a lighter coloured horizon that is above a zone of calcium carbonate accumulation.	Alfisols, Mollisols
Reddish-brown Mediterranean soils	Non-calcareous brown soils in which the A horizon is well developed, red or brown.	Alfisols
Reddish brown soils	A zonal group of soils with a light brown surface horizon of a slight reddish cast which grades into dull reddish brown or red material heavier than the soil, then into a horizon of whitish or pinkish lime accumulation; developed under shrub and short-grass vegetation of warm temperate to tropical regions of semiarid climates. TU: Like brown soils except for colour, which is typically red or reddish brown on the surface; some caliche formation at depth. ABC profile.	Alfisols, Aridisols
Hydromorphic soils	Alluvial soil in high groundwater environment. Gleyed profile.	Aquic Entisols, Spodosols
Colluvial soils	Material that has moved downhill and has accumulated on lower slopes and/or at the bottom of the hill; moved downhill by the force of gravity and to some extent by frost action and local wash	Entisols, Inceptisols
Brown forest soils	A great soil group of the intrazonal order and calcimorphic suborder formed on calcium-rich parent materials under deciduous forest and possessing a high base status but lacking a pronounced illuvial horizon, developed under the deciduous forest in temperate humid regions from parent material relatively rich in bases.	Alfisols, Mollisols
Non-calcareous brown forest soils	Brown, reddish brown, or greyish brown skeletal soils formed from granite.	Inceptisols, Alfisols
Reddish Mediterranean soils	Formed on crystalline limestone at high altitude, and typically red.	Mollisols, Alfisols
Non-calcareous brown soils	ABC-profiled soils developed from serpentine schist, or limestone, but the carbonate is leached. They do not react with HCl. The A-horizon is dark, greyish brown.	Alfisols
Basaltic soils	Shallow to moderately deep, non-calcareous, brown-coloured soil.	Alfisols, Inceptisols
High mountain pasture soils	Dark brown surface formed as a result of gleying and calcification under frigid conditions.	Entisols

Limestone plays an important role in the genesis of soils belonging to the Mollisol soil order. Thick beds of marl, defined variously as a calcareous clay or a mudstone cemented by calcium, make up much of the plateaux between Sivas south to the Taurus Mountains, and much of their

foothills. Their soils, now much depleted since the advent of mechanised agriculture, were formed from the underground decomposition of organic residues in the presence of divalent cations [Ref 4]. The resulting topsoil is now mixed substantially with material from the subsurface, including soft rock from the native marl, and soil erosion has reduced much of its original depth.

5.4.3 Description of soils in the project area

For the purpose of describing soils, the project area is defined as any land surface disturbed by construction of the pipeline or associated temporary or permanent facilities. In general, it can be taken to mean the length of the pipeline times the working width, normally 28 metres. The following text adopts the terminology of soil taxonomy, the international soil classification scheme adopted by the US Department of Agriculture in 1966 and now followed by many countries worldwide. Soils of the project area belong to four orders, as indicated by the final three letters of a soil name (Table 5.3).

Table 5.3 Explanation of the four orders of soils found along the BTC Pipeline route

NAME SUFFIX	SOIL ORDER	IMPLICATION
Ent	Entisols	From recent, implying a soil so young that soil horizons have not yet had time to develop. Used especially for alluvial and colluvial (depositional) soils.
Ept	Enceptisols	From inception, implying young soils developed in situ from the underlying rock. Erosion normally plays an important role in the development of such soils, which are commonly thin and stony. Often used in this report for soils developed on sloping land.
Oll	Mollisols	Soils believed to develop from the underground decomposition of organic matter in the presence of calcium. Used in this study for soils developed from marl.
Alf	Alfisols	Soils having a subsurface horizon of illuviated clay. In this study soils that appear on stable, flat to gently sloping, well-drained land away from flooded valleys or locations with high ground-water table.
Other words found in soil names include the following:		
PREFIX OR ABBREVIATED ROOT		**MEANING**
Andic		Volcanism played a role in forming the rock from which the soil developed
Calcic		Calcium plays a role in soil formation
Cryic		Cold soil
Dystric		Inherently infertile
Fluvic		From fluvial: a high water table during part of the year
Haplic		Common
Mesic		Temperate soil
Ochric		Pale surface
Orthic		Common soil
Skeletal		Stony
Thermic		Warm soil
Typic		Usual type
Xeric		Dry soil, albeit one suited to many rainfed crops

5.4.3.1 Mesic upland soils between the Georgian Border and Ardahan

Mesic soils between the Georgian border and Posof include the following:

- **Coarse-loamy Entic Dystrandepts** wherever tuff dominates the landscape. Dystrandepts develop in situ from tuff, have a brown colour, are thin, and have low inherent productivity. Their lack of depth will make them difficult to reinstate, leaving the whitish tuff exposed wherever this soil dominates;
- **Clayey-skeletal to Loamy-skeletal Xerochrepts** on most basaltic landscapes. Xerochrepts are shallow, stony soils that have a pale brown surface. They occupy sloping lands and, while they have a natural resistance against soil erosion when left intact, erode easily when laid bare by construction;
- **Loamy Typic Xerorthents** wherever colluvium has accumulated from steep basalts. Xerorthents are brown soils formed from alluvium and colluvium on plains or from colluvial deposits along the lower third of steep slopes. They are young soils that have not yet had time to develop soil horizons. Most Xerorthents support productive agriculture;
- **Coarse-loamy to -silty Xerorthents** on alluvial plains;
- **Fine- to Coarse-loamy Haploxeralfs and Rhodoxeralfs** as minor inclusions on stable, gently sloping landscapes. Haploxeralfs are brown soils developed in situ from the underlying rock. Their formation requires a stable landscape where soil erosion is much less than the rate of soil formation. Rhodoxeralfs develop from soil rich in carbonate and have a reddish colour. Both soil types support productive agriculture, though their small area makes them comparatively unimportant in the landscape's economy.

Agriculture is practised in valleys with livestock grazing on upland slopes and on soils developed from tuff. Conservation forestry and woodlands occupy the steep and dissected land. Soil erosion, especially on denuded slopes, is an important factor along this part of the route.

Soils between Posof and Ardahan derive much of their formative character from natural soil erosion, which reduces their depth actively but at a rate marginally slower than, or equal to, their rate of formation. The resulting soils, classed as Mesic Clayey-skeletal to Loamy-skeletal Typic Xerochrepts, are shallow, stony, and have a pale-brown to brown surface (see Plate 5.9). The landscape's short growing season and the potentially high rate of soil erosion limit their use to forestry and managed grazing. When vegetated, the soils have a natural resistance to erosion, but when laid bare, or if run-off becomes concentrated, for example from a road drain, then rills and gullies rapidly achieve sizes that become unmanageable.

Plate 5.9 Mesic soils on steep slopes are typically shallow and stony

Small inclusions of fluvial soils occur near the Posof River, where floodplain soils are classed as Typic or Coarse-silty Typic Xerifluvents. These are alluvial soils that have had insufficient time for soil horizons to develop. They are young and form from the periodic deposition of sediments from the river and of colluvial material from the surrounding slopes. They play an important role in local economic and subsistence agriculture.

5.4.3.2 Cryic soils between Ardahan and Horasan

Cryic soils occur at elevations usually above 2,200m. These areas have annual soil temperatures less than 8°C, which within the project area means that soils generally freeze at depth during winter. Cryic soils reflect in large part their topography and to a lesser degree their parent material, especially tuff[1], which fosters a shallow, brown-coloured soil that contrasts strongly with the whitish rock from which it evolved. Several soils occur, which are described below.

- **Sandy-skeletal Cryochrepts**: these are young, shallow soils occurring on slopes at high elevations. Typically they are stony and have a pale brown-to-brown surface. They support upland grassy meadows but are sensitive to overgrazing. Cryochrepts are problematic for the pipeline because of their instability. The landslides are typically shallow, and may owe their cause to the loss of soil shear strength when saturated during rapid spring thaws.
- **Fine-loamy Andeptic Cryorthents**: these are dark brown depositional soils that develop in valleys from volcanic materials. They are deep, easily worked, and if well drained, offer easy construction. However, more often than not, they have a long history as irrigated meadow, resulting in extremely shallow water tables during all months except winter, when they are frozen at depth (see Plate 5.10).
- **Coarse-loamy Typic Cryandepts**: these are pale brown to brown soils that develop from the weathering of tuff. Typically they are shallow, and occupy plateau lands used for grazing.

1 Tuff: a rock formed by the fusing of volcanic fragments, generally less than 2 mm diameter, on the ground.

- **Sandy-skeletal Typic Andic or Andic Coarse-loamy Cryochrepts**: in the project area, these are brownish soils that form in-place from tuff. They are shallow, have good infiltration, and are moderately resistant to damage.
- **Coarse-loamy or Loamy-skeletal Cryochrepts**: these occur on sloping land, have a brown or pale-brown colour, and are stony or gravely. Cryochrepts are sensitive to soil erosion wherever laid bare or where concentrated run-off flows unobstructed over them.

Plate 5.10 Cryic, valley-bottom commonly has high water tables

5.4.3.3 Mesic soils of the Kars Plateau

Dystrandepts occur wherever tuff is a component of the terrain, but become replaced by Xerorthents on alluvial plains. The following sections discuss their appearance and management.

- **Mesic Coarse-loamy Entic Dystrandepts**: these are pale brown, shallow soils that develop in-place from the weathering of tuff. Their inherent soil productivity is low, limiting their use to managed grazing, watershed and conservation forestry and natural habitat.
- **Mesic Coarse-loamy to-silty Xerorthents**: these are young, depositional soils that form on alluvial plains. Their topsoil is pale brown to brown, and needs to be reinstated carefully for soil productivity to be maintained. Irrigation canals and drains are likely to be a feature of the local economy and require protection.
- **Mesic Fine-loamy to Loamy-skeletal Shallow Typic Xerochrepts**: these are pale brown to brown, commonly stony, shallow soils that develop on slopes from the weathering of the underlying rock. They erode easily if laid bare or are exposed to concentrated run-off.

5.4.3.4 Cryic and Mesic soils north of Erzincan

The cryic soils north of Erzincan share the characteristics of cryic soils between Ardahan and Horasan (Section 5.4.1). Careful attention needs to be given to reinstatement if the productive capacity of the area is to be maintained. Replacing topsoil, fertilising, and seeding to an appropriate grass mixture are particularly important (see Plate 5.11).

Plate 5.11 Cryic soils and native rock along the NGP north of Erzincan

5.4.3.5 Mesic Gypseous soils east of Sivas

Gypseous soils east of Sivas develop from the anhydrite of the surrounding karst. The following section describes two soils: one formed in situ from the native rock and the second from colluvial and other processes that form the gypseous upland and valley soils.

- **Xerochrepts of the polygonal karst**: these are soils developed in situ from anhydrite are Mesic Clayey-skeletal Micro Xerochrepts. They are brown to light greyish-brown, very shallow, stony soils whose most obvious use lies in support of scenic and watershed values. Construction of the NGP and its reinstatement has created a difficult-to-restore scar the length of the resource. Xerochrepts of the polygonal karst are gypsic, which means they contain more than 40% by weight of carbonates. In the field they give an audible reaction to dilute hydrochloric acid, which repeats on undisturbed anhydrite but not on freshly broken boulders, indicating high pH carbonate soil.
- **Calciustolls of gypseous uplands**: these are soils of gypseous lands surrounding the polygonal karst and of the intra-karst polygonal depressions classed as Mesic Gypsic Calciustolls, with Loamy-skeletal Xerochrepts (see above) appearing wherever anhydrite approaches the surface. Calciustolls have a pale brown to dark brown colour, a strong structure that makes the soil seem soft underfoot, and occasional cracking of the surface (see Plates 5.12 and 5.13).

Plate 5.12 The typically dark brown colour of a Gypsic Calciustoll near an active sinkhole

Plate 5.13 Light brown stony soil of an eroded Calciustoll

5.4.3.6 Soils of Mesic Stepped Plateaux

The soils of stepped plateaux reflect their mesic soil temperature regime, xeric soil moisture regime, and marl from which they have evolved. Their undisturbed colour is brown to dark brown, but millennia of exploitation have caused a general thinning of the surface so that whitish parent material lies exposed along ridge summits and steep slopes. Their internal drainage is good, and gullies are conspicuously absent. The stepped plateau includes the following soil landscapes: plateau surfaces, plateau scarps, sloping and dissected lands, and fluvial lands.

- **Mesic Typic Calciustolls**: these are soils of plateau surfaces with a brown colour and strong, granular structure, which makes the soil feel soft underfoot and seemingly easy to plough. This characteristic can be illusive, however, as it corresponds closely to soil moisture content: too wet and the soil becomes a plastic, sticky clay. Cereal farmers avoid the problem by ploughing during autumn, when the soil is far from saturated (see Plate 5.14).

Plate 5.14 Mesic Typic Calciustolls have a dark brown surface and good internal drainage

- **Mesic Fine-loamy to Loamy-Skeletal Typic Xerochrepts**: these are thin soils of sloping and dissected lands that have a pale brown, often stony surface, and high soil

pH. They are susceptible to soil erosion wherever concentrated run-off discharges onto their surface, eg from a road drain (see Plate 5.15).

Plate 5.15 Typic Xerochrepts are thin and have a pale brown, often stony surface

- **Mesic Clayey-skeletal Micro Typic Xerochrepts**: these are soils of plateau scarps that differ from those in the preceding section only in terms of higher natural erosion, which has reduced their depth and aerial extent. Their vegetation is sparse and difficult to reinstate (see Plate 5.16)

Plate 5.16 Xerochrepts of plateau scarps are especially thin and have sparse vegetation

- **Mesic Loamy-skeletal Shallow Typic Xerochrepts and channel gravel, cobbles, and boulders**: these are soils of fluvial landscapes which are similar to the thin soils of previous paragraphs, with the exception that they terminate in coarse material related to fluvial environments (see Plate 5.17).

Plate 5.17 Xerochrepts associate with coarse channel material alongside streams

5.4.3.7 Mesic soils of the Taurus Mountains

Two soils dominate the landscape of the Taurus chain – Mesic Clayey-skeletal to Loamy-skeletal Xerochrepts occur on sloping lands; and Mesic Coarse-silty Typic Xerorthents or Xerifluvents, depending on the presence of floodplains and their hydrology, occupy the valleys. Of the two, Xerorthents predominate.

- **Skeletal Xerochrepts**: these are thin, stony soils that have a pale brown surface. Those of the project area will have developed primarily from conglomerate in a weak sandstone matrix, though pure sandstone may also be present at some locations. While Xerochrepts offer no untoward difficulties to construction, they are susceptible to soil erosion wherever run-off becomes concentrated. The soil erosion risk in the Taurus Mountains exceeds that of the Anatolian Plateau due to increasing rainfall intensities near Turkey's southern coast.

- **Mesic Coarse-silty Xerorthents**: these are brown-coloured depositional soils that occur typically in valleys (see Plate 5.18). Irrigation and drainage structures occupy locations downstream of reservoirs and off-takes.

Plate 5.18 Xerochrepts and Xerorthents representing a typical upland valley association encountered by the Project

5.4.3.8 Thermic soils linking the Taurus Mountains to the Cukurova Plain

Thermic Orthic Calciustolls dominate the foothills and valleys between the Taurus Mountains and the Cukurova Plain. While differences in Calciustolls occur, these arise mainly from soil erosion that has truncated or reduced the depth of soils on the slopes marginally more than those of valley bottoms and hilltop summits. Calciustolls normally have a dark brown surface with a strong, granular structure, so that the soil appears soft underfoot. Those of the project area often have parent material incorporated into their profile, giving it a pale brown colour (calcareous concretions also appear but are too few to affect soil appearance). While the soil may appear soft, its character changes during the rainy season, when it becomes like a plastic, sticky clay. The dominant use of Calciustolls is the production of rainfed cereals and small volumes of figs, grapes, and row crops; forests also appear, but these seem to be mainly for conservation. Farmers time their ploughing carefully so as not to disturb the soil's beneficial structure.

Calciustolls in foothill locations pose moderate difficulties for the Project. Any activity that increases soil pore pressure in zones of low soil shear strength risks causing mass failure of the underlying marl (see Plates 5.19 and 5.20)

Plate 5.19 Dark surface of calciustolls soils

Coarse-loamy Typic Xerifluvents may occur on floodplains that have a history of regular inundation. Their area would be small and, in any case, would not affect the pipeline.

Plate 5.20 Soil erosion of calciustolls soils showing a pale brown colour

5.4.3.9 Thermic soils of the Cukurova Plain

The Cukurova Plain is made up of alluvial, greyish sands and rounded gravel (see Plate 5.22), which are classed as Thermic Sandy Orthic Quartzipsamments. Despite having high to excessive internal drainage — the groundwater lies at a depth of about two metres — a system of drainage canals complements a highly developed network of irrigation canals. High value row crops and irrigated cotton play important roles in the region's agricultural economy. As seen in Plate 5.21, preserving the soil profile is important in maintaining its productive qualities: an emergence of gravel onto the soil surface would reduce the volume of soil unnecessarily and hinder its tillage.

Plate 5.21 Sands and gravel that make up the soil of the Cukurova Plain

5.4.4 Soil erodibility

Soil erodibility is a measure of a soil's inherent susceptibility to erosion, due to rainfall or run-off. It is quantified as the average loss of soil per hectare per unit of rainfall erosivity, as measured on a unit plot of bare soil 22m long and having a slope of nine per cent. It can also be estimated empirically by observing variables related to soil structure, texture, permeability and organic matter [Ref 6].

Soil erodibility estimates for this EIA are derived from field analysis of soil texture and observations of land condition. For example, marl-derived soils on undulating landscapes showed few instances of surface rills and gullying, a condition that could result only from high infiltration and permeability.(1) Similar observations were made for other soils of the Project. Table 5.4 gives qualitative estimates of soil erodibility for different project soils.

Table 5.4 Indicative erodibility of project soils

TEMPERATURE REGIME	TERRAIN	TOPOGRAPHY	GEOLOGY AND ABBREVIATED TAXONOMY		SOIL ERODIBILITY
1. Thermic	1.1 Thermic plains	1.1.1 Alluvial plains	Quartzipsamments		High
	1.2 Thermic foothills	1.2.1 Sloping lands	Calciustolls		Moderate
		1.2.2 Valley lands	Calciustolls		Moderate
		1.2.3 Fluvial lands	Calciustolls		Moderate
2. Mesic	2.1 Mesic plateaux	2.1.1 Plateau flat and undulating lands	Marl	Calciustolls	Low
			Tuff	Dystrandepts	Moderate
			Alluvium	Xerorthents	High
		2.1.2 Plateau scarps	Xerochrepts		High
		2.1.3 Sloping and dissected lands	Tuff	Dystrandepts	Moderate
			Non-tuff	Xerochrepts	High
		2.1.4 Fluvial lands	Xerochrepts		High
	2.2 Mesic uplands	2.2.1 Mountains and sloping land	Skeletal Xerochrepts		High
			Haploxeralfs		Moderate
		2.2.2 Valley flat and undulating land	Xerorthents		Moderate
		2.2.3 Fluvial lands	Xerifluvents		High
	2.3 Mesic gypseous uplands	2.3.1 Gypseous ridges	Xerochrepts		High
		2.3.2 Gypseous valleys and slopes	Calciustolls		Low
			Xerochrepts		High
3. Cryic	3.1 Cryic uplands	3.1.1 Mountains and sloping lands	Cryochrepts		High
		3.1.2 Valleys	Cryorthents		High
	3.2 Cryic plateaux	3.2.1 Plateau flat and undulating lands	Cryandepts		Moderate
		3.2.2 Sloping and dissected lands	Cryochrepts		High

1 Soil permeability is a factor that moderates erodibility. Wishmeier and Smith found that highly permeable soils are 27% less erodible than low permeability soils [Ref 4].

5.4.5 Soil erosion classes

Table 5.5 presents the soil erosion classes crossed by the pipeline expressed as percentages of the length of the centreline. These show that the most eroded areas are found between Cayirli and Imranli, while those between Sariz and Ceyhan are also badly affected.

Table 5.5 Soil erosion classes crossed by the pipeline centreline (%)

EROSION CLASSES	POSOF - HORASAN	HORASAN - CAYIRLI	CAYIRLI - IMRANLI	IMRANLI - SARIZ	SARIZ-CEYHAN	TOTAL (%)
None or Very Few	7.97	52.2	16.3	14.3	31.84	23.7
Moderate	79.73	36.33	30.39	51.57	25.66	45.89
Severe	11.79	11.04	32.52	24.71	25.45	21.01
Extreme	0.44	0.00	19.38	9.22	16.88	8.99
Other	0.08	0.51	1.41	0.20	0.17	0.43
Total length (km)	224.03	193.49	186.38	248.46	210.39	1,062.74

5.4.6 Wind erosion

Wind erosivity was estimated during the basic engineering phase of the Project as playing a potentially significant role in soil erosion on the Anatolian Plateau. Turkey follows international standards for synoptic stations, which call for an anemometer height of 10m. However, wind erosion estimates require cup heights to be installed at 0.3m above the ground surface. Readings between different anemometer heights can be adjusted by the following formula, where *v* is wind speed:

$$v_n = v_z \times 0.606$$

The adjustment from 10m to 0.3m cup height reduces to a factor of 0.606 times wind speed. When data from Turkey's synoptic gages were corrected, no significant risk exists. Even were it to pose a theoretical risk, the farmer practice of leaving stubble over their fields or marking their borders with brush and trees would moderate its impact.

5.4.7 Frost heave

Frost heave is the raising and deformation of water-saturated soil due to the formation of ice within the soil layers. Heave involves the transport of water through the soil towards the region where freezing is occurring. The pressure driving this flow originates from pre-melted liquid films between soil grains and ice within the partially frozen soil. Cryostatic suction may increase the upward water permeation to facilitate ice-lens growth and increased heave. In almost all instances, frost heave is observed in silty-clayey soils [Ref 7], ie fine silty or fine clayey soil families in Soil Taxonomy. Frost heave is a potential cause of pipeline failure.

Table 5.6 and Table 5.7 give average monthly soil temperatures measured at depths of 50 and 100cm in the project area and show that soils between Posof and Tercan freeze at or below one metre depth at times between January and March. This means that the pipeline in cryic fine-textured soils at elevations higher than about 2,000m should be buried deeper than one metre if soil heave is to be avoided. Susceptible soils will likely occupy valley-bottoms and the lower third of their slopes. Stony soils are less likely to be vulnerable to frost heave.

Table 5.6 Average monthly soil temperatures (ºC) at a depth of 50 cm

STATION NAME	Period of Record (Yrs)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Posof (Ardahan)	14	-0.1	-0.4	2.3	8.4	12.5	15.6	18.5	19.4	17.3	12.5	7.2	3.1
Ardahan	22	-3.4	-4.4	-1.5	2.8	9.0	13.4	16.5	17.3	15.2	10.3	5.0	0.4
Selim (Kars)	20	-1.1	-2.1	-0.3	3.4	8.4	12.7	16.0	17.5	16.1	11.8	6.6	2.6
Sarikamis (Kars)	26	-1.9	-2.3	-0.4	2.4	7.2	10.9	14.0	15.4	13.6	9.2	4.5	1.1
Oltu (Erzurum)	8	1.4	1.6	4.8	11.0	15.3	19.9	24.7	25.3	22.8	16.4	9.7	4.3
Horasan (Erzurum)	8	-0.9	-1.3	0.6	7.2	12.2	17.0	21.4	22.5	19.3	14.1	7.6	3.0
Tortum (Erzurum)	27	0.7	0.1	2.7	8.6	13.4	18.4	23.0	24.0	20.8	14.6	8.6	3.8
Tercan (Erzincan)	19	0.1	-0.5	2.5	8.8	13.9	19.3	23.5	25.5	22.4	16.0	8.7	3.6
Erzincan	46	2.2	1.9	4.5	10.0	14.8	19.4	23.2	24.2	21.5	15.8	9.9	5.1
Susehri (Sivas)	7	3.8	3.9	5.3	10.7	14.4	18.7	22.0	22.7	20.7	15.7	9.2	5.5
Divrigi (Sivas)	23	3.1	2.4	4.8	9.9	14.1	18.5	22.6	23.6	21.3	16.2	10.1	5.7
Zara (Sivas)	26	1.0	0.6	2.8	8.2	12.9	17.6	21.6	22.7	20.1	14.3	7.9	3.4
Sivas	54	1.8	1.7	3.8	9.1	14.1	18.5	22.4	23.4	20.5	14.9	8.9	4.0
Kangal (Sivas)	12	1.6	1.8	2.7	7.0	11.0	15.3	18.8	19.7	17.4	12.9	7.3	3.7
Pinarbasi (Kayseri)	1	1.9	1.2	2.5	7.6	11.8	15.7	19.2	19.9	17.8	12.8	7.5	3.8
Sariz (Kayseri)	16	1.3	1.0	3.0	7.7	11.7	15.9	19.3	19.8	17.3	12.5	6.9	3.1
Afsin (Kahramanmaras)	4	1.6	2.0	4.9	10.3	15.8	21.0	25.4	25.7	22.3	16.1	8.6	4.5
Goksun (Kahramanmaras)	3	2.5	2.6	4.5	9.2	13.8	18.1	21.5	23.2	20.4	15.6	10.5	5.5
Kozan (Adana)	26	10.3	10.7	13.4	17.4	21.6	26.0	29.3	30.3	28.0	23.3	17.3	12.6
Ceyhan (Adana)	16	9.8	10.3	12.8	17.2	21.3	25.1	28.1	29.1	27.6	22.9	17.0	12.3
Yumurtalik (Adana)	15	12.1	12.1	14.2	18.2	21.8	25.6	28.4	29.4	28.3	24.1	18.5	14.4

Table 5.7 Average monthly soil temperatures (ºC) at a depth of 100 cm

STATION NAME	Period of Record (Yrs)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Posof (Ardahan)	14	3.2	1.8	2.8	6.6	10.0	12.9	15.7	17.2	16.5	13.5	9.7	6.0
Ardahan	22	1.0	-0.8	-0.4	1.4	6.2	10.4	13.2	14.8	14.2	11.4	7.6	4.1
Selim (Kars)	20	3.0	0.9	1.1	3.1	6.6	9.8	12.9	14.9	15.1	13.0	9.5	6.2
Sarikamis (Kars)	26	1.7	0.5	0.7	2.2	6.4	10.0	13.0	15.0	14.6	11.6	7.8	4.4
Oltu (Erzurum)	8	6.0	4.9	5.9	9.7	13.1	16.8	20.6	21.9	22.1	18.7	13.8	9.2
Horasan (Erzurum)	8	3.8	2.2	2.4	5.8	9.8	13.3	17.2	19.7	18.8	16.0	11.0	7.0
Tortum (Erzurum)	27	4.5	3.0	3.9	7.4	11.2	15.1	19.2	21.4	20.6	17.0	12.4	7.9
Tercan (Erzincan)	19	0.4	-0.4	0.2	1.6	8.0	12.4	15.8	20.0	18.2	13.1	8.2	3.8
Erzincan	46	4.9	3.7	4.9	8.9	12.9	16.7	20.1	21.9	20.8	17.0	12.1	7.8
Susehri (Sivas)	7	6.1	5.4	6.0	9.5	12.5	16.2	19.1	20.2	19.6	16.9	12.2	8.6
Divrigi (Sivas)	23	4.0	2.7	2.7	5.3	9.2	12.5	15.7	19.3	18.3	10.8	10.0	6.1
Zara (Sivas)	26	4.3	3.1	3.7	7.0	10.6	14.4	17.9	19.9	19.2	15.8	10.9	6.9
Sivas	54	4.7	3.7	4.7	8.3	12.0	15.8	19.2	20.9	19.8	16.3	11.5	7.4
Kangal (Sivas)	12	5.2	4.1	4.2	6.0	8.6	11.7	13.4	16.4	16.1	13.9	10.5	7.5
Pinarbasi (Kayseri)	1	2.7	2.0	2.0	2.8	6.8	10.3	12.3	15.0	14.9	11.5	7.7	4.3
Sariz (Kayseri)	16	4.5	3.7	4.3	7.0	9.9	12.8	15.7	17.1	16.4	13.8	10.0	6.6
Afsin (Kahramanmaras)	4	4.7	3.7	5.6	9.3	13.4	17.9	21.5	23.0	21.5	17.5	12.1	7.6
Goksun (Kahramanmaras)	3	4.7	4.2	5.0	8.0	11.7	15.4	18.1	20.8	19.8	16.4	12.3	8.1
Kozan (Adana)	26	12.6	12.2	13.6	16.5	19.8	23.5	26.3	30.1	27.4	24.2	19.6	15.4
Ceyhan (Adana)	16	12.4	11.8	13.1	16.0	19.2	22.5	25.2	26.8	26.4	26.3	19.2	15.2
Yumurtalik (Adana)	15	14.2	13.5	14.6	17.1	19.8	22.9	25.6	27.0	26.9	24.4	20.6	17.0

5.4.8 Agricultural soil quality investigations

Fifty-nine samples were collected at 29 locations from the topsoil (upper 60cm) of agricultural lands neighbouring the pipeline corridor during July 2001 [Ref 8]. Locations of sampling points along the route can be seen in Figure 5.2. Agricultural soil samples collected were analysed for the following parameters at the General Directorate of Rural Services (GDRS) Research Laboratories in Ankara:

- pH;
- electrical conductivity (dS/m);
- exchangeable cations (% Na, K, Ca, and Mg);

- cation exchange capacity (meq/100 g);
- boron (ppm);
- structure classification (% sand, silt, clay);
- total nitrogen (%);
- saturation with water (%);
- total salt (%);
- pH of water-saturated soil;
- $CaCO_3$ (%);
- productivity (P_2O_5 and K_2O as kg per one-tenth of hectare);
- organic content (%);
- fertiliser amount to be added (P_2O_5 and N as kg per one-tenth of hectare).

The soil samples were classified according to the GDRS soil quality criteria for salinity (based on total salt content and electrical conductivity), productivity and acidity in order to establish baseline conditions for important agricultural soils within the project area. These criteria are presented in Table 5.8 and Table 5.9.

Table 5.8 Salinity Criteria for the Agricultural Soils

Salinity	Total Salt (%)	Electrical Conductivity (dS/m)
Non-saline (NS)	0.00 – 0.15	0 – 4
Slightly Saline (SS)	0.15 – 0.35	4 – 8
Moderately Saline (MS)	0.35 – 0.65	8 – 15
Very saline (VS)	> 0.65	> 15
Source: GDRS, 1990.		

Table 5.9 Agricultural Soils Productivity Criteria

	Very Low (VLP)	Low (LP)	Medium (MP)	High (HP)	Very High (VHP)
K_2O (kg/da)	0-3	3-6	6-9	9-12	>12
P_2O_5 (kg/da)	-	0-20	20-30	30-40	>40
Source: GDRS, 1990.					

Most of the soils were found to be non-saline (NS) (90% based on the EC criteria; 75% based on the total salt content criteria). Based on the total salt criteria 12 (20%), 1 (2%), and 2 (3%) soil samples out of a total of 59 samples were found to be slightly saline (SS), medium saline (MS), and very saline (VS), respectively.

Eighty per cent of the soil samples were classified as slightly basic (SB). The number of slightly acidic (SA), medium acidic (MA), and highly basic (HB) soils was found to be 5%, 1%, and 6%, respectively.

The productivity of the soil samples was evaluated based on phosphorus oxide (P_2O_5) and potassium oxide (K_2O) criteria. The majority of the soil samples (85%) were found to be of very high productivity (VHP) based on the potassium criteria. However, based on the phosphorus criteria, 71% of the soil samples were determined to be of very low productivity (VLP).

5.4.9 Soil Capability Classes

Table 5.10 shows the soil capability classes crossed by the pipeline by section and in total expressed as percentages of the length of the centreline. These show that the route crosses mostly soils with high capability classes (Classes I and II) between Horasan and Cayirli, and between Sariz and Ceyhan; and crosses mostly poor soils (Classes VI and VII) between Cayirli and Sariz. Descriptions of the soil capability classes are given in Table 5.6 in Section 5.4.7 above.

Table 5.10 Soil capability classes crossed by the pipeline centreline (%)

	POSOF - HORASAN	HORASAN – CAYIRLI	CAYIRLI - IMRANLI	IMRANLI - SARIZ	SARIZ- CEYHAN	TOTAL (%)
I	0.08	29.63	13.52	9.23	25.75	17.86
II	14.50	23.00	11.73	16.47	16.18	20.31
III	35.49	13.86	13.97	27.98	6.17	23.59
IV	21.28	13.64	9.61	14.96	8.87	18.69
V	0.00	0.00	0.00	0.00	0.00	0.00
VI	19.65	15.68	18.19	14.59	13.12	22.49
VII	8.91	3.71	31.56	16.58	29.74	15.24
VIII	0.00	0.37	1.41	0.05	0.03	21.37
Other	0.08	0.10	0.00	0.15	0.14	2.99
Total length (km)	224.026	193.494	186.375	248.457	210.386	1,062.738

Figure 5.2 Locations of Agricultural Soil Sampling along the Route

5.4.10 Existing soil contamination

In September 2001, fifteen soil samples were collected from nine locations, which were either suspected to have been exposed to past petroleum contamination or were proposed as locations for permanent BTC Pipeline facilities. The locations of these sites are shown in Figure 5.3. These sites were selected based on both desktop study and a visual assessment of existing contamination along the pipeline route carried out during the Basic Engineering phase of the Project (June-September 2001).

The collected soil samples were screened for petroleum hydrocarbons using a portable photo ionisation detector (PID) using headspace gas analysis technique. For samples indicating possible petroleum contamination, samples were to be further analysed for Total Petroleum Hydrocarbons (TPH) analyses in the gasoline and diesel ranges (GRO and DRO). In addition, all collected soil samples were analysed for six metals (As, Cd, Cr, Pb, Hg, Ni, and V), which are also indicators of petroleum related contamination. In order to account for the burial depth of the pipeline, soil samples were taken at three different depths where possible (ie surface, 1.5, and 3 metres). Deep soil samples were collected using hand augers where ground conditions permitted. Otherwise, backhoes were used to penetrate hard ground surfaces.

The TPH screening results were not indicative of past petroleum contamination at any of the sampling locations. Therefore, further TPH analyses for GRO and DRO were not conducted.

Key findings of the metal analyses are summarised below.

- Concentrations of arsenic, cadmium, lead, mercury, and vanadium in all of the soil samples were below the established international guideline values and Turkish standards [Ref 40].

- Chromium concentrations for samples S1, S14, and S15 was above the established standards and guideline values. The S1 chromium concentrationwas above the Canadian agricultural and residential guideline values but below the Dutch and other Canadian guideline values. For samples S14 and S15, the chromium concentrationwas above the Turkish standard and the Canadian guideline values, but below the Dutch guideline value.

- Nickel concentrations were above the Canadian guideline values but below the Dutch guidelines for samples S1, S6, S7, S8, S10 and S11. For samples S14 and S15, the nickel concentrations were above both the Canadian and Dutch guideline values. Based on a nickel standard of 112.5mg/kg, the soil samples S11, S14 and S15 have nickel concentrations above the Turkish soil quality standard.

The relatively high chromium and nickel concentrations described above for some soil samples (ie S1, S6, S7, S8, S10 and S11) can be attributed to high natural background levels. In particular, it is noted that the Mediterranean region of Turkey is rich in chromium mineral reserves. Similarly, elevated levels of nickel are observed in areas with ophiolite rock formations in the south eastern Mediterranean region.

For samples S14 and S15, however, high chromium and nickel concentration may be indicative of some form of past contamination. Since the TPH screening results and vanadium levels (a typical indicator used for petroleum contamination) are not indicative of a petroleum contamination. It is therefore possible that:

- high nickel concentrations observed at the S14 and S15 sites may be indicative of pollution sources other than petroleum; or

- any organic contaminant (eg TPH) that might have been present was biodegraded or volatilised (especially in the upper layers of soil) in the course of time.

The S14 and S15 sites will be further investigated prior to the commencement of construction to confirm the presence of existing contamination. In addition, at the time of the survey summarised above, the location of some permanent project facilities had not been fixed (eg PT2, PT3 and PT4, and IPT1). In order to establish the existence and extent of existing contamination at these sites further baseline soil contamination surveys were undertaken by BOTAŞ. The results of the surveys concluded background concentrations for those parameters tested.

It is noted that the soil contamination survey was undertaken in September 2001, over a year prior to the planned commencement of construction activities. Accordingly, third party activities during the intervening period may result in additional sites of existing contamination not identified during the above survey. In particular, construction of the NGP, which parallels the BTC route for approximately 400km, was ongoing at the time of the survey. Accordingly, Contractors will be required to include Phase I contamination surveys in their pre-construction survey programmes in order to identify such areas prior to construction.

Figure 5.3 Location of Potentially Contaminated Soil Sampling Sites

5.5 GEOLOGY AND GEOHAZARDS

5.5.1 Sources of information

The identification of geological features and geohazards along the pipeline route corridor during project development included the following main phases of investigation:

- desktop studies and field investigations conducted during the pre-work programme of the Basic Engineering (BE) phase;
- independent review of geohazards;
- detailed geological, geomorphological and geotechnical investigations along the pipeline route during Detailed Engineering (DE).

5.5.1.1 Geological and geohazard investigations during Basic Engineering

During BE, geological features were identified with the use of 1:100,000-scaled geological maps prepared by the General Directorate of Mineral Search and Exploration (MTA) and confirmed by the observations of field teams. The aim at this stage was to reduce the 10km Corridor of Interest to a 500m Preferred Route Corridor and, as such, no intrusive geotechnical investigations were undertaken.

Geological cross-sections were then prepared at a scale of 1:25,000 for significant areas along the pipeline route, including areas of karstic formations, gypsum and evaporite formations, frequent geological formation changes and major crossings based on deskbased information and field observations.

5.5.1.2 Independent investigation of geohazards

Following completion of the BE investigations, BOTAŞ commissioned an independent assessment of geohazards along the BTC Pipeline Route and at the BTC Marine Terminal site. The scope of this investigation was to provide additional guidance with regards to three specific geohazards: landslide areas, karstic areas and liquefaction. Experts in these respective fields undertook an assessment of the proposed route based on a combination of desktop and field investigations during May 2001.

The findings of this study included the identification of further investigations to be undertaken during DE and potential areas requiring re-routes outside of the preferred 500m corridor.

5.5.1.3 Investigations during Detailed Engineering

The aim of the geology and geohazard investigations undertaken during DE phase was to clarify the recommendations of the Independent Geohazards Investigation undertaken in May 2001 as part of BE phase and to obtain the necessary geotechnical information necessary for routing and engineering of the pipeline.

Five investigation programmes were implemented to address different areas of concern:

- subsurface conditions and facility areas investigation programme;
- fault investigation programme;
- landslide investigation programme;
- karst hazard analyses investigation programme;
- liquefaction investigation programme.

Prior to undertaking field studies a review was undertaken of existing documentation, including topographical and geological maps and aerial photographs of the geology, hydrogeology and geomorphology of the project area. This information formed the basis for further field study programmes. The methodology adopted for each of the five investigation programmes listed above is summarised in Box 5.1.

A summary of the results of the various investigation programmes undertaken during both BE and DE and a resulting description of the geology and geohazards along the length of the BTC Pipeline route are summarised in the following sections.

An overview of the geology of Turkey is shown in Figure 5.4 and a map showing the active faults throughout Turkey is shown in Figure 5.5.

Box 5.1 Summary of Geological and Geohazard Investigation Undertaken During Detailed Engineering

Facilities Area and Subsurface Investigation Programme (September to November 2001)
The subsurface conditions at planned pump station and pressure reduction station sites were explored by means of core drillings. The aim was to obtain the necessary geotechnical information for the foundation of these facilities.

Trial pits were the most common method adopted to clarify the subsurface conditions and these were undertaken at the following locations:

- proposed block valve station sites;
- special crossing points at rivers, roads, railroads and main irrigation channels;
- areas of observed high groundwater table in order to define anti buoyancy design measures.

Trial pits were also undertaken along the pipeline route to investigate subsurface build-up and hence gain information for the method of trench excavation with the exception of route sections where the excavation method was obvious due to surface outcrops. A total of 345 trial pits and 33 core drillings were undertaken under the scope of this investigation programme. To obtain specific geotechnical information extensive laboratory tests were executed on the collected samples.

Fault Investigation Programme (October 2001)
Forty-two faults or potential faults were identified during the BE fault investigations. The purpose of the DE fault investigation programme was to identify which of these faults are Holocene active faults and to develop the parameters for each active fault that would be necessary for the fault crossing design. The investigation included the following activities:

- field observations and interpretation of 1:60,000 and 1:16,000 aerial photographs, satellite images and topographic maps;
- development of geological and geomorphological maps of fault crossings;
- paleoseismological trenching; and
- Very Low Frequency (VLF) measurements.

Landslide Investigation Programme (September to November 2001)
The landslide investigation programme involved the following key components.

- *Initial Desktop and Field Reviews* - previous landslide studies, topographical and geological maps, aerial photos and related literature were reviewed and a overview field trip was undertaken to define the scope for detailed investigations.
- *Trial Pits* – based upon the scope defined from the initial review nine trial pits, to depths of up to 5m, were undertaken at sites of concern.
- *Core Drillings* – were undertaken at three sites to depths of 9 to 23m.
- *Laboratory Tests* – the above trial pit and core drilling samples were analysed for grain size distribution, Atterberg limits, natural moisture content, unit weight, specific weight, direct shear and residual shear strength

Karst Investigation Programme (October 2001 - ongoing)
Five karst models along the pipeline route were identified based upon Karst investigations undertaken during BE and by the independent audit of these results by experts on Karstic areas (see *Section 5.4.3*). Based upon these previous investigations, a detailed karst investigation programme has been implemented made up of the following key stages:

- detailed mapping of potential high risk karst areas based on the identified karst models and an assessment of initial routing recommendations in highly karstified zones;
- extensive geophysical measurements in high-risk karst areas of karst models 2 and 3 undertaken primarily as a screening process to detect major subsurface voids along the pipeline route. These geophysical investigations included multi electrode geoelectric survey over a total distance of 12.2km;
- additional geophysical measurements in critical zones where major underground cavities were detected to further identify potential ground failure areas in order to identify a feasible route;
- a detailed drilling programme to reinforce the results of geophysical measurements was carried out in April-May 2002.

Box 5.2 Summary of Geological and Geohazard Investigation Undertaken During Detailed Engineering (continued)

Liquefaction Investigation Programme

Based upon studies undertaken during Basic Engineering and the recommendations made by liquefaction experts regarding the further definition of liquefaction risks, a site investigation programme was undertaken to determine the soil stratification and, mechanical and physical properties of the soil layers comprising the soil profiles at specific sites identified as potential risk areas. The site investigation programme included:

- *site sampling* including *boreholes* at 11 locations and *trial pits* at 13 locations;
- *in-situ tests* at the above locations including the use of standard penetration tests (SPT) and pressure meters (PMT);
- *laboratory tests* including unit weight, Atterberg limits, grain size distribution, natural moisture content, triaxial compression test, unconfined compression test and consolidation test.

Figure 5.4 Geological Map of Turkey

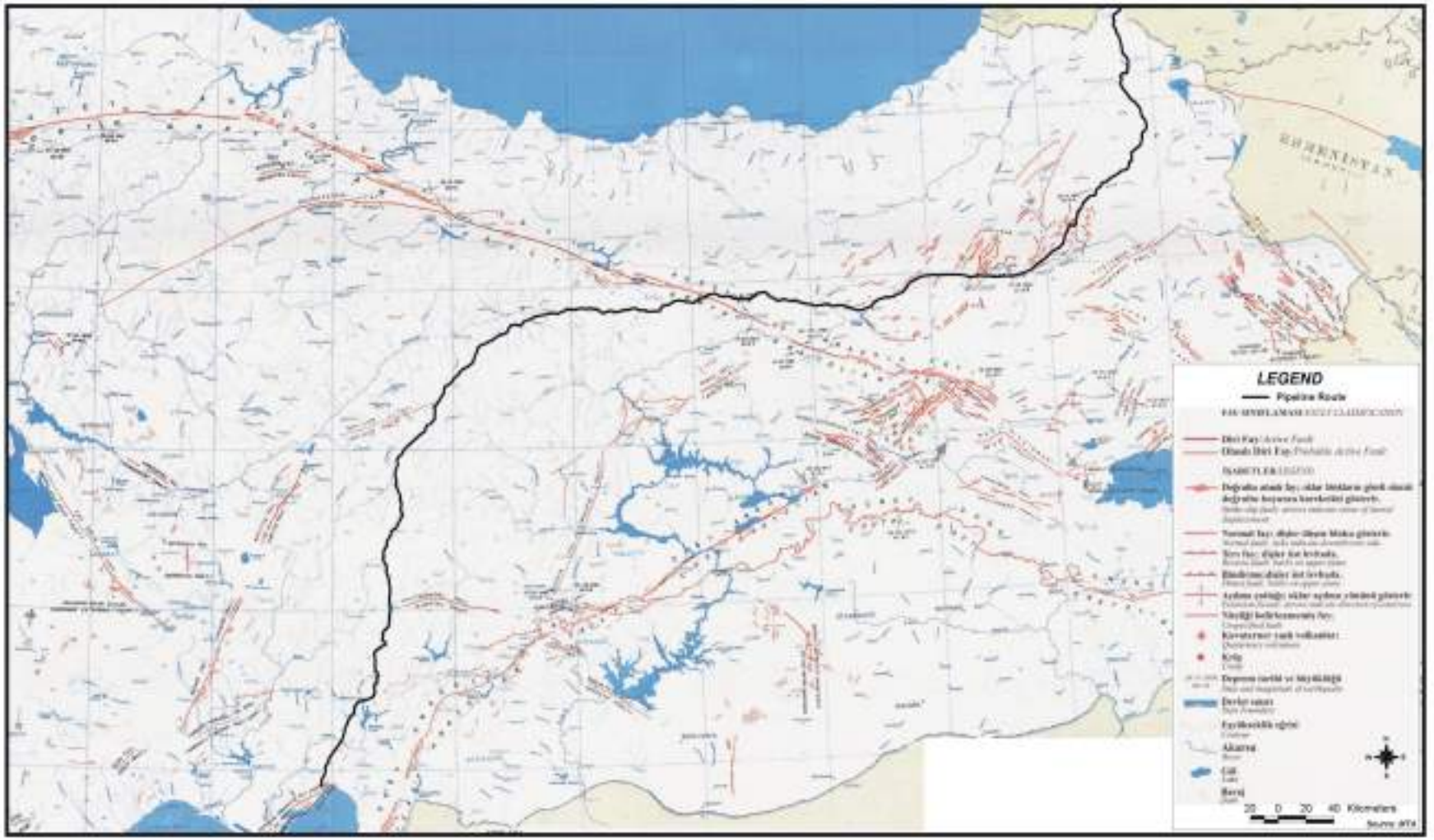


Figure 5.5 Active Fault Map of Turkey

5.5.2 Stratigraphy

The route corridor between Posof and Yumurtalik can be divided into five regions, defined according to their geological characteristics. Each region is described below.

5.5.2.1 Kars Plateau

In the north, the region between Posof and Pasinler is defined as the Kars Plateau comprising young Tertiary volcanics with limited outcrops of mostly Mesozoic-aged rocks and underlain by Eocene-aged deposits. The rock groups forming the Kars Plateau are mainly basalt, andesite lavas of the dasite type, pyroclastics (comprising tuff and agglomerates) with alternating sediments. In general, the volcanic feeder centres form the high mountains, while the pyroclastics and sedimentary rocks, which are softer and hence relatively easily eroded, form the plains. The generalized stratigraphy of the region is presented in Figure 5.6.

5.5.2.2 East Anatolia Creep Prism between Pasinler and Imranli

The area between Pasinler and Imranli consists of a rock group called the East Anatolian creep prism, which is made up of an ophiolited mixture, (sometimes covered with Tertiary volcanics and same-aged deposits), chiefly comprising serpentinited peridotite, gabbro, diabase and limestone blocks. Between these, predominantly green-coloured, rocks, same age sediments are found. In some locations, embedded over these rock groups, are Plio-Quaternary young basin deposits of east-west orientation. In the area between Pasinler and Imranli, undisturbed peridotites and silicified limestone blocks form high mountains, whilst easily abraded same-age sediments form a wide and shallow topography. The generalized stratigraphy of the region is presented in Figure 5.7.

5.5.2.3 Sivas Evaporitic Basin

In the Sivas Province and its vicinity, the pipeline route passes the Sivas Basin. This is made up of evaporitic rock groups of Tertiary Period, comprising halite (rock salt) and gypsum interbedded with sandstone, gravels and clays. These soft rock formations present a relatively wide and shallow topography and the action of water has produced unique karstic forms. Sloped areas of clay are susceptible to landslip, whilst in flatter areas wide plains with seasonal or permanent shallow lakes are found. The generalized stratigraphy of the region is presented in Figure 5.8.

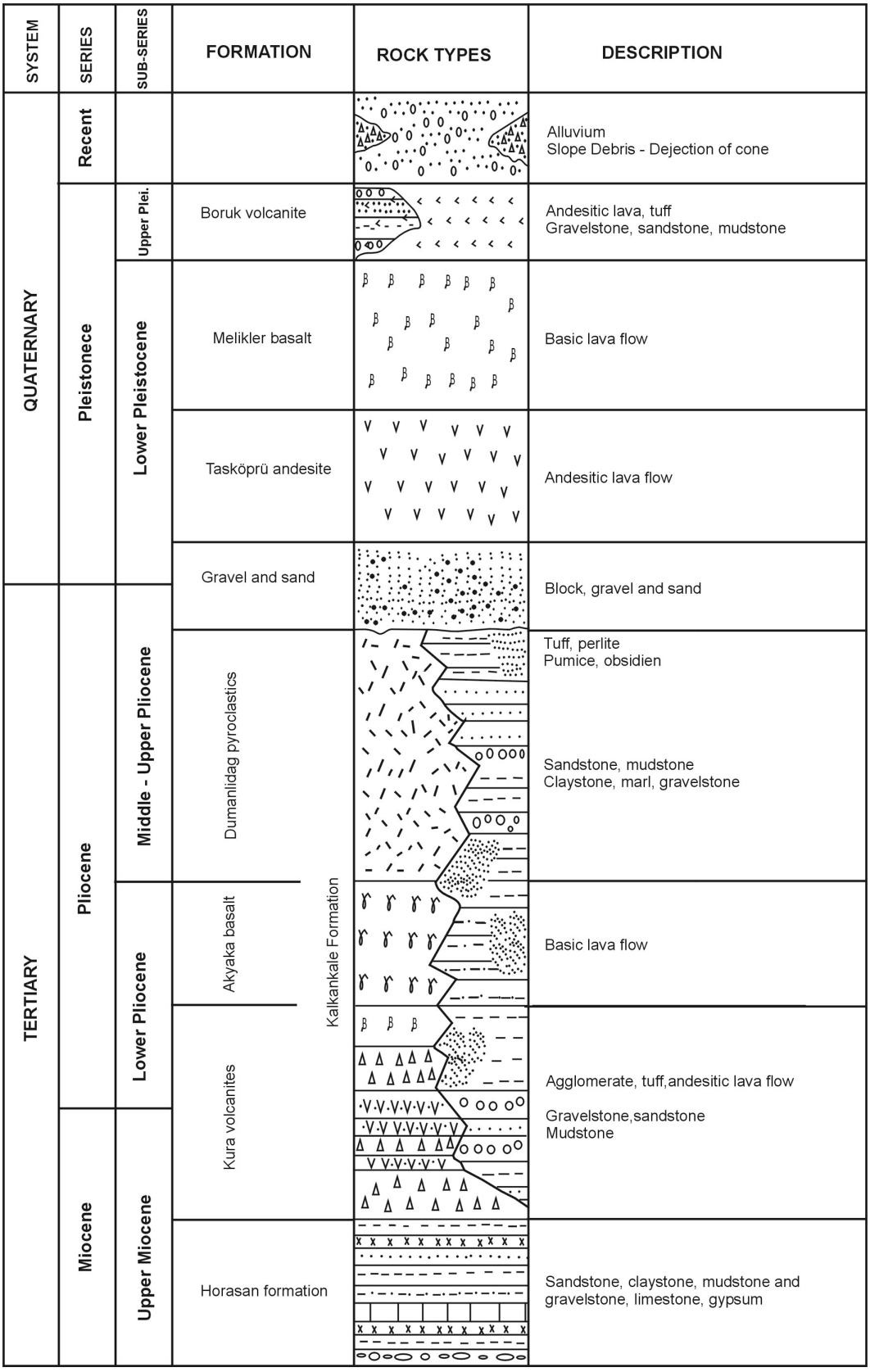


Figure 5.6 Generalised Stratigraphic Column of Kars Plateau

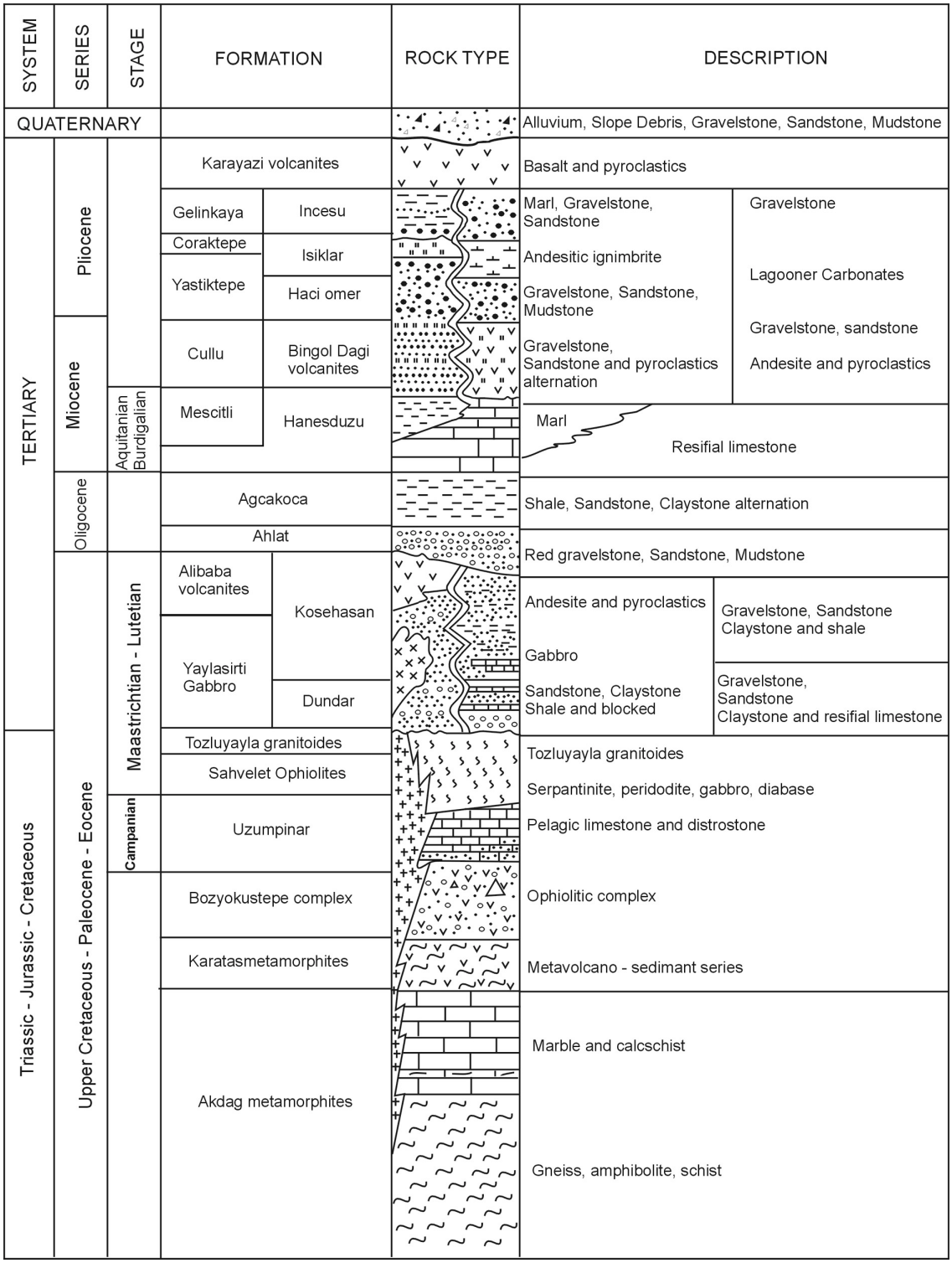


Figure 5.7 Generalised Stratigraphic Column of East Anatolia Creep Prism between Pasinler and Imranli

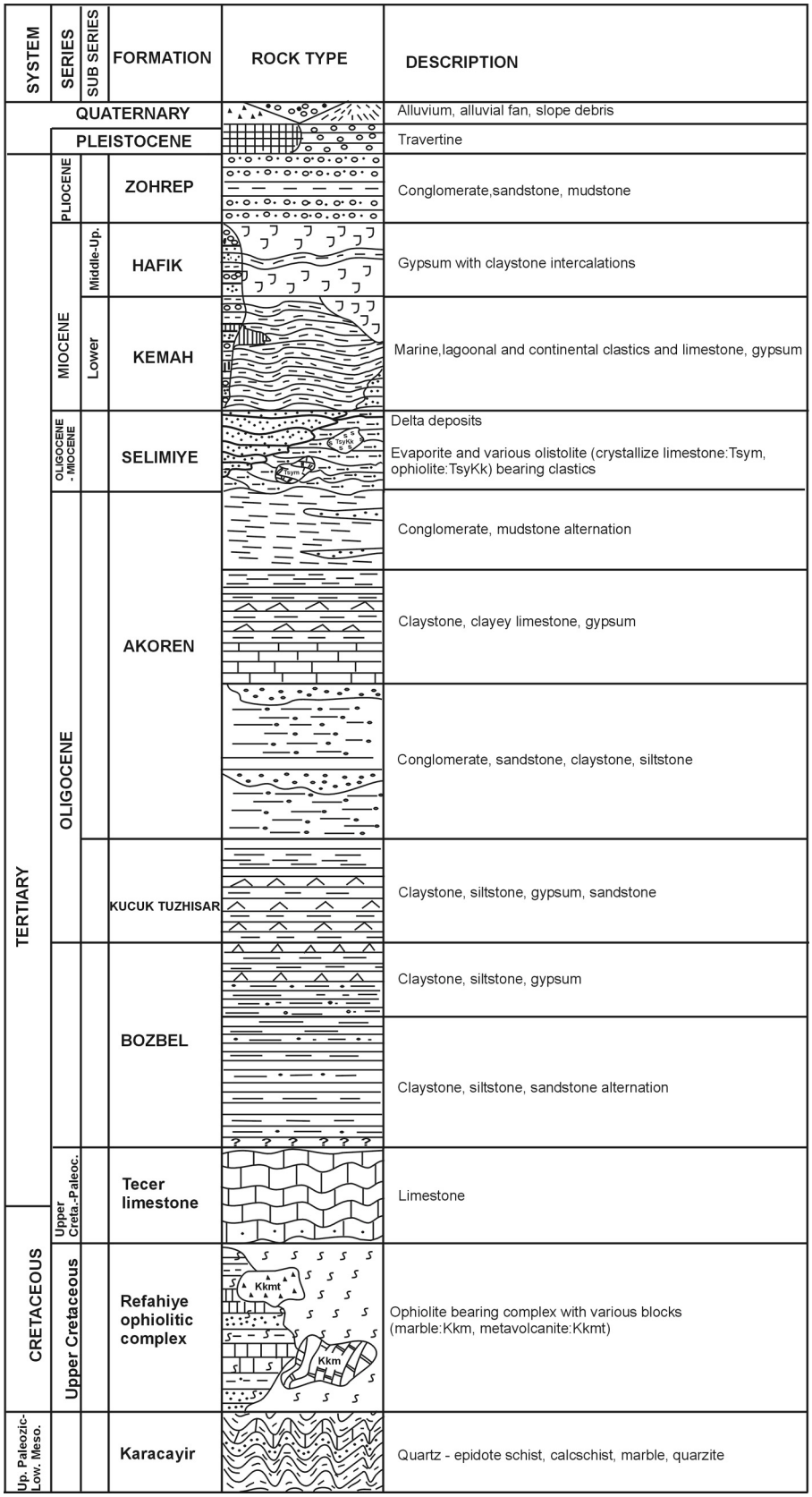


Figure 5.8 Generalised Stratigraphic Column of Sivas Evaporatic Basin

5.5.2.4 Taurus Orogenic Zone between Sariz and Osmaniye

The route between Sariz and Osmaniye passes through the orogenic Taurus Mountains – a range of Palaeozoic and Mesozoic Era rock groups and unique tectonics. Most of these rock groups comprise tectonically overlaid rock formations composed of carbonates and ophiolites. The mountain ridges of east-west orientation are formed by tectonic compression, which has produced a complex folding of the sedimentary rocks. The steep valleys and canyons of the north-south oriented rivers are the only places that allow passage across the Taurus Mountains. The generalized stratigraphy of the region is presented in Figure 5.9.

5.5.2.5 Cukurova Basin between Kadirli and Ceyhan

The area where the pipeline route passes between Kadirli and Ceyhan is known as the Cukurova Basin. At the bottom of the basin, there are Miocene Era clastics overlain discordantly by Plio-quaternary-aged deposits. The Miocene Era clastics are partly volcanic in origin, whilst most of the widely distributed, young deposits are of either lake or river origin. The Miocene deposits form a relatively rough topography, while the young deposits form the plains. The generalized stratigraphy of the region is presented in Figure 5.10.

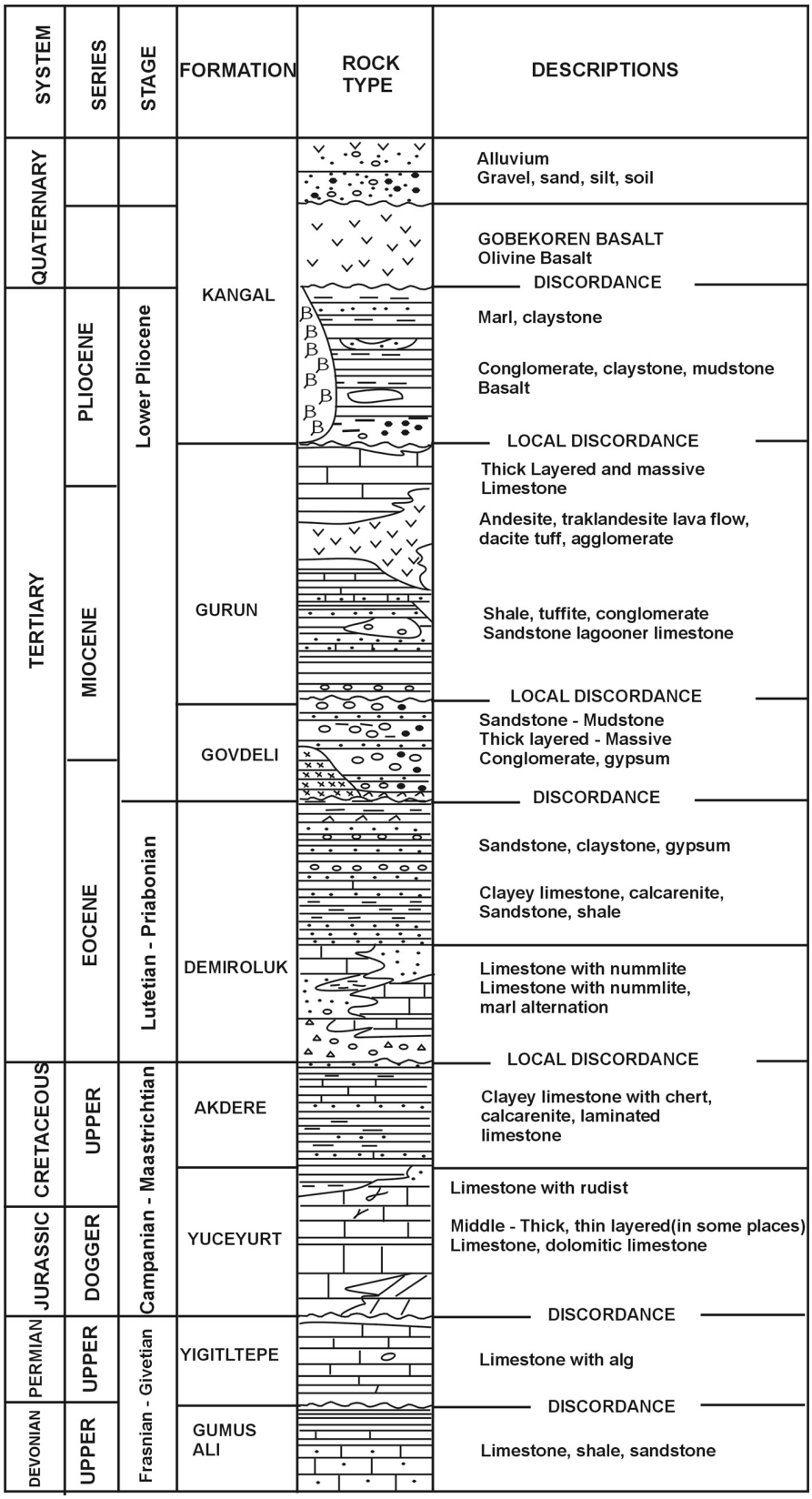


Figure 5.9 Generalised Stratigraphic Column of Taurus Orogenic Zone between Sariz and Osmaniye

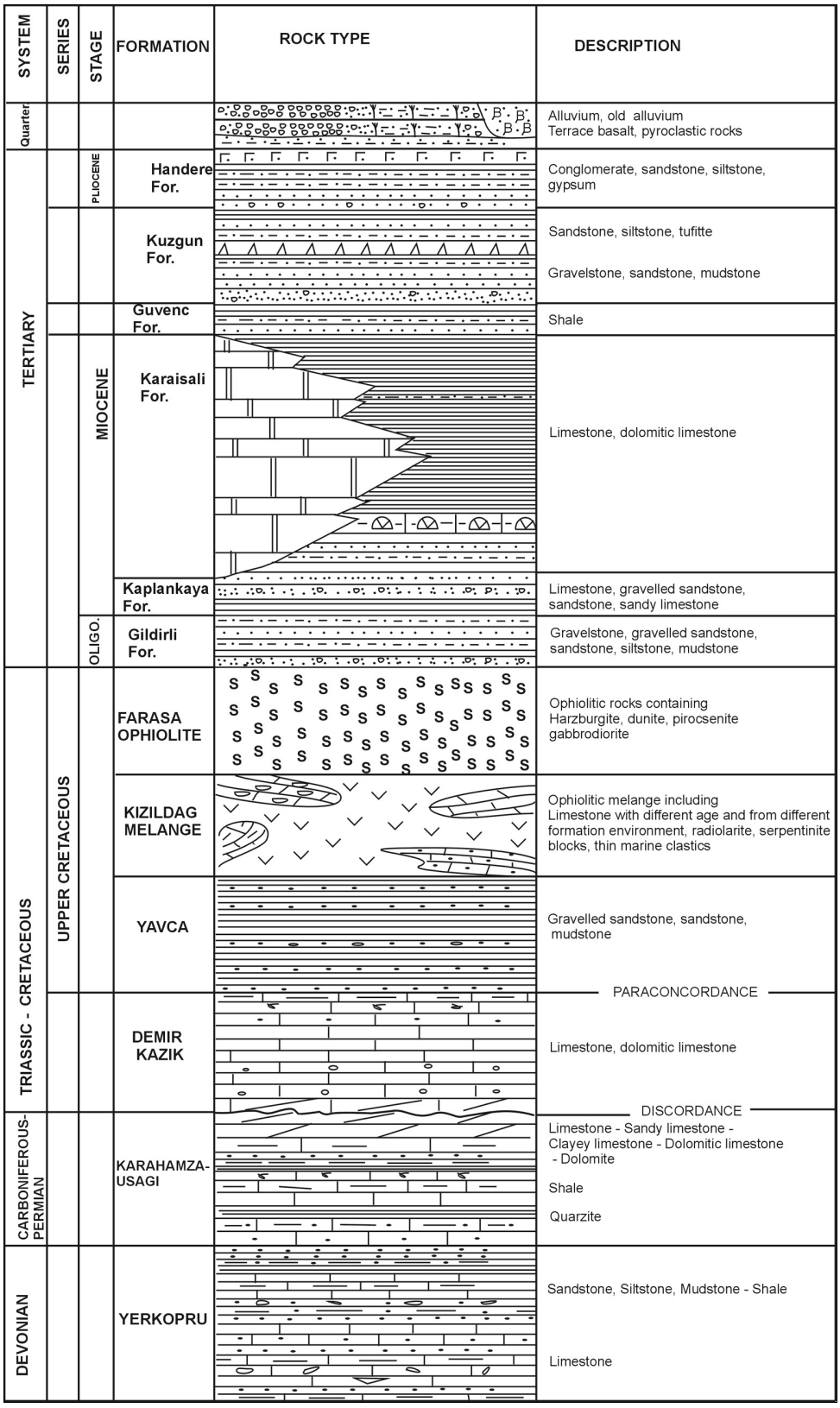


Figure 5.10 Generalised Stratigraphic Column of Cukurova Basin between Kadirli and Ceyhan

5.5.3 Tectonic history

The Anatolia region, being part of the Alpine-Himalayan Orogenic Zone, has been exposed to different tectonic movements since the Late Palaeozoic Era. These movements, which brought together several rock groups of different ages and formation mechanisms, originate as normal faults, but later became up thrust or napped structures. The current orogenic event, which began to affect the region in the Upper Miocene Period, is responsible for the morphological location of the Taurus Mountains today.

This latest tectonic regime is believed to have been formed by the collision of the Anatolian and Arabian continental plates, which occurred as a result of the closure of a basin in south east Anatolia probably in the Middle or Upper Miocene Period. This collision resulted in the compression of the Anatolian plate, generally in a north-south direction and resulted in the compression, folding, up-thrust, strike-slip and normal faults being formed. Deformation of the region continues, as evidenced by the crack systems revealed by the recent earthquake activity in the region.

Brief descriptions of the two major earthquakes that have affected regions traversed by the BTC Pipeline are presented below.

- *Erzincan Earthquake (13th March 1992):* the earthquake was centred approximately 10km southeast of Erzincan city centre on the North Anatolian Fault Zone. The earthquake was the second largest event in the Erzincan region among the 79 earthquakes of magnitude greater than 4 on the Richter Scale that have taken place in the region during the 20th Century (13 March 1992 Erzincan Depremi Raporu, 1993). The biggest of these previous events was that of the 26th December 1939 with a magnitude of 7.9. This earthquake represented the beginning of a series of destructive earthquakes propagating westward on the North Anatolian Fault between 1939 and 1967. An important aspect of the 1992 earthquake was that fault ruptures were not distinguishable on the surface. Although some surface breaks and deformations were observed on a line of almost 45km in length, the breaks cannot be easily defined as a surface rupture. The deformations observed were 5 to 20cm right lateral and 25 to 50cm vertical. Ten percent of the buildings in the town of Erzincan either collapsed or were badly damaged during the 1992 event and the total number of casualties was 653.

- *Adana-Ceyhan Earthquake (27th June 1998):* when a moderate earthquake hit the highly populated city of Adana, ground shaking was felt over a wide area from the cities of Mersin, Nigde and Kayseri in Turkey to cities in Cyprus, Syria, and Israel. The event occurred on the north-south trending left lateral Misis-Ceyhan fault. The peak ground acceleration recorded at the Ceyhan station, locatedon soft sedimentary soils very close to Ceyhan River at a 32km distance from the epicentre, marked in Figure 10.7, was 0.27 g. Liquefaction and landslides were observed along the banks of the Ceyhan River. The earthquake caused 146 deaths, 940 injuries and about 1,900 structures were damaged. Thirty of these collapsed either partially or totally and at least 30 cases of heavy damage in industrial structures were recorded.

A number of significant aftershocks followed the main event. The largest of them (M_d=5.1) occurred on 4th July 1998. The aftershock caused no structural damage but a significant number of injuries were reported.

5.5.4 Active faults

The area along the length of the pipeline between Posof and Ceyhan is a seismically active region. The pipeline crosses directly, or passes near to, a number of active faults (see Figure 5.11 and Figure 5.12). Investigations during Basic and Detailed Engineering have resulted in the identification of five fault zones with a total of eight faults which will be crossed by the BTC Pipeline Route. These fault zones and associated fault lines are summarised below.

- *Erzurum Fault Zone:* class A fault (ie a main active fault with potential for producing large earthquakes with displacements of >1m). Within this fault zone, the eastern and middle segments comprise two active fault splays, whilst the western segment is inactive. The fault has a left-lateral style of deformation and a maximum earthquake magnitude (Mmax) of 7.1 to 7.2.

  Volcanic and volcano-sedimentary rocks of Miocene-Pliocene age and Holocene deposits are exposed along the eastern segment. It extends through Kargapazari Mountains that are Upper Miocene-Pliocene age volcano complexes comprising lava, tuff and agglomerate. At Hamamdere Valley, Upper Miocene age volcanic rocks comprise andesite- basalt lavas, tuffs and agglomerates form the oldest rock units. The lithology changes dramatically in both vertical and lateral directions in the acidic volcanic rocks, which consist of tuffs, lava blocks and extensive pumice. Lava with inter-bedded tuffs and tuffite overlie these volcanics and are, in turn, overlain by basalts. Fluvial deposits can be observed along Hamamdere Valley with the eastern splay subdivided into three parts that occur across a zone approximately 100m wide.

  The eastern most fault splay, referred to as Erzurum East 1, is inferred to have a pure strike-slip style of deformation with an estimated average displacement of 1.5m.

  The western portion of the fault (Erzurum East 2) is also inferred to have a pure strike-slip motion and an average displacement of 1.5m.

  The Erzurum East 3 fault splay is a small sympathetic thrust fault that branches off the East 2 fault. It has a reverse sense of displacement and dips approximately 45 degrees to the west. It is estimated to have an average displacement of approximately 0.5m, which would produce approximately 0.35m of vertical displacement and horizontal shortening.

  The Erzurum Middle segment has a left lateral style of deformation and a length of 19-25km with a maximum earthquake magnitude of 6.6 to 6.8. The fault is inferred to have a pure strike-slip style of deformation with an average displacement of approximately 0.6m.

  The BTC Pipeline Route crosses the eastern and middle segments.

- *North Anatolian Fault Zone:* class A fault with four main fault splays, considered as synthetic faults that will slip only during an earthquake on the main fault trace, ie they are not likely to produce earthquakes independently. The North Anatolian fault is a major right-lateral strike slip fault that has a slip rate of 23 mm/yr and has produced historical earthquakes up to a magnitude of 7.9. The fault plane dips approximately 85 degrees to the north and the fault has a slight compressional component. Therefore, there will be approximately 0.5m of vertical motion as well as 0.05m of horizontal shortening. For the pipeline design, the displacement amount is estimated to be 3m.

Based on the mapping and trenching programme, there are four main splays within this zone and these faults are likely reverse/oblique faults.

The pipeline intersects the North Anatolian Fault in Karadag, about 30km north west of Erzincan. In the intersection area the main geological units are ophiolitic melanges and Mesozoic and Tertiary age sediments. The main lithological units in the study area are ophiolitic rocks in the south and conglomerate in the north.

At the fault crossing, the fault zone is approximately 500m wide, measured perpendicular to the fault strike. The pipeline crosses the fault zone twice in the area that has a series of well-developed pressure ridges.

- *Deliler Fault:* class A fault approximately 100km long with a general trend from north-east to south-west. The segment of the fault at the crossing point is approximately 55km long. The fault has a left lateral style of deformation and is expected to have an Mmax of 7.1 with a recurrence interval of about 1,500 years. An earthquake of this size would produce a net average displacement of 1.5m.

  The fault has a dip of about 80 degrees with eight fault planes distributed over a zone that is 7m wide. The x, y and z components of slip are estimated to be 0.05m, 1.48m and 0.26m, respectively.

  The well-bedded detritic rocks and marl with serpentinite and limestone blocks constitute the basement rocks in the intersection area with the pipeline. Pliocene-Pleistocene fluvial-lacustral detritic sediments cover these units unconformably.

- *Cokak Fault:* class B fault (ie fault with indications on Holocene activity; possible and probably displacements of centimetres to meters). This fault is part of a complex and only partly understood, system of faults in the Taurus Mountains. It is a reverse/right-lateral fault, approximately 3km long, and is thought to be connected with the Kiziloluk fault (see below), therefore forming a longer structure approximately 15-20km in length. The main fault has 14 fault planes distributed over a zone 8m wide with four subsidiary splays identified across an area of 700m. The maximum earthquake magnitude is expected to be 6.5 – 6.7 and the net displacement to be produced on the fault is estimated as 0.7 m. The x, y and z components of the slip are estimated to be 0.19m, 0.43m and 0.52m respectively. At the fault location, there are Tertiary aged detritic rocks consisting of siltstone, clay stone and marl, which are overlain by alluvial deposits.

- *Kiziloluk Fault:* class B fault, also forming part of the complex and poorly understood system of faults in the Taurus Mountains. This fault is approximately 12-17km long and approximately 3m wide, forming the south eastern boundary of the Cokak Plane basin. The fault has a right-lateral style of deformation and is expected to have an Mmax of 6.5 to 6.75. The net displacement is expected to be 0.7m. At the fault location, there are Tertiary aged detritic rocks consisting siltstone, claystone and marl, overlain by alluvial deposits.

- *General note on the faults:* All of these five fault zones are considered as being Holocene active.

Pipeline design and construction methods at these fault crossings are described in Section 4.8.5.

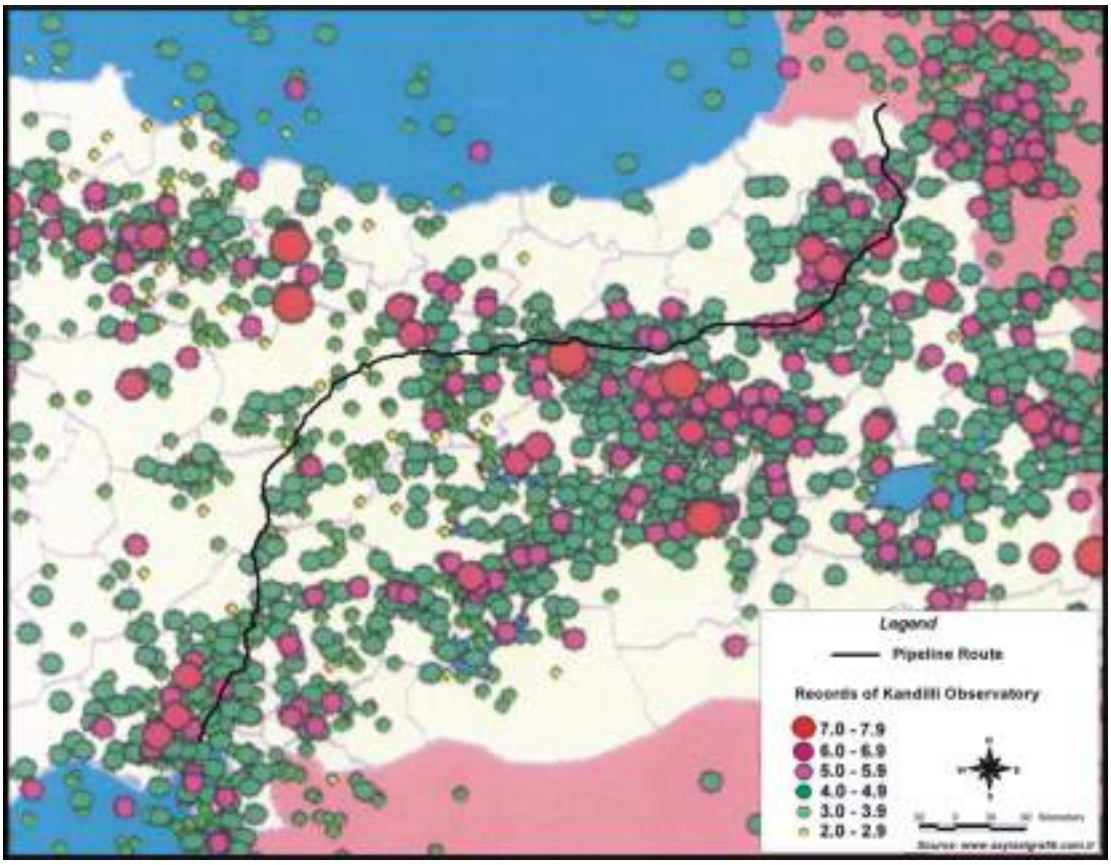


Figure 5.11 Earthquakes in the Region Between 1900-2000

5.5.5 Landslides

The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes and shallow debris flows. Although gravity acting on an oversteepened slope is the primary reason for a landslide, other contributing factors are as follows:

- erosion and weathering effects caused by water supply (precipitation, snowmelt, torrents, rivers) create oversteepened or weakened slopes;
- rock and soil slopes are weakened through saturation by snowmelt or heavy rains (joint and pore water pressures, reduction of normal stress);
- natural dynamic impacts (such as earthquakes) create stresses that can result in the failure of weak slopes;
- excess weight from accumulation of rain or snow or from man-made structures and deposits may stress weak slopes to failure;
- vibrations from machinery, traffic and blasting may trigger failure of weak slopes;
- man-made steepening of natural slope geometry due to civil works may result in slope failure.

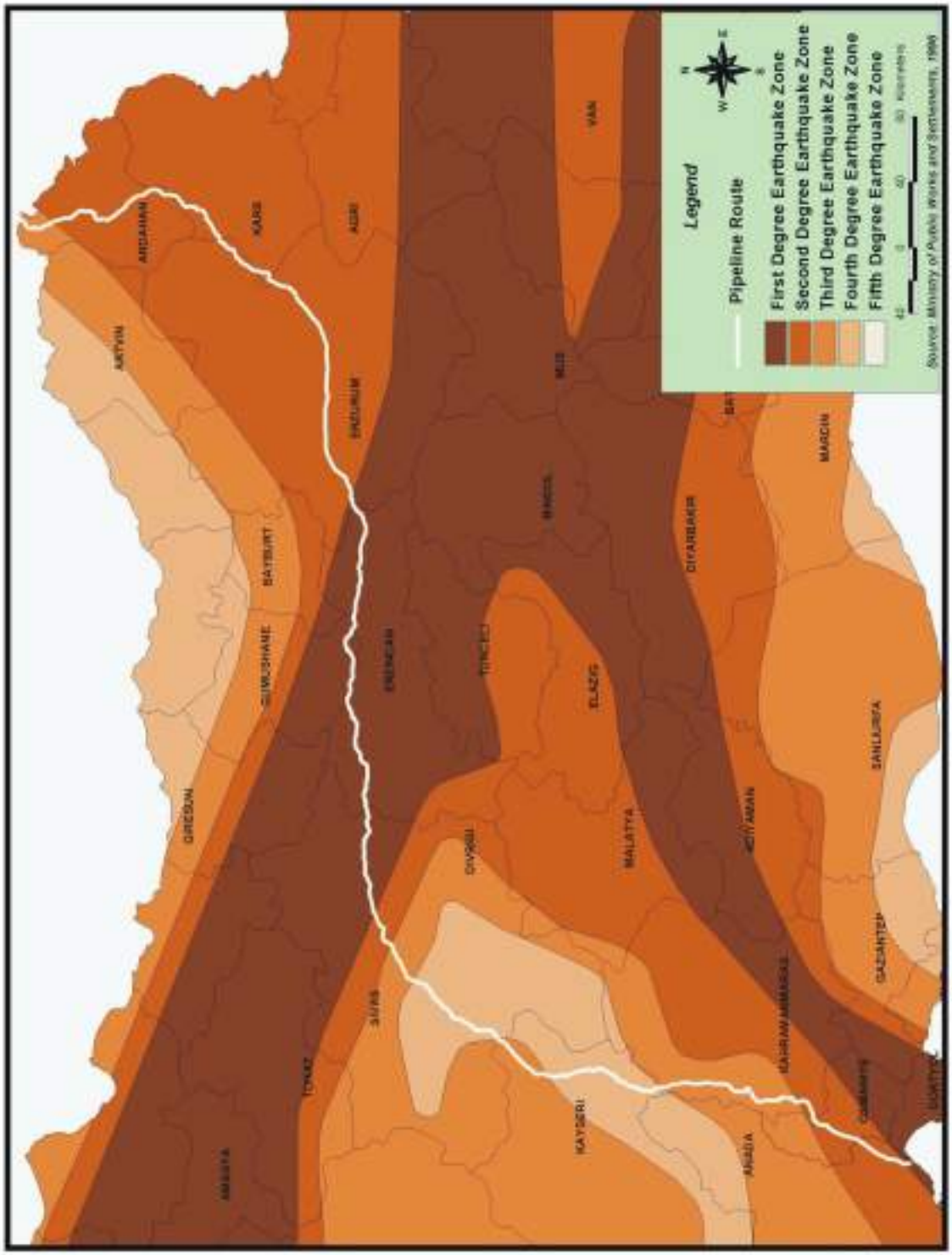


Figure 5.12 Map of Earthquake Regions in Turkey

A number of areas of landslide potential have been investigated. The following provides a summary of the four most significant landslide areas investigated:

- *Asagimaden-Kandil Villages (Refahiye Sub-District, Erzincan):* there are two areas in this region that have to be taken into consideration in pipeline routing. The first area consists of the toe area of old and shallow earthflow lobes, where the maximum thickness of the colluvium generally is around 1.5 to 2m. In the second area, the route runs along the toe area of a slope close to the valley floor with a creek parallel to the pipeline alignment. Shallow depressions and gullies in the slope and close to the valley floor are filled with slope debris. Landslide experts interpreted these structures as an accumulation zone for a series of earthflows with 1 to 2m high debris lobes, but considering the topography and the soil conditions it is considered unlikely that these deposits can be mobilised.

- *Golcuk Village-Tuzla River (Hafik Sub-District, Sivas):* in this section, the route is parallel to the existing NGP and passes down a stable ridge to the Tuzla River with landslide areas on both sides of the crest. The pipeline route crosses the river on the valley floor and a small erosion gully in the lower part of the slope. The soil cover of the lower part of the slope is around 2.6m deep. The watersides of the Tuzla River are scoured locally so minor soil slips are caused by this process.

- *South of Alacorak Lake (Ulas Sub-District, Sivas):* the route crosses the flat toe area of a shallow eroding gully running north from Kara Tepe. Erosion takes place within the weathered, soil cover, which is up to 2m thick and overlies the bedrock. The bedrock is exposed along the bottom of the gully and in connected erosion channels. In this rock mass no significant landslip can proceed at depth.

- *Southwest of Degirmendere Irrigation Reservoir (Goksun Sub-District, Kahramanmaras):* this area is of concern because of an assumed crossing of debris flows and rock fall accumulation mounds. Siltstone exists covered by strongly weathered material and overlain by the topsoil with a thickness of up to 0.5m. The bedrock outcrops along the existing road parallel to the route alignment. The total soil cover is estimated to be around 1m in general due to the morphology of the terrain. It is considered that there is a low potential for significant landslides in this area.

Further landslide investigation work is on-going, involving the stereoscopic inspection of aerial photographs which will be followed by field investigations. [Ref 40, Ref 41]

5.5.6 Karst areas

Karst areas constitute a geohazard risk to the pipeline due to potential subsidence caused by cavity formation. The karst areas include a number of different types of karst and, as a result of studies undertaken during the BE phase and the associated audit activities by karst specialists, five different karst models were developed:

- Model 1: Karstmargin;
- Model 2: Polygonal Doline Karst;
- Model 3: Old Polygonal Doline Karst;
- Model 4: Merokarst;
- Model 5: Mantled Karst.

Further investigations undertaken during the DE phase provided more detailed information defining the nature of these different types of karst and the implications on pipeline routing and design works (see Box 5.1). A summary of the key findings of these investigations are presented below:

- Model 1 areas showed features of karst like marginal dolines, but with a smooth topography without specific ridges and an open slope towards the boundaries of the karst area. No active sinkholes or foot caves were observed in the vicinity of the pipeline route. In other areas of the Sivas Gypsum Karst, south of the pipeline route these, features can be observed as low cliffs adjacent to ephemeral lakes.

- In model 2 and 3 areas active sinkholes were recorded. In general, the bedding of the gypsum dips southward with moderate angles. Local divergences probably due to faults or diapiric structures may occur. Most sinkholes are placed at the base of the southern ridge of the dolines in accordance to off-flow along the bedding planes. No karst features develop on steep slopes due to rapid rainfall runoff, only distinct channels have been chiselled into the steep slopes.

- An important observation was that all over the area no recent features of collapsed dolines were observed. The evolution of dolines in general is probably based on sub aerial and subsoil dissolution by rainwater that runs off into sinkholes and passes into deep-levelled horizontal run off. Development of sinkholes is related to collapse features which have a maximum span of approximately 10m and the deepest point in direction of off flow, ie asymmetric cones.

- In general, development of dolines is a gradual ongoing process without extensive collapse features. Thus, formation of extensive subsurface cavities due to distinct large scale, canalised runoff may occur. However, probability of ground failure is extremely low with the probability in model 2 areas estimated as one event per 12ma choosing a 10m wide corridor exposing an area of 0.084km^2. The probability for model 3 area (ie, 0.089km^2) is estimated to be one event per 3ma.

- Model 4 and 5 show little evidence of karstic processes. Over wide distances only the exposures caused by the NGP reveals the existence of subsurface gypsum. In some sections isolated dolines, generally without sinkholes, may occur.

Geophysical investigation by means of multi electrode geoelectric survey was carried out in areas of Model 2 and Model 3 karst. Table 5.11 illustrates the geophysical response and possible geological interpretation.

Table 5.11 Results of Geophysical Investigation in Karst

Specific Resistivity	Geological Units
2-50	Clay filling in dolines
50-100	Silty sandy clay with blocky gypsum material
100-250	Weathered gypsum
250-1000	Slightly weathered gypsum
1000-5000	Gypsum with micro karstic voids (several cm to several dm)
>5000	Gypsum with karstic voids (several cm tom wide)

- In model 3 areas, exclusively clay and silt filled dolines were encountered partly containing huge gypsum blocks, which may show small-scaled disperse cavities of minor extent. No evidence of potential voids was determined.

- In model 2 areas, six distinct zones showing potential void occurrence up to 40m in extent. In general, dolines in model 2 areas show minor marginal cavities due to sinkholes while the centre part is filled with clay and silt rich material partly mixed up with gypsum blocks originated by gradual solution of the gypsum bedrock or in some cases representing old features of former collapse events.

- In most cases, sinkhole cavities are located at the borderline of dolines with elongation of cavities indicating the direction of runoff. The central part consists of thick-layered clay and silt, which may include blocks of gypsum.

- Large cavities may occur beneath dolines, showing internal drainage without developing sinkholes at the borderline.

On the basis of the results of the geophysical measurements, supplemented by information obtained from geotechnical mapping, a safe route corridor was identified through critical areas of the Sivas Gypsum karst area, taking into account the risk of ground failure due to subsurface potential cavities.

In Spring 2002, a drilling programme was undertaken to reinforce and confirm the geophysical results. A reasonable correlation between geophysical anomalies and fissure occurrence was found during the drilling exercise. The route changes brought about by the presence of such voids will be verified using consistent techniques (ie, geophysics and drilling).

5.5.7 Liquefaction areas

Thixotropy or liquefaction is a reversible gel-soil transformation under isothermal shearing stress following rest whereby, if broken down, a structure can rebuild itself. The breakdown may be caused by agitation, by shearing, or even by ultrasonic waves. Some natural soil materials exhibit this property. Sand, for example, becomes thixotropic if it is:

- uniformly graded, with grain size <0.7mm;
- poorly packed with low bulk density; or
- below the water table at shallow depth.

Geohazard risk due to liquefaction is considered to be of minor relevance for the construction and operation of the BTC Pipeline, since areas with the requisite soil properties and

morphological features, allowing the mobilisation of this soil, are not widespread along the pipeline route. Thirteen areas along the southern part of the route were identified as having potential for liquefaction and were subject to detailed investigation during Detailed Design. The conclusions of these investigation and implications for pipeline design are summarised below.

- The potential liquefaction areas in Gaziantep Region, Akifiye Basin, Meryemcibel River Valley, Karayurt Crossing, Asagi Borandere Crossing, Hilmiye River Crossing and Ucpinar/Zamanti Crossing are considered as liquefaction hazard free zones.

- The Bogazici Basin area has nil to very low liquefaction susceptibility and Bogazdere Village Crossing is considered a low risk area in terms of liquefaction. Therefore, no special measures are required to mitigate the potential liquefaction hazard.

- For the Adana (Ceyhan) Basin, only localised depressions may be expected along the pipeline route as a result of liquefaction in a strong seismic event. The liquefiable soil layers are located below the pipeline trenchline, thus, buoyancy effects will not be experienced. According to the results of the liquefaction induced settlement analysis total settlement of the liquefiable layers are predicted to be in the range of 2-10cm. Therefore, the pipeline will tolerate the estimated settlement within the range o0f elastic deformation and special engineering measures are not required in this area. [Ref 42]
- Liquefaction induced buoyancy and lateral spreading risks are considered as minimal for the Ceyhan River Crossing and no special engineering measures are required to mitigate the liquefaction hazards.

- At the Acisu River and Acioz River crossings the design of the pipeline has taken into consideration the liquefaction potential. The pipeline burial depth will be placed below the mobile/immobile interface so that landslides due to liquefaction do not influence the pipeline integrity. The pipeline will be protected from buoyancy effects by increasing the concrete coating, and protecting the pipeline with saddlebags filled with gravel material. The remaining backfilling of the trench will be performed using coarse material not susceptible to liquefaction. [Ref 42]

5.5.8 Mineral resources

Information regarding mineral resources was gathered from the General Directorate of Mineral Works (GDMW), supplemented by observations during field visits. The following mineral resources exist along the route:

- coal (Erzurum, Erzincan and Sivas provinces;
- lead (Kahramanmaras province);
- chromium (Erzurum, Erzincan and Sivas provinces);
- zinc (Kahramanmaras province);
- silver (Kahramanmaras province);
- gold (Kahramanmaras province);
- strontium salt (Sivas province);
- sodium (Sivas province).

These resources are illustrated in Figure 5.13. There are 21 mineral mines crossed by the centreline of the BTC Pipeline Route.

The General Directorate of Mineral Works has advised of the presence of one private coal mine in the Cayirli District of Erzincan within the 500m pipeline corridor (see Appendix A8). Further investigations and route alignment have ensured that the protection boundaries of the coal mine are 15 metres from the pipeline construction corridor to avoid any interactions between the pipeline and the mine during construction or operations. Due to the presence of geohazards (ie Cilhoroz landslide area) in the area, the distance to the protection boundary of this specific coalmine cannot be further increased by re-routing. This is the only known mineral mine in close proximity to the pipeline route based on the advice of the GDMW.

Figure 5.13 Mineral resources along the pipeline route

5.6 SURFACE AND GROUNDWATERS

5.6.1 Sources of information

5.6.1.1 Surface water

Initial desk-based information review

An initial desk study was undertaken to identify baseline conditions including a description of surface water features of particular importance along the BTC Pipeline Route. Hydrological information for the watercourses crossed by the pipeline route was obtained from the General Directorate of State Hydraulic Works (DSI) and the Electrical Power Resources Survey and Development Administration (EIE) for six rivers – the Posof, Kura, Aras, Karasu, Andirin and Ceyhan. In addition, hydrological data on the major river crossings was also obtained through the Middle East Technical University in Ankara from a study carried out in December 2001, 'Hydrologic and Hydraulic Analysis of River Crossings For Baku-Tbilisi-Ceyhan' [Ref 14].

Information about long-term water quality data recorded in 1999 and 2000 for Zamanti and Ceyhan rivers, which are among the most important rivers along the route in terms of both water utilisation and flow were obtained from DSI.

Water quality data collection

Water quality data for all major (width >30m) rivers crossed by the BTC Pipeline were collected in July 2001. The 17 rivers included in this surface water quality study are listed below:

- Posof;
- Kura;
- Hasankale;
- Karasu (Kandilli);
- Karasu (Yesilova);
- Aksu (Cayirli);
- Aksu (Balikli);
- Aksu (Yesilkaya);
- Acioz;
- Acisu;
- Tatli;
- Zamanti;
- Sariz;
- Huseyinli;
- Kesis;
- Ceyhan;
- Mercin.

It was also the intention to study the Kesrik River; however, this river was dry at the time of sampling. The location of the 18 major river crossings along the pipeline route is shown in Figure 5.14.

Water quality samples were obtained in accordance with BS 5930 [Ref 9, TS 5090, EN 25667-2] [Ref 10] and the Notice on the Sampling and Analysis Methods (7 January 1991) of the Turkish Water Pollution Control Regulation (4 September 1988).

All surface water samples were analysed in-situ for temperature, pH, dissolved oxygen, oxygen saturation and electrical conductivity using a Multi Parameter Instrument (WTW MultiLine P4). In addition, samples were taken for laboratory analysis of chlorine, sulphate, sodium, total dissolved solids, suspended particulate matter, total organic carbon, nitrate and phosphate, COD, BOD, oil and grease, total coliforms and metals.

The majority of the laboratory analyses was conducted at the three regional laboratories of State Hydraulic Works (DSI) in Erzurum, Sivas and Adana. For some parameters that could not be performed in regional DSI laboratories, water samples were delivered to the Public Health Institutes in these three provinces and to the Sivas Cumhuriyet University. Heavy metal analysis was undertaken at the General Directorate of DSI in Ankara and total organic carbon (TOC) analysis was carried out at Ankara Water and Sewage Works (ASKI) in Ankara.

All laboratories utilised during the water quality survey were visited before the sampling survey by a quality assurance team to confirm the adequacy of QA/QC procedures at these laboratories.

Field surveys and aerial photograph interpretation

Assessments of river crossings were made based on a combination of field survey and desk based assessment. Between 150 and 175 streams are crossed the BTC Pipeline Route. A hydrological field survey visited the majority of those larger than 30 metres wide. Using both information gained in the field and aerial photographs of pipeline crossings, 113 streams were characterised using the following channel descriptors: plan form, approximate cross section, floodplain widths, land use, riparian vegetation, terraces, levees, bar type, bed controls, width controls, bed sediment, sand bed forms, flow type, discharge pattern, and bank-full width.

Impacts were assessed in terms of potential changes to the preceding descriptors. In addition, potential environmental impacts assessed included the potential for:

- increased sediment;
- increased turbidity;
- cross-border or other important pollution;
- stream capacity, which could rupture the pipeline.

The survey utilised geomorphic methods to anticipate the effects of change, usually of sediment discharge and water discharge, to the parameters listed above. Change was assessed as likely modifications of land use during the 40-year life of the BTC Project. The results of this baseline description and assessment study [Ref 3] are discussed in the following sections.

Figure 5.14 Location of major river crossings along the pipeline route

5.6.1.2 Groundwater

An initial desk study was undertaken to identify baseline conditions including a description of vulnerable groundwater aquifers along the BTC Pipeline Route. Hydrogeological information for the major aquifers crossed by the Pipeline Route was obtained from the General Directorate of State Hydraulic Works (DSI), although data held by the DSI on groundwater quality, conditions and characteristic of the aquifers are difficult to obtain. However, groundwater analysis reports of DSI recorded in 1998 and 2001 for four wells in Ceyhan Plain, which include information on present groundwater quality, conditions and characteristics of the aquifers, flow directions, guaranteed capacities, levels and past groundwater characteristics were obtained.

Water quality data collection

The groundwater quality survey focussed on the four major plains (ie Pasinler, Erzurum, Goksun and Ceyhan Plains) bearing high groundwater capacity and potential for extensive utilisation. This study was conducted with the assistance of DSI authorities of the related Regional Directorates. There are no groundwater wells inside the 100m-wide pipeline corridor and therefore sampling was undertaken at 19 groundwater wells located close to the pipeline route.

Water quality samples were obtained in accordance with BS 5930 (Code of Practice for Site Investigation, 1999), TS 5090 EN 25667-2 (Water Quality Sampling, Section 2: Guidance on Sampling Techniques, April 1997) and the Notice on the Sampling and Analysis Methods (7 January 1991) of the Turkish Water Pollution Control Regulation (4 September 1988).

All groundwater samples were analysed in-situ for temperature, pH, dissolved oxygen, oxygen saturation and electrical conductivity using a Multi Parameter Instrument (WTW MultiLine P4). In addition, samples were taken for laboratory analysis of chlorine, sulphate, sodium, total dissolved solids, suspended particulate matter, total organic carbon, nitrate and phosphate, COD, BOD, oil and grease, total coliforms and metals.

The majority of the laboratory analysis (as was the case with surface water anaylsis) was conducted at the three regional laboratories of State Hydraulic Works (DSI) in Erzurum, Sivas and Adana. For some parameters that could not be performed in regional DSI laboratories, water samples were delivered to the Public Health Institutes in these three provinces and to the Sivas Cumhuriyet University. Heavy metal analyses were undertaken at the General Directorate of DSI in Ankara and total organic carbon (TOC) analysis was carried out at the Ankara Water and Sewage Works (ASKI) in Ankara.

5.6.2 Surface water

Surface water resources are described below in terms of the six watersheds crossed by the Pipeline Route: from north to south the Aras; Euphrates; Yesilirmak; Kizilirmak; Seyhan and Ceyhan. The following descriptions are based on the data sources described in Section 5.7.1.

An extensive hydrological analysis of the drainage areas of each river crossing was carried out in December 2001 [Ref 3]. The details of this analysis are provided within each watershed outlined below.

5.6.2.1 Aras watershed

The Pipeline Route crosses three rivers within the Aras watershed, from north to south, the Posof, Kura and Hasankale (Aras). Details of hydraulic information are provided in Table 5.12. The Table presents data from gauging stations (EIE and DSI) and actual crossing information (ESER).

Table 5.12 Hydraulic Data for Aras Watershed

Station No	River Name	KP (3D) at Crossing	Elevation	Measurement Period (Year)	Min. Flow Amount (m^3/sec)	Max. Flow Amount (m^3/sec)	Average Flow (m^3/sec)
80 [2]	Posof	16.5	1350	2	1.88	27	5.17
2415 [1]	Kura	64	1750	27	0.733	306	17.6
29 [2]	Hasankale (Aras)	260	1443	21	3.5	870	37.7
Name of river [3]		**Discharge** (m^2/day)	**Slope**	**Top Width (m)**	**Actual Depth (m)**	**Water surface Elevation (m)**	**Velocity (m/s)**
Posof		147,7	0,014	131,04	1,53	1371,73	1,96
		160,0		131,04	1,56	1371,76	2,03
Kura		401,5	0,0021	107,15	3,62	1777,29	1,71
		468,0		113,32	3,88	1777,55	1,78
Hasankale (Aras)		180,0	0,0013	297,04	1,86	1622,03	0,82
		255,0		297,04	2,03	1622,20	0,94

1. EIE: Flow-rate Values of the Rivers Measured by the Stations of Electrical Power Resources Survey and Development Administration
2. DSI: Flow-rate Values of the Rivers Measured by the Stations of State Hydraulic Works
3. Verification Of Hydrologic And Hydraulic Analysis Of River Crossings (ESER Report, ESE-REP-ENG-PLG-002)

Since these are transboundary waters, water quality monitoring data are confidential.

Although the **Posof River** (Plate 5.22) does not receive any wastewater discharge and is not polluted according to desktop studies. However, high phosphate values (0.40 mg/L) were measured; and exceed the limit value of Class II as stipulated in the Water Pollution Control Regulation (WPCR), which is 0.16mg/L. This river is classified as Class III based on the results of the water quality survey. Run-off and drainage from agricultural land is one possible source for the high phosphate concentrations observed.

Plate 5.22 Posof River Crossing

The **Kura River** (Plate 5.23) is highly polluted from discharges from Gole and Ardahan settlements and from the Gole Military Garrison. In 1994 and 1995, fish in the Kura River were poisoned and died from excessive concentrations of nitrogen arising from fertiliser run-off. The water quality survey confirms that the Kura is polluted, especially in terms of the nitrite, phosphate and Biochemical Oxygen Demand (BOD) as well as Total Organic Carbon (TOC) parameters.

Plate 5.23 Kura River Crossing

The **Hasankale River** (Plate 5.24) is also polluted, especially in terms of the nitrite, phosphate, BOD, TOC and oil and grease parameters. These rivers will all be monitored during the pre-construction and construction phases of the BTC Pipeline Project.

Plate 5.24 Hasankale (Aras) River Crossing

5.6.2.2 Euphrates watershed

The Euphrates watershed is the largest in Turkey with a drainage area of 127,304km². The average precipitation potential of the basin is 74.09×10^9 m³/year, and the average total flow rate is 31.46×10^9 m³/year. The BTC Pipeline Route crosses two rivers within the Euphrates watershed – the Karasu, and Aksu. Details of hydraulic information are provided inTable 5.13. The Table presents data from gauging stations (EIE and DSI) and actual crossing information (ESER).

Table 5.13 Hydraulic Data for Euphrates Watershed

Station No	River Name	KP (3D) at Crossing	Elevation	Measurement Period (Year)	Min. Flow Amount (m^3/sec)	Max. Flow Amount (m^3/sec)	Average Flow (m^3/sec)
2154	Karasu	345.6	1675	28	1.24	283	19.8
	Aksu	420, 422, 428	Information not available				

Name of river [3]	Discharge (m^2/day)	Slope	Top Width (m)	Actual Depth (m)	Water surface Elevation (m)	Velocity (m/s)
KARASU RIVER	317,0	0,0049	206,87	2,43	1687,14	1,76
	379,0		212,81	2,54	1687,25	1,87
AKSU RIVER	81,2	0,0092	34,49	1,37	1491,10	2,53
	135,5		39,08	1,74	1491,47	2,95
AKSU RIVER	81,2	0,0079	35,91	1,72	1507,53	2,38
	135,5		48,67	2,13	1507,94	2,58
AKSU RIVER	75,4	0,0132	134,14	0,87	1569,71	1,34
	120,0		143,69	1,02	1569,86	1,57

1. EIE: Flow-rate Values of the Rivers Measured by the Stations of Electrical Power Resources Survey and Development Administration
2. DSI: Flow-rate Values of the Rivers Measured by the Stations of State Hydraulic Works
3. Verification Of Hydrologic And Hydraulic Analysis Of River Crossings (ESER Report, ESE-REP-ENG-PLG-002)

There are no water quality monitoring stations along these rivers. Water pollution within the Euphrates watershed is considered to be negligible because of low population density and lack of industrialisation. Agriculture is not widespread and pollutants are diluted quickly by the high flow rates of the rivers.

The water quality survey at two different crossings of the Karasu (Plate 5.25) and three different crossings of the Aksu indicated that there is some pollution arising from domestic wastewater discharges from local villages.

Plate 5.25 Karasu River Crossing

5.6.2.3 Yesilirmak watershed

The Pipeline Route traverses the upper part of the Yesilirmak watershed, close to its boundary, and crosses three rivers within it – the Ilgar, Tuzlakonagi (minor river crossings) and Acioz (major river crossing). The Yesilirmak watershed has a drainage area of 36,114km², an average precipitation potential of $20{,}079\times10^9$ m³/year, and an average total flow rate of 5.781×10^9 m³/year. There is no hydraulic information available for the Yesilirmak Watershed. There are no monitoring stations for water quality along these rivers.

The **Yesilirmak River** has an elevated sediment load, which affects its quality classification. The Kelkit River, its main tributary, has the second highest alluvial load of any river in Turkey with a sediment load of 647 tonnes/km²/year. In summer, the values for arsenic, boron, detergent, grease and COD frequently exceed the limit values defined in the Water Pollution Control Regulation (WPCR). The domestic pollutant loads within the Yesilirmak watershed for the year 1990 are presented in Table 5.14 together with projections for the year 2010.

Table 5.14 Domestic Pollution Loads within Yesilirmak Watershed

PARAMETER	1990	2010 (PROJECTED)
BOD_5 (kg/day)	142,235	201,625
Total Nitrogen (kg/day)	28,447	40,325
Total Phosphorus (kg/day)	5,690	8,065
Suspended Solids (kg/day)	85,431	120,975

SOURCE: [Ref 11, Ref 12]

The water quality survey of the Acioz River showed that the river is polluted in terms of the nitrite, phosphate, BOD, TOC and total coliform parameters. Electrical conductivity, sodium, chloride, and sulphate are also very high, due mainly to the presence of dense gypsum and gypsum formations in the Imranli-Zara region. Gypsum formations in contact with the surface waters dissolve rapidly, increasing Na, Cl, K, Ca, and Mg ions in the surface waters. The high concentrations of these ions cause concomitant increases in electrical conductivity and salinity.

5.6.2.4 Kizilirmak watershed

The Kizilirmak watershed is the second largest watershed of Turkey, with a drainage area of 78,180km². The average precipitation potential of the basin is $35{,}885\times10^9$ m³/year, and the average total flow rate is $5{,}932\times10^9$ m³/year. Details of hydraulic information are provided in Table 5.15. The Table presents data from gauging stations (EIE and DSI) and actual crossing information (ESER).

Table 5.15 Hydraulic Data for Kizilirmak Watershed

Station No	River Name	KP (3D) at Crossing	Elevation	Measurement Period (Year)	Min. Flow Amount (m^3/sec)	Max. Flow Amount (m^3/sec)	Average Flow (m^3/sec)
	Acisu	636, 660	Information not available				
	Tatli	674	Information not available				
Name of river [3]		**Discharge** (m^2/day)	**Slope**	**Top Width (m)**	**Actual Depth (m)**	**Water surface Elevation (m)**	**Velocity (m/s)**
Acisu		366,0	0,0055	96,99	2,69	1147,13	2,80
		433,0		97,73	2,84	1147,28	2,99
Tatli		262,4	0,0072	53,72	2,83	1333,66	3,36
		331,0		58,05	3,09	1333,92	3,58

1. EIE: Flow-rate Values of the Rivers Measured by the Stations of Electrical Power Resources Survey and Development Administration
2. DSI: Flow-rate Values of the Rivers Measured by the Stations of State Hydraulic Works
3. Verification Of Hydrologic And Hydraulic Analysis Of River Crossings (ESER Report, ESE-REP-ENG-PLG-002)

The BTC Pipeline Route crosses two rivers within the Kizilirmak watershed - the Acisu and Tatli. Records from 1993 showed the total nitrogen and phosphorus loads arising from fertilizer run-off within the basin are 102,000 tonnes/year and 34,000 tonnes/year respectively [Ref 12]. However, the northeast part of the watershed through which the pipeline passes is less heavily populated and agricultural and industrial activities less widespread than elsewhere in the watershed.

The water quality survey of the Acisu and Tatli rivers confirmed that they are polluted especially in terms of total coliform bacteria. Additionally, because of hydrogeological formations similar to the Acioz River, they have high readings for electrical conductivity, sodium, chloride, and sulphate.

5.6.2.5 Seyhan watershed

The Seyhan watershed has a drainage area of 20,450km², an average precipitation potential of $12{,}863\times10^9$ m³/year, and an average total flow rate of $6{,}727\times10^9$ m³/year. The BTC Pipeline Route crosses two rivers within the Seyhan watershed – the Zamanti and Sariz. Details of hydraulic information are provided in Table 5.16. The Table presents data from gauging stations (EIE and DSI) and actual crossing information (ESER).

Table 5.16 Hydraulic Data for Seyhan Watershed

Station No	River Name	KP (3D) at Crossing	Elevation	Measurement Period (Year)	Min. Flow Amount (m^3/sec)	Max. Flow Amount (m^3/sec)	Average Flow (m^3/sec)
	Zamanti	796	Information not available				
17 2	Sariz (stream)	880	1542	9	0.32	34	2.23
32 2	Sariz (creek)	-	1400	3	1.45	21.5	3.67

Name of river [3]	Discharge (m^2/day)	Slope	Top Width (m)	Actual Depth (m)	Water surface Elevation (m)	Velocity (m/s)
ZAMANTI RIVER	77,8	0,0017	166,29	2,01	1587,29	0,70
	118,5		166,29	2,20	1587,48	0,83
SARIZ RIVER	255,9	0,0045	131,05	2,70	1483,50	2,04
	323,0		136,13	2,86	1483,66	2,20

1. EIE: Flow-rate Values of the Rivers Measured by the Stations of Electrical Power Resources Survey and Development Administration
2. DSI: Flow-rate Values of the Rivers Measured by the Stations of State Hydraulic Works
3. Verification Of Hydrologic And Hydraulic Analysis Of River Crossings (ESER Report, ESE-REP-ENG-PLG-002)

In the early 1980s the **Zamanti River** (Plate 5.26) was a drinking water resource (class I for all parameters) but this river is now heavily polluted, at least in its lower reaches, which are industrialised and intensively farmed. Current water quality classifications are given in Table 5.17. The water quality survey showed that the Zamanti River is heavily polluted with coliform bacteria.

Plate 5.26 Zamanti River Crossing

Table 5.17 Quality Classification of the Water Resources within Seyhan Watershed

PARAMETER	NO_3-N	O-PO_4	BOD	HEAVY METALS
Class	III-IV	III	II	IV-III

SOURCE:[Ref 12]

The **Sariz River** (Plate 5.27) is not polluted, although the survey showed high concentrations of TOC and oil and grease. Since BOD and COD concentrations of the river are very low (Class I), high TOC is probably a result of background organic matter, while high oil and grease concentrations may be due to an analysis error as no potential source could be identified.

Plate 5.27 Sariz River Crossing

5.6.2.6 Ceyhan watershed

The Ceyhan watershed has a drainage area of 21,982km² and an average precipitation potential of $16{,}662\times10^9$ m³/year [Ref 3]. The BTC Pipeline Route crosses four rivers within the Ceyhan watershed – the Huseyinli, Kesis, Ceyhan and Mercin. Details of hydraulic information are provided in Table 5.18. The Table presents data from gauging stations (EIE and DSI) and actual crossing information (ESER).

Table 5.18 Hydraulic Data for Ceyhan Watershed

Station No	River Name	KP (3D) at Crossing	Elevation	Measurement Period (Year)	Min. Flow Amount (m^3/sec)	Max. Flow Amount (m^3/sec)	Average Flow (m^3/sec)
	Huseyinli	912	Information not available				
59 2	Kesis (Creek)	1003	1025	8	0.06	84	3.51
2020 1	Ceyhan	1036	90	10	0	1960	149
	Mercin	1055	Information not available				

Name of river [3]	Discharge (m^2/day)	Slope	Top Width (m)	Actual Depth (m)	Water surface Elevation (m)	Velocity (m/s)
Huseyinli	105,0	0,0026	112,99	1,82	1365,24	1,01
	130,0		116,69	1,96	1365,38	1,08
Kesis (Creek)	698,0	0,0069	44,1	5,81	162,61	4,87
	812,0		109,75	6,99	163,79	3,64
Ceyhan	3224,0	-0,002			ADVERSE SLOPE	
	4252,0				ADVERSE SLOPE	
	3224,0	0,0001	430,26	10,18	29,95	1,02
	4252,0		430,26	11,53	31,30	1,14
Mercin	137,7	0,004	34,35	2,70	16,19	1,83

1. EIE: Flow-rate Values of the Rivers Measured by the Stations of Electrical Power Resources Survey and Development Administration
2. DSI: Flow-rate Values of the Rivers Measured by the Stations of State Hydraulic Works
3. Verification Of Hydrologic And Hydraulic Analysis Of River Crossings (ESER Report, ESE-REP-ENG-PLG-002)

The water quality survey showed the **Huseyinli** and **Kesis** rivers to be non-polluted; despite high TOC and oil and grease concentrations. Since all other measured parameters give water quality of Class I and II, high TOC concentrations derive probably from background organic matter.

The Ceyhan (Plate 5.28) and Mercin rivers have low water quality due mainly to high nitrite and TOC levels arising probably from domestic wastewater discharges of nearby villages or manure utilisation in cultivated areas close to the river banks.

Plate 5.28 Ceyhan River Crossing

5.6.2.7 Reservoirs

As part of the route selection process, the locations of reservoirs, which are planned, under construction or in operation along the route, were identified. In this regard, there are three reservoirs, which are within the 500m wide corridor, of which two are currently under construction and one is currently planned. The status of all the reservoirs is shown on the environmental maps in Section 6, Supplement 2.

5.6.3 Groundwater

Groundwater is sensitive to pollution and requires a long recovery period due to its limited dilution capacity. Sources of groundwater pollution in Turkey include the following:

- domestic wastewater, which seeps in through inadequate and inefficient sewerage systems and septic tanks. In smaller residential areas, sewerage systems are generally absent;
- domestic solid waste also leaks from inadequate storage systems causing groundwater pollution through micro-organisms, organic materials, dissolved salts, ammonium, nitrate and heavy metals;
- industrial plants, primarily those constructed on plains where groundwater is close to the surface and easily polluted;
- excessive use of agricultural chemicals, particularly over the last 20-25 years, which percolate into groundwater;
- saline intrusion caused by over-extraction of groundwater from aquifers close to the sea;
- recharge of contaminated surface water to aquifer.

5.6.3.1 Pasinler Plain

The aquifers of the Pasinler Plain are the Plioquaternary alluvial formations comprising interbedded clay, sand and gravel. Unconfined aquifers are widespread on the plain. The approximate thickness of the aquifer varies from 200m (between Ovakoy and Pusudere) to 100m (between Pasinler and Otlukbeli). Towards the Hasankale Fault, this thickness is reduced by the fault to between 20-70m. Groundwater piezometry in pressured aquifer reaches +4.00m

in the middle of the plain and groundwater level drops to –30m along the plain boundary. Transmissivity in the aquifers may vary between 50 and 70m^2/day.

During the water quality survey, four groundwater samples were taken (Cakirtas-Artesian Well N^{os}. 3205, 12546, 12577, & 13282, according to DSI well codes). A fifth, N^{o}. 10359 was closed. The analyses of these samples show that the wells have high water quality (Class I and II) according to the WPCR. These groundwater resources may be used as irrigation water and water for animals as well as industrial cooling water without any purification and may be even used as drinking water following a purification process.

A schematic representation of the hydrogeological setting in the Pasinler Plain is shown in Figure 5.15.

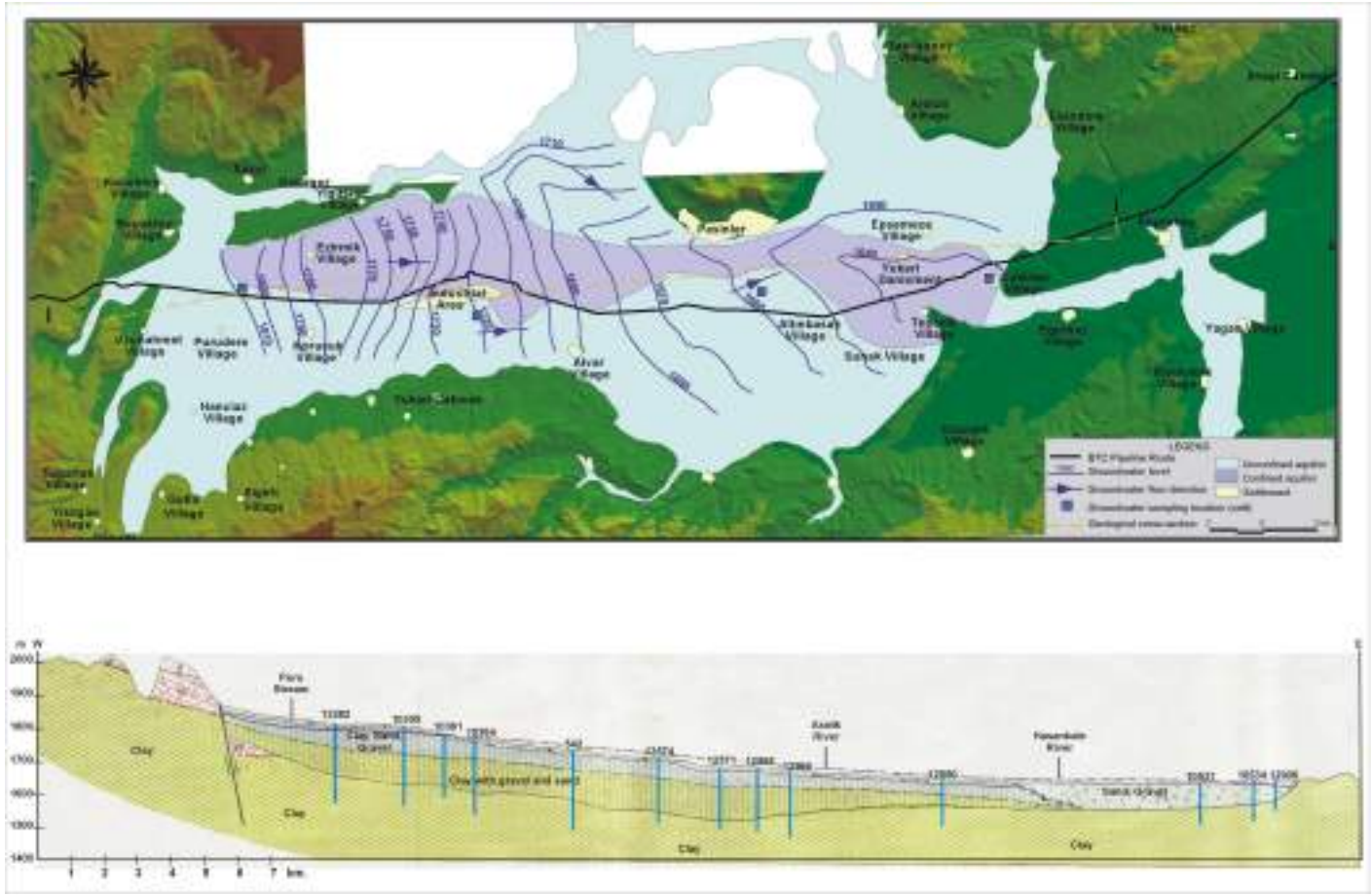


Figure 5.15 Hydrogeological Information for Pasinler Plain

5.6.3.2 Erzurum Plain

The plain comprises three major parts; namely, the Erzurum, Kumbet and Cinis plains. Aquifer characteristics can be described as follows:

- *Erzurum Plain*: both confined and unconfined aquifers exist under this Plain. In this region, the pipeline passes through an unconfined aquifer.

- *Kumbet Plain:* aquifer units in the plain are composed of Quaternary sand and gravel deposits, underlain by Pliocene sand and gravel layers. These two different units show the same characteristics. The aquifer is unconfined and pinches out near its boundary.

- *Cinis Plain:* the aquifer units of the plain are composed of Quaternary sand and gravel deposits. The aquifer is of the unconfined type with a thickness between 20-40 m.

There are five DSI groundwater monitoring stations on the Erzurum plain that are close to the BTC Pipeline Route; sampling was undertaken from each of these stations (Dadas N^{o}. K23; Ciftlik N^{os}. K-5 & K-13; Beypinari Settlement – a potable water well; and Kayapa Settlement – a spring). The analysis of these samples show that the wells, except for K-13 which is polluted by nitrate probably as a result of it being located in marshland, have high water quality (Class I and II) according to the WPCR. These groundwater resources may be used as irrigation water and water for animals as well as industrial cooling water without any purification and may be even used as drinking water following a purification process.

A schematic representation of the hydrogeological information setting in the Erzurum Plain is shown in Figure 5.16.

5.6.3.3 Goksun Plain

In the Komursuyu Valley of the Goksun Plain, there is Quaternary and Pliocene-aged gravel and conglomerate aquifer between 100m and 150m thick. At the north and west of the Plain Palaeozoic-aged limestone occurs and at the southeast Cretaceous-aged limestone exists.

The analyses of these samples show that the wells (DSI 25297, DSI 25294, DSI 28483, DSI 8486, DSI 42035-A) have high water quality (Class I and II) according to the WPCR. These groundwater resources may be used as irrigation water and water for animals as well as industrial cooling water without any purification and may be even used as drinking water following a purification process.

A schematic representation of the hydrogeological information setting in the Goksun Plain is shown in Figure 5.17.

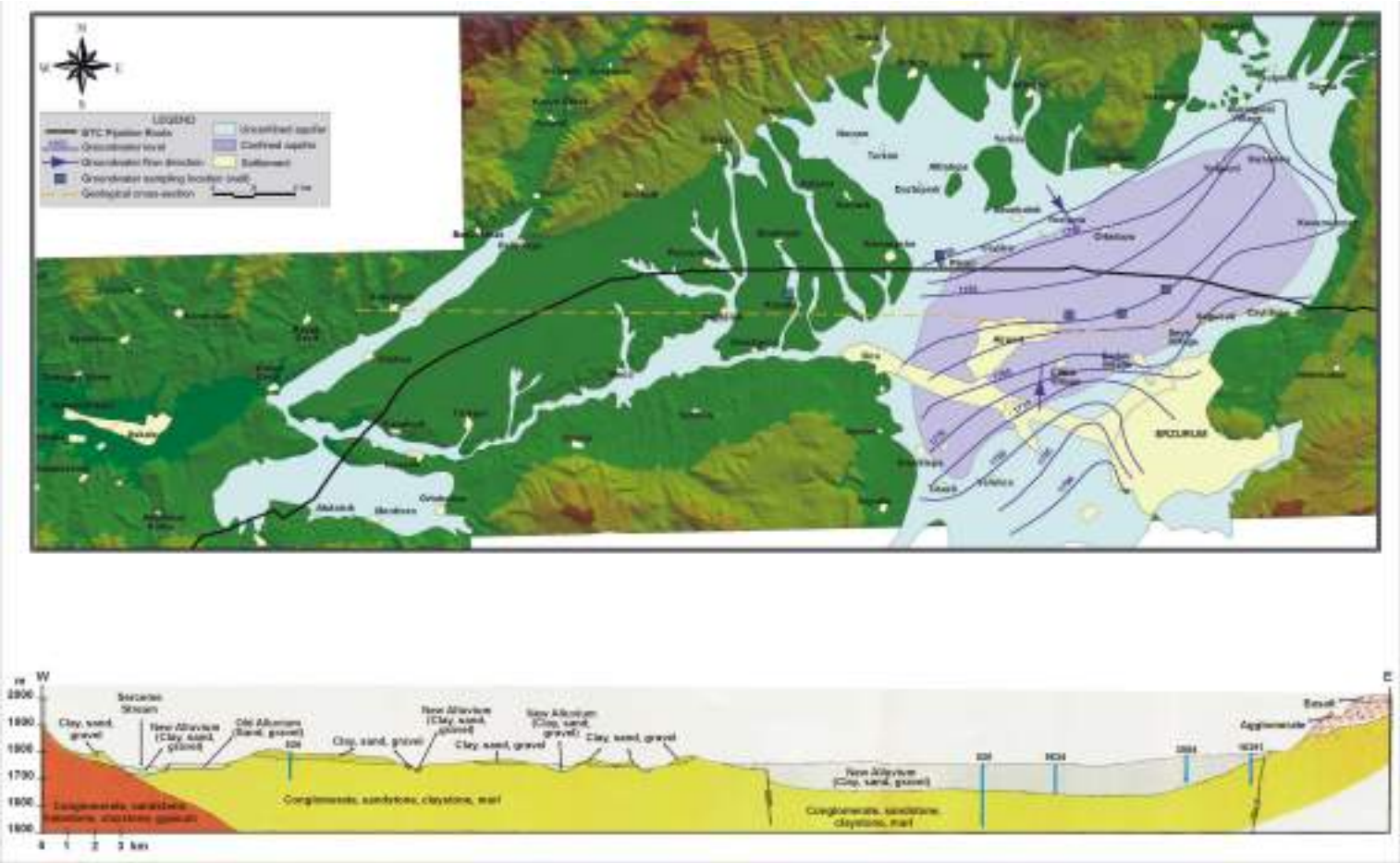


Figure 5.16 Hydrogeological Information for Erzurum Plain

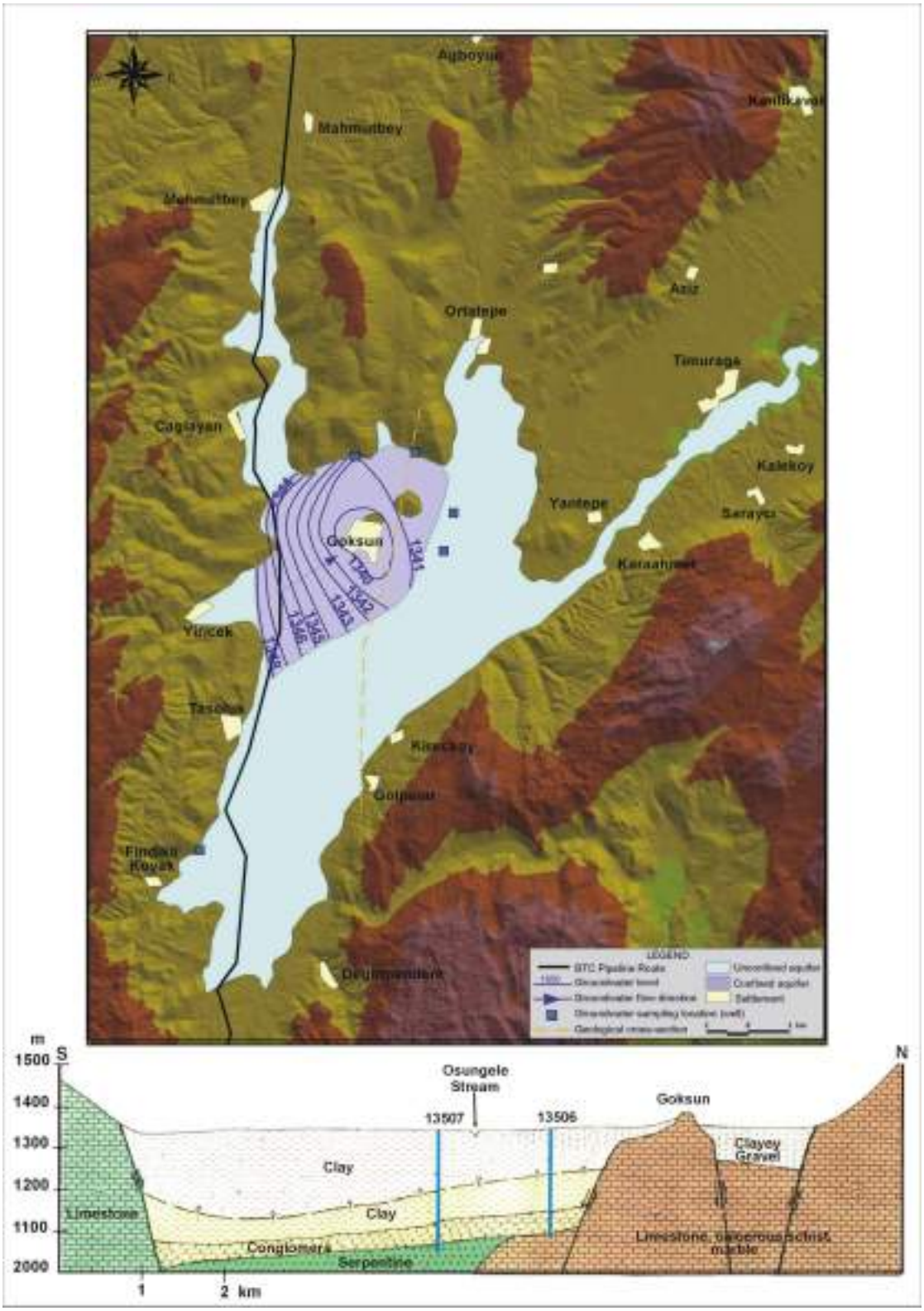


Figure 5.17 Hydrogeological Information for Goksun Plain

5.6.3.4 Adana-Ceyhan Plain

Aquifers on the Adana-Ceyhan plain are composed of Quaternary and Pliocene sand and gravel units. There are two aquifer zones in the southern part of the Plain where the alluvial formation reaches a thickness of 500m. The dominant aquifer type is unconfined with a thickness of 100m. The groundwater quality in this zone is poor due to seawater intrusion. After this unconfined aquifer zone, there exists a confined aquifer zone within the clay layer reaching a depth of 150m. The groundwater in this zone is of high enough quality for drinking purposes.

The analyses of these samples show that the wells (Dutlupinar settlement, Yaslica settlement, Hamdilli settlement, a private well in Kurtpinar settlement, Kurtpinar settlement) have high water quality (Class I and II) according to the WPCR. These groundwater resources may be used as irrigation water and water for animals as well as industrial cooling water without any purification and may be even used as drinking water following a purification process.

A schematic representation of the hydrogeological information setting in the Adana-Ceyhan Plain is shown in Figure 5.18.

5.6.4 Flood risk

Flooding has occurred along the proposed BTC Pipeline Route between 1955 and 1997 and is summarised according to the six catchment areas as follows:

- Aras Catchment: four floods during the 1960s;
- Euphrates Catchment: four floods during the 1960s. The Pipeline Route does not cross the rivers involved in the flooding;
- Yesilirmak Catchment: one flood in 1972;
- Kizilirmak Catchment: three floods between 1967 and 1972. The BTC Pipeline crosses three of the rivers that caused the flooding – the Tecer, Semlik and Tuzla rivers;
- Seyhan Catchment: four flood 'events'[1] between 1958 and 1989. The BTC Pipeline crosses the Zamanti, Kurudere and Sariz rivers, which were all involved in the flooding;
- Ceyhan Catchment: sixteen flooding 'events' between 1956 and 1989. The BTC Pipeline crosses the Ceyhan River, which featured in most of the flood events.

1 A flooding 'event' refers to more than one flood during one day.

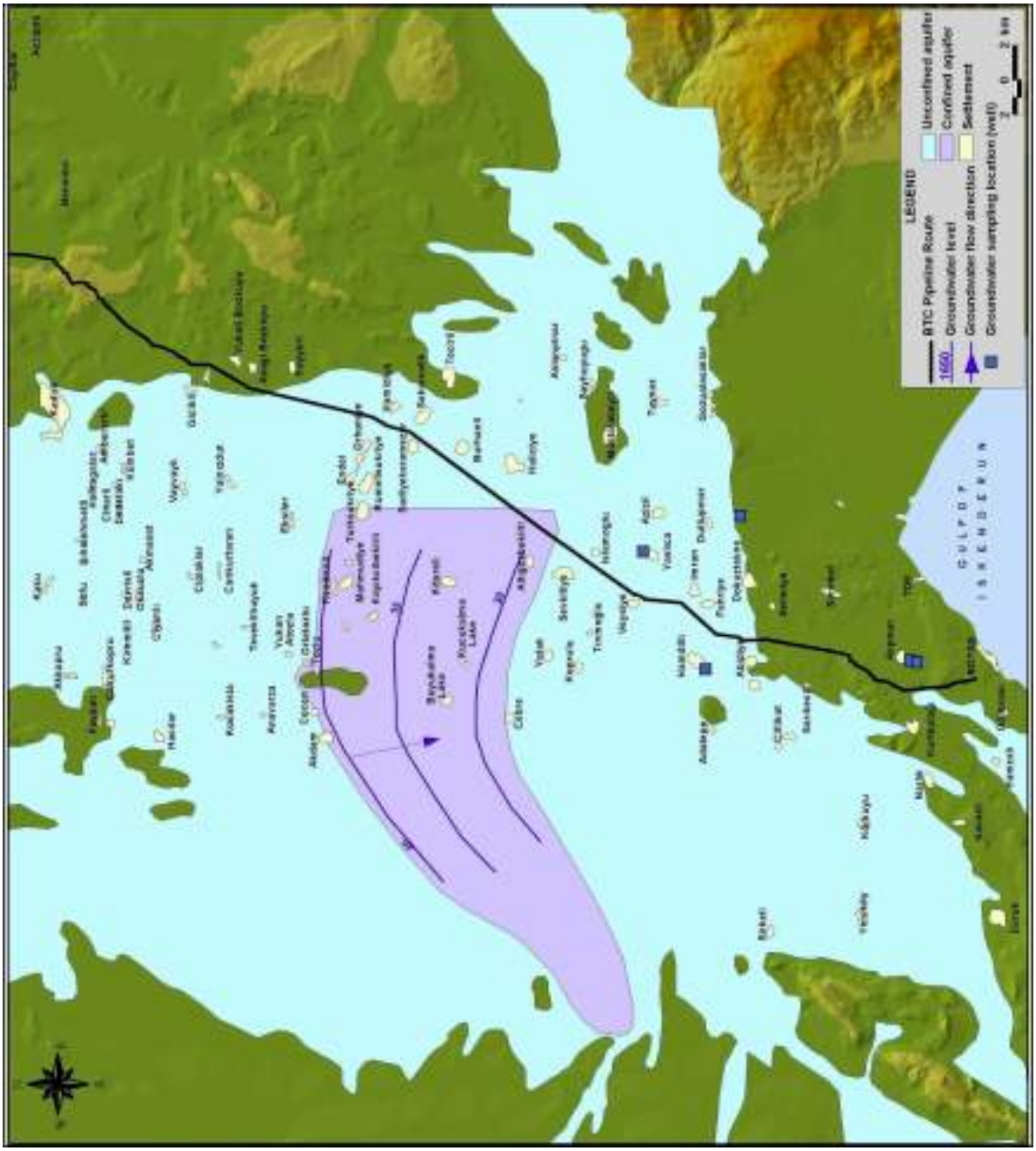


Figure 5.18 Hydrogeological Information for Adana-Ceyhan Plain

5.7 BIOLOGICAL ENVIRONMENT

In this sub-section, details of the biological environment along the pipeline route are described. Further site-specific information on potential impacted ecological resources is provided in the pipeline impact tables and accompanying maps in Section 6; site-specific information on the AGIs along the BTC Pipeline route is discussed in Section 7.

5.7.1 Sources of information

In order to determine the baseline information on the biological environment of the BTC Pipeline, a thorough literature review was carried out in support of a number of biological surveys that have been undertaken at different stages of the Project. The desktop review and field surveys have been supplemented by consultations, attended by ecologists representing the BTC Project, with authorities and local communities along the BTC Pipeline.

5.7.1.1 Phase 1 Habitat Survey

Based on the findings of an initial desktop study and consultation exercise, a Phase 1 Habitat Survey was undertaken during the Basic Engineering (BE) phase (in June and September 2000) of the Project in order to:

- confirm an ecologically sound and sustainable preferred route corridor within the 10km-wide corridor of interest;
- assess the existing nature conservation interest of the route;
- identify particular features and areas of nature conservation interest not already identified during the desktop study and consultation;
- identify the need for additional and more detailed surveys of particular sites.

The Phase 1 Habitat Survey provided a basic record of the extent and distribution of habitats along the route and generated baseline data (including the types of habitat present, their extent, their key components and lists of associated flora and fauna species). Mapping undertaken as part of the Phase 1 Habitat Survey was based principally on vegetation mapping with reference to topographic and substrate features.

The results of this survey, together with findings from pertinent literature including protected areas and other important wildlife areas, were reported in the Baseline Report [Ref 3] and used as a key constraint during the process of reducing the original 10km-wide route corridor to one of 500m, undertaken during the BE phase of the Project.

5.7.1.2 Phase 2 Habitat Survey

With the route more precisely focussed, and drawing on the findings from the Phase 1 survey, 23 localities were identified as being representative of the major habitats and their regional variation to warrant closer ecological investigation. These localities were within the 100m route corridor (ie 50m either side of the centreline of the 500m preferred route corridor). A Phase 2 habitat survey [Ref 13] at these localities was undertaken during July 2001.

The aims of the survey were five-fold:

- provide detailed ecological descriptions of the main habitats along the route using representative samples from undisturbed locations;

- highlight regional variations in these habitats;
- determine and highlight any significant differences between these habitats and similar ones found elsewhere in Turkey;
- evaluate their biological diversity;
- determine whether these habitats are inviolate or if the pipeline can cross them with appropriate precautions.

Sites were selected primarily on the basis of being relatively undisturbed sites that are representative of the main habitat types and sub-types traversed by the BTC Pipeline Route. Subsidiary criteria included:

- Protected Area status (national, international, and proposed sites);
- presence or likelihood of key species (globally-threatened, nationally-threatened, endemic);
- vulnerability of habitat to disturbance.

The twenty-three sites selected for survey, some with more than one habitat type, are listed below:

1. Yumurtalik Lagoons - Aleppo Pine forest, Marsh;
2. Coastal Zone near CMT and Golovasi - Sand dunes;
3. BOTAŞ Afforestation Area - Red Pine forest, Sand dunes;
4. Karacay Creek - Riparian;
5. Ceyhan River - Riparian, Marsh;
6. Kadirli to Geben - Red Pine forest, Maquis, Black Pine forest, Beech forest;
7. Sariz to Pinarbasi - Montane steppe, Meadow, Rocky hillside;
8. Zamanti River - Meadow, Marsh;
9. Zamanti-Ulas region - Montane steppe;
10. Ulas Lake – Marsh;
11. Alacorak Lake – Marsh;
12. Kuru Lake – Marsh;
13. Acioz Creek – Riparian;
14. Bulgur Meadow – Meadow;
15. Imranli to Yaylakent (Erzincan Plateau) - Montane steppe, High mountain steppe, Scot's Pine – Aspen forest;
16. Aksu River – Riparian;
17. Karasu River – Riparian;
18. Erzurum Plain – Meadow;
19. Hasankale River – Riparian;
20. Sarikamis Forest - Scot's Pine forest;
21. Ardahan Forest - Scot's Pine forest;
22. Kura River - Riparian, aquatic;
23. Posof Forest - Scot's Pine forest, sub-alpine meadow.

In the summer of 2002, further Phase 2 Habitat Surveys were undertaken. These surveys were commissioned following detailed evaluation of the Pipeline Route alignment that resulted in a

number of route realignments, due to environmental, social, geotechnical and engineering considerations. Some nineteen of these "re-routes" extended outside the 500m corridor that had initially been subjected to Phase 1 Habitat Surveys. Whilst each of these re-routes was evaluated in terms of potential impacts to biological resources (through literature review, analysis of aerial photographs and discussion with local ecologists), formal Phase 2 Surveys were undertaken during the summer of 2002 in order to confirm habitat types and to identify ecological sensitivities. The nineteen re-routes that were subjected to Phase 2 Habitat Surveys are listed below:

1. Posof (between km 9.7 – 15);
2. Gole (Bogatepe) (between km 112 – 115);
3. Selim – 1 (Tuygun) (between km 135 – 138);
4. Selim – 2 (Hasbey) (between km 138 – 140);
5. Pasinler including the site of PT2 (between km 273 – 282);
6. Erzurum (Cayirtepe) (between km 295.4 – 298);
7. Cayirli (Baskoy) (between km 441 – 445.2);
8. Kelkit (between km 457.4 – 458);
9. Refahiye – 1 (North Anatolian Fault) (between km 508 – 510.2);
10. Refahiye – 2 (between km 527.2 – 529);
11. Ulas (Bogazdere) (between km 741 – 743);
12. Altinyayla – 1 (Pasakoy) (between km 753 – 755.3);
13. Altinyayla – 2 (Sekerpinar) (between km 760 – 762);
14. Pinarbasi (Methiye) (between km 777 – 780);
15. Pinarbasi (Kirkgecit) (between km 835 – 842);
16. Sariz – 1 (Sariz) (between km 861.6 – 865);
17. Sariz – 2 (Karayurt) (between km 871.4 – 875.2);
18. Andirin (between km 959.7 – 962);
19. Kadirli (between km 1009.8 – 1016).

No standardised methodology exists in Turkey for undertaking Phase 2 habitat surveys. Unlike methods developed for other parts of Europe [1] where much research has been undertaken and large amounts of information have been accumulated. Turkey is relatively under-surveyed and such methods may be inapplicable. As a consequence, a more robust, widely used, basic ecological methodology was employed, based upon quadrat sampling. In each ecologically important area, the most representative part of the habitat was selected to obtain the most reliable information about the entire habitat structure of each selected site. Quadrats of appropriate size and shape were used for different habitats. The minimum quadrat size that was representative of a given habitat was determined through use of a series of nested quadrats, each double the size of the next. Species were counted in each and when no difference in number was noted, it was accepted that the area reached the minimum quadrat size [Ref 13, Ref 14, Ref 15, Ref 16, Ref 17].

For each habitat, in each locality, between one and three quadrats were surveyed. Details were taken on the phytoecology and phytosociology of each, and soil profiles were described from soil pits dug in each habitat. A series of five standard forms were completed for each profile and for each quadrat, as follows.

1 National Vegetation Classification (NVC) System and River Corridor Surveys in the United Kingdom by Joint Nature Conservation Committee. [Ref 34]

Soil Profile Description: basic information provided in standardised forms has been collected during the survey to determine the main soil structure and the related features of the site.

Phyto-Ecological Analysis: this has been undertaken using standardised forms to describe the location and nature of the prevailing habitats.

Phytosociological Analysis: this has been undertaken to determine the biological features of the species forming the plant community. The standard phytosociological analyses forms were prepared according to the Braun-Blanquet (1932) method.

Fauna Observations: tables of information on faunal species have been completed at all sites.

Sampling: standardised forms were completed for all flora/fauna samples taken for the herbarium and/or further analyses.

The habitats and flora/fauna species of importance were determined by means of a ranking system. This has been based on a consideration of:

- abundance/rarity;
- sensitivity to physical disturbance and pollution;
- ease with which the reinstatement of the habitat can be achieved.

In addition to the habitat surveys, a number of surveys were undertaken of specific animal species.

5.7.1.3 Other surveys

In addition to the Phase 1 and Phase 2 Habitat Surveys, separate surveys regarding the biological elements of the project area were also undertaken. Faunal records are based on the following sources:

- direct observation during this survey;
- direct observation during previous surveys;
- individuals found dead on roads and tracks;
- information derived from local people.

The surveys undertaken were as follows:

- Bird Survey (Desktop and Field Studies);
- Sea Turtle Survey (Desktop and Field Studies);
- Marine Ecology Survey (Desktop and Field Studies);
- Brown Bear Survey (Desktop);
- Mammal Dossier (Desktop);
- Fish Survey (Desktop and Field Studies);

[See Ref 18; Ref 19; Ref 20; Ref 21; Ref 22.]

5.7.2 The biological environment in Turkey

5.7.2.1 Overview

Turkey has a rich and varied ecology due to its geographic location, variable climate and geological and geomorphologic structure. It also displays a high degree of endemism. The country is situated at the intersection of three phytogeographic regions, from north to south: the Euro-Siberian, Irano-Turanien, and Mediterranean. The BTC Pipeline Route skirts the first of these and passes through the other two.

The Irano-Turanien phytogeographic region covers the semi-arid central, eastern and southeastern parts of Anatolia, which are dominated by a continental-type climate. Steppe is the dominant vegetation cover and oak (*Quercus*) brushwoods are widespread in the more humid conditions at the base of slopes and in valleys. The Euro-Siberian and Mediterranean phytogeographic regions cover the northern and southern parts of Turkey, respectively. However, mountain ranges running parallel to the sea in the north and south have prevented both the maritime climate and the associated mesophyl species (those favouring semi-humid conditions) from penetrating into the more arid interior. Furthermore, observation of the remains of local forests of Black Pine (*Pinus nigra ssp. pallasiana*), Scot's Pine (*Pinus sylvestris*), Cedar of Lebanon (*Cedrus libani*) and various oak species suggests an anthropogenic origin to the steppe vegetation of the interior. The main habitat types along the route are shown in Figure 5.19. The BTC Pipeline Route traverses seven phytogeographically different districts accounting for the high diversity of species encountered within the corridor. These seven districts are summarised in the following paragraphs.

It should also be noted that the BTC Pipeline Route runs parallel to the NGP (c 30% of the route) in the Erzurum Plain, Erzincan Area and Cappadocia districts. In these areas, habitats remain disturbed by the construction, and unsuccessful reinstatement, of the NGP.

Within this overall ecological context, the Pipeline Route passes through a series of ecoregions. Each of these ecoregions is described in the subsections that follow.

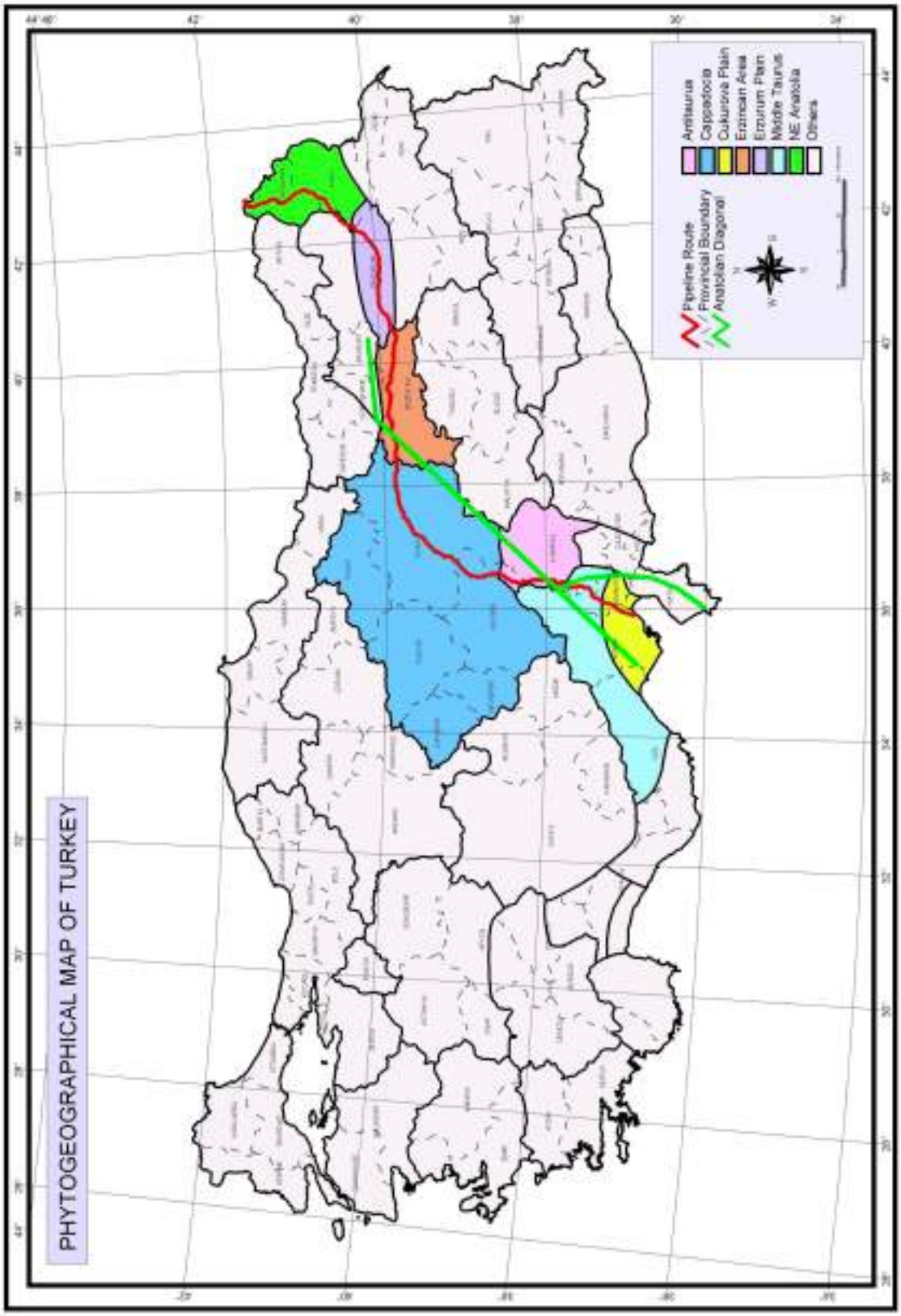


Figure 5.19 Phytogeographical Map of Turkey

5.7.2.2 North-eastern Anatolia

The section between the Georgian Border and Sarikamis marks a transition between the humid Euro-Siberian and the more arid Irano-Turanien phytogeographic regions. The humid maritime influence pervades inland along the main river valleys from the Black Sea, especially the Kura River, adding to the complexity. The flora is dominated by Scot's Pine forest, but where cutting has degraded these, the better regeneration properties of Aspen (*Populus tremula*), Sessile Oak (*Quercus petraea*) and *Q. hartwissiana* have led to these forest types becoming locally dominant. The forests are interspersed with grassy and bushy clearings, which at high altitudes comprise *Rhododendron spp.*, while lower down Hazel (*Corylus avellana*) and Black Cherry (*Prunus divaricata*) are common. Sub-alpine meadows occur at altitudes over 2,000m, particularly in the vicinity of Posof where they are good representatives of the Colchice Floristic Province (see Plate 5.29). These are extremely species rich, dominated by the fescue grass *Festuca artivensis*, *Pipatatherum holciforme*, and Caucasian Lady's-mantle (*Alchemilla caucasica*). They possess few endemic species but contain many relict species. Further south, these largely Caucasian meadows show a gradation into the drier steppe elements of the Irano-Turanien phytogeographic region. Agriculture is sparse within the section, due to the harsh climate, and is limited to fodder crops.

Plate 5.29 Posof Forest showing mosaic of forest, scrub and sub-alpine meadow important for mammals and birds

The extreme north-eastern part of the region falls fully within the 'Colchice Floristic Province' characterised by very dense vegetation arising from the humid climate with its heavy precipitation, and the presence of many relict species of pre-glacial Tertiary Period origin, eg Caucasian Spruce (*Picea orientalis*), Balkan Maple (*Acer hyrcanum*), Rhododendrons (*Rhododendron spp*.), Gentians (*Gentiana spp*.), and Lilies (*Lilium spp*.) that are absent from the more arid climate further south. Although the climate is similar to that of the nearby Black Sea, this area is not maritime influenced as a semi-circle of high mountains to the south-west acts as a barrier. Instead, the humid temperate climate enters the region via the Posof River, a tributary of the Kura River that in turn drains into the Caspian Sea. Similar vegetation is observed along the Kura Valley in Georgia, especially around Borjomi, and hence the Posof area acts as a gateway where elements of the Caspian Sea flora and fauna enter North-east Anatolia.

The difference in the pattern of precipitation within the region further complicates the vegetation patterns. Precipitation levels in Posof and Sarikamis are similar but in Posof, rain falls throughout the year (because of the presence of the Kura valley), while in Sarikamis it falls almost solely in winter. As a result, Caucasian Spruce which requires summer rain, is present only around Posof, a distribution reflected by other species including *Rhododendron flavum*, *R. caucasicum*, Silver Birch (*Betula pendula*), Hazel, Rowan (*Sorbus aucuparia*), and Common Alder (*Alnus glutinosa*). The Scot's Pine forests around Ardahan and Sarikamis have a much less-developed bushy understorey than those further north, and are generally less diverse. However, they are important because they represent the only Scot's Pine forests in Turkey that grow in a continental-type climate.

Although the fauna of the region is much impoverished by previous heavy hunting and by high levels of grazing, the mammalian and ornithological fauna remain important. European Lynx (*Lynx lynx*) may still be present; Roe deer (*Capreolus capreolus*) is present but scarce; and Eurasian Brown Bear (*Ursus arctos*), perhaps surprisingly, remains reasonably common. Caucasian Black Grouse (*Tetrao mlokosiewiczi*), a globally-threatened and restricted-range bird species, occurs at the forest-meadow interface where rhododendron bushes occur. The high grazing pressure in the area undoubtedly keeps its population level low. The small creeks in the region provide ideal spawning grounds for Black Sea Trout (*Salmo trutta labrax*), which is common and widespread.

5.7.2.3 Erzurum plateau

The section between Sarikamis and Tercan falls within the Irano-Turanien phytogeographic region. The region is dominated by steppe grassland, although much has been converted to cropland, and much has been degraded and altered because of heavy grazing pressure. The steppe along the route is anthropogenic in origin, ie derived through human intervention. Montane steppe has developed on areas that were originally forest, and is dominated by the deep-rooting Astragalus spp. and Acantholimon spp. Where this has become further degraded through grazing and subsequent soil erosion, these species cannot survive and the steppe has become dominated by shallow-rooting fescue grass (*Festuca valesiaca*) and herbs (eg *Thymus sipyleus*), which also require less water. Because of its resemblance to naturally-occurring plain steppe, it is referred to as plain steppe throughout this EIA. Various Irano-Turanien flora elements accompany these species. Eastern Anatolia is rich in endemic plant species, but these are found only at high elevations away from the BTC Pipeline Route.

The Erzurum plateau is cut off from the humid influence of the Black Sea Region by mountains to the north. Although the prevailing continental-type climate results in low agricultural production, irrigated agriculture is carried out between Erzurum and Horasan on the alluvium soil deposited by the Aras River system. There are seasonal marshes on the route immediately north of Erzurum, but these have suffered significant drainage and reclamation for agriculture and development and the marshland remains only as fragmented pockets. Nonetheless, these retain interest for wetland birds, eg Common Crane (*Grus grus*) and Marsh Harrier (*Circus aeruginosus*), and amphibians, see Plate 5.30.

Plate 5.30 Wet meadow and ditch with Lesser Reedmace (*Typha angustifolia*) and Flowering Rush (*Butomus umbellatus*)

5.7.2.4 Erzincan region

In the east of the section between Tercan and Imranli, the BTC Pipeline Route traverses mostly agricultural areas and degraded plain steppe until Yaylakent, but it crosses major rivers, the Karasu and Aksu, and wetland habitats including Bulgur Meadow, a wet meadow dominated by Meadowsweet (*Filipendula ulmaria*) and Common Agrimony (*Agrimonia eupatoria*), species which are found mostly in North Anatolia. These are important for amphibians, eg Iranian Long-legged Frog (*Rana macrocnemis*), and as spawning grounds for fish, eg Transcaucasian Barb (*Capoeta capoeta*). Between Yaylakent and Imranli, the route originally crossed a considerable part of the alpine zone, present at the highest altitudes of the Otlukbeli Mountains (Plate 5.32). Even though the pipeline is routed below this zone, it still crosses this habitat for c. 25km (see Section 6, Table 6.28). Below this is montane steppe, where the principal dominant species are *Onobrychis cornuta*, *Astragalus compactus*, *Acantholimon acerosum* and Juniper Thyme (*Thymus leucotrichus*). At lower altitudes nearer Imranli, Scot's Pine forests appear but they are localised, highly disturbed, and have mostly become replaced with Aspen and Sessile Oak in bush form.

The mountains in the vicinity of Erzincan are one of the most important centres of endemism for plants in Turkey, lying on what botanists term the Anatolian Diagonal – a series of mountain ranges acting as a threshold between the Central Anatolia Plateau at c.1,000m elevation and Eastern Anatolia at c.2,000m elevation across which various species advanced and retreated in a north-south direction with the warming and cooling of the climate during the Quaternary Period (see Plate 5.31). They also lie close to the Black Sea at the transition zones of the Euro-Siberian and Irano-Turanien phytogeographic regions and have widespread, shallow, ophiolite and gypsum soils which, being poor in nutrients but with toxic concentrations of magnesium and iron, have exerted strong edaphic selection pressure resulting in speciation. Examples of endemic plants include *Achillea sipikorensis, Alyssum filiforme, Campanula hedgei, Salvia rosifolia, Gypsophila tuberculosa, Verbascum armenum* var. *temskyanum*, and *Iris kerneriana*.

Plate 5.31 Alpine zone in the Otlukbeli Mountains showing the short, sparse vegetation

The northern side of Otlukbeli Mountains is penetrated by valleys originating near the Black Sea coast that introduce a humid influence to the area and increase levels of biodiversity. Scot's Pine forest grows in these valleys at altitudes below 2,000 m. The BTC Pipeline Route passes along one such valley near Guzyurdu Village, which is particularly important, since it comprises bush species of Black Sea origin such as Black Cherry, Eastern Hawthorn (*Crataegus orientalis*), Apple (*Malus sylvestris*), Rowan (*Sorbus aucuparia*), *Vaccinium arctostaphyllos, Rubus caesius* and Cornelian Cherry (*Cornus mas*). These provide food and shelter to endangered mammal species including the Eurasian Brown Bear, Wild Goat (*Capra aegagrus*), Chamois (*Rupicapra rupicapra*) and Roe Deer. Population estimates are unknown but given the general rarity of these species they are likely to be low.

5.7.2.5 Cappadocia Region

This section, lying between Imranli and Pinarbasi, crosses mostly agricultural areas and plain steppe. This region has the most arid climatic conditions along the BTC Pipeline Route. Agricultural productivity is low due to the wide distribution of the gypsum rocks; annual wheat production being around only one-third (60kg/ha) of that found on the more fertile lands of Central and East Anatolia. Consequently, animal husbandry, particularly sheep grazing is widespread over the steppe, resulting in the vegetation, which was already poor, being further degraded. The dominant steppe species are *Festuca valesiaca*, *Thymus sipyleus*, *Gypsophila ssp*., Hairy Sea-Heath (*Frankenia hirsuta*) and Sea Wormwood (*Artemisia santonicum*), the last two being found in semi-salty areas are not distributed widely along the BTC Pipeline Route. The Central Anatolia steppe is rich in endemic plant species, but most of these are not unique to just this region but grow in two or more regions of Turkey.

The steppe is believed to be rich in reptile species, but surveys appear to contradict this – probably because the route is subject to a high degree of human interference.

Given the aridity of the region, wetlands adopt a greater significance than usual. There is a group of five lakes near Ulas, mostly seasonal and located on gypsum, which though generally unimportant for reptiles and mammals are of international importance for birds. The Ministry of Environment is considering these lakes for designation under the Ramsar Convention. Two globally-threatened species – White-headed Duck (*Oxyura leucocephala*) and Ferruginous Duck (*Aythya nyroca*) – occur, the former apparently breeding. Thirteen nationally-threatened species were also present during surveys – Red-necked Grebe (*Podiceps grisegena*), Great Egret

(*Egretta alba*), Common Shelduck (*Tadorna tadorna*), Shoveler (*Anas clypeata*), Teal (*A. crecca*), Garganey (*A. querquedula*), Pochard (*Aythya ferina*), Marsh Harrier (*Circus aeruginosus*), Common Crane (*Grus grus*), Black Tern (*Chlidonias niger*), White–winged Black Tern (*C. leucopterus*), Citrine Wagtail (*Motacilla citreola*), and Whinchat (*Saxicola rubetra*). The main river in the region is the Zamanti River whose broad species-rich wet meadows, carpeted with orchids, act as something of an oasis for both biodiversity and the local people who use them for grazing their stock and for winter fodder (Plate 5.32). They are an important staging point for migrant waders, eg Wood Sandpiper (*Tringa glareola*), Ruff (*Philomachus pugnax*), and breeding ground for other wetland birds, including Common Crane.

Plate 5.32 Zamanti River valley in spring with wet meadow dominated by Creeping Buttercup (*Ranunculus repens*)

5.7.2.6 Anti-Taurus region

The BTC Pipeline Route traverses emostly croplands between Pinarbasi and Kirkgecit Village, montane steppe between Kirkgecit Village and Sariz, and a mixture of cropland and steppe between Sariz and Goksun (Plate 5.33). A case study illustrates a number of the ecological issues associated with the pipeline in the Kirkgecit valley area. The Tahtali Mountains between Sariz and Pinarbasi are important because they are located on the Anatolian Diagonal. Furthermore, the region forms a transition zone between the Irano-Turanien and Mediterranean phytogeographic regions. Forests typical of the Mediterranean, ie Black Pine, Cedar of Lebanon, and Cilician Fir (*Abies cilicica ssp. cilicica*) are present within this area because of the influence of the marine climate up the Goksun Valley. However, they are present here at the extremities of their ranges and are not resistant to disturbance, being replaced in such cases by Grecian Juniper (*Juniperus excelsa*). Although Mediterranean forests are not present along the Pipeline Route, Grecian Juniper is observed amongst the montane steppe as scattered trees. Except for targeted cutting required in order to clear the specified construction corridor, no disturbance of Grecian Juniper will be permitted by the Project.[1]

1 According to the Forestry Circular, dated 13 June 1996 and numbered 5010 and Forestry article dated 16 May 2002 and numbered S1.KDM.0/90; if juniper species are found at sites where public benefit activities are held (such as energy transportation lines, natural gas pipeline, sand, stone quarries, mind permits etc), attention shall be paid to avoid the disturbtion of these species, except where cutting is inevitable.

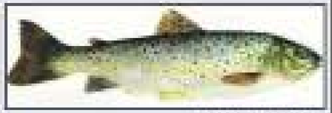
KIRKGECIT VALLEY

The area between Kirkpinar Village and Sariz is considered important for its biodiversity and consists predominately of montane steppe type terrain. In this region, the floristic elements of both the Irano-Turanien and Mediterranean mountain regions coexist. This type of rocky karst habitat in South Anatolia is rich in endemic plant species with narrow distributions especially within the Taurus Mountains. The pipeline route along this area has been re-routed to avoid disturbance to these endemic plant species.

Brown Trout (*Salmo trutta macrostigma*) are present in the small mountain creek flowing through the meadow south of Kirkgecit Village. This area is also rich in reptiles and amphibians. Smooth snakes (*Coronella austriaca*) have been observed in the rocky areas surrounding the meadow. This is a significant range extension to their main distribution throughout North Anatolia.

GENERAL VIEW OF THE VALLEY

Looking north towards the Alafi Tower (right), now avoided by the route change. The tower is associated with a settlement south of the Alafi Tower. Collected pottery sherds from the surface reveal that the settlement can be dated to the Iron Age, Hellenistic, Roman and Medieval Periods.



BROWN TROUT

SMOOTH SNAKE

2002

Plate 5.33 Typical montane steppe dominated by dwarf bushes of *Astragalus sp.*

The area between Kirkpinar Village and Sariz is important for its biodiversity. Although this area is mostly montane steppe, and there is little variation in the dominant species of montane steppe in Turkey and no important physiognomic differences, there are differences in the species composition of the rest of these communities. In this region the floristic elements of both the Irano-Turanien and Mediterranean mountain regions coexist, and various endemic plant species occur. This type of rocky karst habitat in South Anatolia is rich in special endemic plant species with narrow distributions, especially that within the Taurus Mountains. However, such species are absent along the BTC Pipeline Route that traverses the Anti-Taurus.

Brown Trout (*Salmo trutta macrostigma*) are present in the small mountain creek flowing through the meadow south of Kirkgecit Village, which is also rich in reptiles and amphibians. Smooth Snake (*Coronella austriaca*) was observed in the rocky areas surrounding the meadow – a significant range extension to its main distribution in North Anatolia. Lesser Kestrel (*Falco naumanni)*, a globally threatened bird species (VU), was recorded breeding in Yesilkent Village.

5.7.2.7 Taurus Mountains

This section lies between Goksun and Kadirli. The Taurus Mountains are the most important area of Turkey in terms of biodiversity, and supports the highest number of endemic plant species, for several reasons. First, the Mediterranean basin is well known for its rich biodiversity. Second, the Taurus Mountains rise sharply from the sea to an altitude of more than 3,000m so a variety of climatic zones exist. Third, the Taurus Mountains have a highly fragmented geomorphology, realised only within the last two million years. This caused fragmentation of plant populations which were then isolated subsequently by geographical obstructions (generally deep valleys) giving rise to the formation of new species. Many of these species have highly restricted ranges, sometimes only a few hectares in area. Fourth, they act as a barrier between the Irano-Turanien and Mediterranean floristic regions that intersect at the highest elevations of these mountains where species from both regions coexist. Fifth, during the glacial age in the Quaternary Period, many plant species retreated from the north to the Taurus Mountains. After the glacial age, some of these species remained living along high altitude, north-facing slopes. Additionally, many species inhabiting the Mediterranean basin during the Tertiary Period remain as relicts in the Taurus Mountains. Sixth, this range also played an important role in the migration of plants between Asia and Europe. However, the BTC Pipeline Route does not cross many of these special habitats except the Black Pine and Beech forests with a total crossing length of c.3.5km.

The forests in this section are important. Between Goksun and Cokak the Pipeline Route traverses mainly Black Pine forests. Significantly, Oriental Beech (*Fagus orientalis*) is present between Cokak and the Kiriksu River (a tributary of the Goksun River) since outside of North and Northwest Anatolia it exists in Turkey only locally in the south (Plate 5.34). These beech forests, which occur east of the Pipeline Route but not directly along it, support various small tree and bush species with relict characters (eg Common Yew (*Taxus baccata*), Boxwood (*Buxus sempervirens*), Holly (*Ilex aquifolium*), and Cornelian Cherry. Between Andirin and Kadirli the route traverses Red Pine (*Pinus brutia*) forests and maquis. Red Pine forests are at the edge of their range here and hence are not well-developed. Maquis, formed as a result of disturbance to Red Pine forests, is dominated by Kermes Oak (*Quercus coccifera*) and Mock Privet (*Phillyrea latifolia*). Most maquis species are also present within the Red Pine forests.

Plate 5.34 Oriental Beech (*Fagus orientalis*) forest with Black Pine (*Pinus nigra*)

The maquis and Red Pine forests are an important refuge for fauna, particularly reptiles, from the intensively-farmed Cukurova Plain to the south. Lizards and snakes have migrated to the maquis areas between Kadirli and Goksun where the rocky substrate, presence of water, and scarcity of human activities have proved ideal conditions for them. Small mammals (eg Red Fox (*Vulpes vulpes*) Rabbit (*Oryctolagus cuniculus*), and European Hedgehog (*Erinaceus concolor*) have also moved from cultivated lands to shelter within the Red Pine forests.

5.7.2.8 Cukurova Plain

The section lying between Kadirli and the existing BOTAŞ Marine Terminal traverses mostly intensively cultivated land. Non-agricultural habitats are restricted mostly to the river and canal crossings, and the coastal sand dunes. The BTC Pipeline Route crosses two important rivers – the Ceyhan River and Karacay Creek. The Ceyhan River is disturbed by the extraction of sand and gravel which has decreased its ecological importance. However, the diversity of fish in the river is high although the abundance of any species is low. A wide range of aquatic birds is also present. In comparison, the diversity of fish in the Karacay Creek is low but their abundance is high, such high productivity being the result of little disturbance, a low flow rate, and abundant aquatic plants.

Nearby, Yumurtalik has extensive saline and brackish lagoons, sand dunes, and a forest of Aleppo Pine (*Pinus halepensis*). Although the BTC Pipeline Route does not cross Yumurtalik, this is one of the largest intact beaches remaining along the Turkish coast and one of the most sensitive sites close to the Pipeline Route. The halophytic vegetation (salt tolerant) around the saline and brackish lagoons is poorly-developed with Glassworts (*Arthrocnemum fruticosum* and *A. glacium*), *Holocnemum strobilaceum* and Sea Purslane (*Halimone portulaccoides*) being the dominant species. This salt marsh vegetation is particularly obvious around Yelkoma Lake,

which is linked to the sea, holds marine fish species, and is rich in bird species, but is very poor in other faunal groups. The sand dunes show a range of vegetation from bare sand to well-developed dune slacks. The dunes are important as the nesting grounds of globally-threatened sea turtles - Green Turtle (*Chelonia mydas*) and Loggerhead Turtle (*Caretta caretta*). These turtles lay their eggs in July and August in those parts of the dunes that have consolidated and have a light covering of vegetation. The dunes also support Sea Daffodil (*Pancratium maritimum*), a widely-distributed but rare plant species. Aleppo Pine is distributed across the coastal areas of southern Europe and North Africa, and is present in West and South Anatolia only in small communities since in Anatolia it is replaced by Red Pine, which forms forests up to altitudes of 1,200m (Plate 5.35).

Plate 5.35 Maquis occurring amongst agricultural cropland

5.7.3 Protected areas and other important conservation sites

5.7.3.1 Special Environmental Protection Areas (SEPA)

The legislative basis for the designation of conservation sites and areas is outlined in Appendix D. The Turkish Council of Ministers is responsible for the designation of areas of particular ecological importance, as 'Special Environmental Protection Areas (SEPA)'. The Council of Ministers determines which Ministry is responsible for preparing and implanting plans and projects that achieve the conservation principles inherent in the designation.

There are no designated Special Environmental Protection Areas along the route of the BTC Pipeline.

5.7.3.2 World Wide Fund for Nature ecoregions and sub-ecoregions

The World Wide Fund for Nature (WWF) has identified biological regions in order to prioritise the protection of biodiversity. These regions are collectively known as 'The Global 200', crucial to the conservation of global biodiversity. The Global 200 is a science-based global ranking of the Earth's most biologically outstanding terrestrial, freshwater and marine habitats. It provides a critical blueprint for biodiversity conservation at a global scale. Developed by WWF scientists in collaboration with regional experts around the world, the Global 200 is the first comparative analysis of biodiversity to cover every major habitat type, spanning five continents and all the world's oceans.

The aim of the Global 200 analysis is to ensure that the full range of ecosystems is represented within regional conservation and development strategies, so that conservation efforts around the world contribute to a global biodiversity strategy. It uses ecoregions as the unit of scale for comparison and analysis. Ecoregions are large areas of relatively uniform climate that harbour a characteristic set of species and ecological communities. By focusing on large, biologically distinct areas of land and water, the Global 200 sets the stage for conserving biodiversity [Ref 39].

The BTC Pipeline will traverse two terrestrial ecoregions and will terminate at the proposed BTC Marine Terminal, which will be located on the Mediterranean coast, another ecoregion. These three ecoregions are described below:

- *Caucasus-Anatolian-Hyrcanian Temperate Forests:* the combination of a moderate climate, rugged topography, varied geology, and geographic proximity to both Europe and the Near East help account for the uniqueness and complexity of plant and animal life here. The region functions as a biogeographic corridor between the Mediterranean region and Central Asia. Endemism is high throughout - in the Caucasus alone up to twenty per cent of the flora is considered endemic.

- *Mediterranean Forests, Woodlands and Scrub:* known as the cradle of civilization, the Mediterranean region has been subject to ecosystem degradation for millennia. Yet the region retains its biological significance due to a high level of plant endemism and the occurrence of many relict species, notably along the coasts. The variety of flora is estimated at over 25,000 species, of which over half are endemic.

- *Mediterranean Sea:* rocky reefs, seagrass meadows, and upwelling areas are particularly important habitats that support Mediterranean marine biodiversity. Seagrass meadows provide important habitat - especially as breeding, feeding, and resting areas - for numerous marine species, particularly fish, crustaceans, and marine turtles. These meadows produce more than 80% of the annual fish yield in the Mediterranean. The grasses also stabilize the seashore and maintain water quality, particularly through oxygen production.

5.7.3.3 Other important conservation sites

There are five sites of conservation value, and a further eight worthy of mention that are within the broad corridor of the BTC Pipeline Route and which are identified in Figure 5.20. A summary of these sites from north to south is as follows:

Figure 5.20 Environmental Protected Areas and Sites of Recognised Conservation Value

Posof Forest – the forest edge/sub-alpine meadows with rhododendron scrub are the main habitat of Caucasian Black Grouse – a globally-threatened restricted-range species, classified as Data Deficient. The **Posof Wildlife Protection Area** (c. 43,375 ha) has been established primarily to conserve this species. However, as reliable population estimates are lacking, the size of the Protection Area has been maximised to protect as much suitable habitat as possible given the grouse's globally-threatened status. There is currently no management plan for this protected area and as such the site is not included on the United Nations List of National Parks and Equivalent Reserves. Even though it is not stated officially, discussions with Turkish authorities have indicated that it is their opinion that if a plan was developed and the area was included in the United Nations List, the area would fall into Category IV of the International Union for the Conservation of Nature – The World Conservation Union (IUCN)'s classification – a Habitat/Species Management Area: protected area managed mainly for conservation through management intervention' [Ref 23].

Ardahan Forest – approximately 2,500ha of grazed montane steppe, meadow, high altitude Scot's Pine forests, and a 15 ha marshland (Putka Lake) are recognised as an Important Bird Area (IBA) on account of the globally near-threatened Ferruginous Duck and 10 pairs of nationally threatened Montagu's Harrier (*Circus pygargus*) breeding around the lake (See Box 5.3). The IBA, which has no legal protection status, lies c.250m from the pipeline and Putka Lake, which attracts attention for supporting bird species, lies 1,500m away. The forest supports healthy populations of mammals including the Eurasian Brown Bear and Roe Deer.

Sarikamis Forest – the forest supports healthy populations of mammals including nationally threatened Eurasian Brown Bear [Ref 28], Roe Deer and globally threatened Wild Goat. Approximately 20,000ha have been given the national designation **Natural Site Area** for its important Scot's Pine forest communities. The pipeline crosses the edge of this area through an existing narrow clearing.[1] A gorge that lies within 500m to the North and West route is an important breeding site for a number of raptor species; including the nationally threatened Lammergier (*Gypaetus barabatus*), Griffon Vulture (*Gyps Fuluvs*) and Saker Falcon (*Falco cherrug*). According to the decree of Directorate of Protection of Cultural and Natural Assets of Erzurum dated May 10, 2002 and numbered 1233, BTC Pipeline was allowed to traverse Sarikamis Forest. A case study illustrates a number of the ecological issues addressed during the planning and design of the Sarikamis Forest crossing.

Erzurum Marshes – this is an area of marshes and wet meadows, recognised as an Important Bird Area, now much-drained, but still supporting a wide range of wetland birds including eight nationally-threatened species, eg the Common Crane, Marsh Harrier, Garganey (*Anas querquedula*), and Citrine Wagtail (*Motacilla citreola*). The IBA has no legal protection status.

1 Permission for the BTC Pipeline to traverse the fringes of this forest area, utilising a natural tree break as the pipeline corridor has been given by the Directorate of Protection of Cultural and Natural Assets in Erzurum via Pronouncement No 1233, dated 10 May 2002.

SARIKAMIS FOREST
The Sarikamis Forest supports a healthy population of mammals including the European Brown Bear (Ursus arctos) and Roe Deer (Capreolus capreolus). Approximately 20,000 ha of forest is designated as a Natural Site Area (Turkish Natural Designation) due to the stands of native Scots Pine forest.
The BTC Pipeline Route crosses the edge of forest through an existing narrow clearing where trees are widely spaced, thereby avoiding dense tree stands.
Globally and nationally-threatened plant species, previously recorded during ecological surveys, will be identified and located during the pre-construction surveys, particularly within Ecologically Sensitive Area (ESA) B. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated, where practicable, outside of the RoW to a similar habitat, under supervision by a botanical specialist.
At the earliest opportunity, ecological advisors will determine the presence of nesting sites of raptor species (Lammergier, Griffon Vulturies, Northern Goshawk). A single, which is known to be of particular significance for nesting raptors, will be safeguarded from any construction-related intrusion.
The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement.
Construction activities will be subject to specific mitigation measures including timing considerations.
The hunting of bears or any other wildlife by the BTC project personnel or contractors will be strictly forbidden. All work sites will operate a waste management system ensuring that the storage of food and waste foods will be appropriately managed. Special bear-proof waste containers (haul-all-bins) will be provided at all sites. Construction personnel will be made aware of the need to comply with these waste management system procedures.
Sarikamis Forest Area (Natural Site)
Sarikamis Forest Crossing
KP 168
KP 170
KP 171
Old Route
New Route
BROWN BEAR
SARIKAMIS FOREST CROSSING
ROE DEER
btc

Box 5.3 Important Bird Areas (IBAs)

Summary
IBAs are places of international significance for the conservation of birds at the global, regional or sub-regional level. IBAs are a BirdLife International initiative and national inventories are produced and published by BirdLife Partners.

What is BirdLife International?
BirdLife International is a global Partnership of non-governmental conservation organisations with a focus on birds that works together on shared priorities, exchanging skills, achievements and information, and so growing in ability, authority and influence. BirdLife International is present in 103 countries and territories worldwide.

What Are IBAs?

- critical sites for the conservation of birds and biodiversity;
- places of international importance;
- practical targets for conservation action;
- selected according to internationally recognised criteria;
- used to reinforce existing protected area networks;
- used as part of a wider approach to conservation .

Important Bird Areas are places of international significance for the conservation of birds at the global, regional or sub-regional level. They are identified using standardised, internationally agreed criteria. IBAs are a practical tool for conservation. Sites must, wherever possible, be amenable to being conserved and to being delimited from surrounding areas, and be large enough to support viable populations of the species for which they are important.

IBA Programme
The Important Bird Area Programme of BirdLife International is a world-wide project aimed at identifying, monitoring and protecting a network of critical sites for the world's birds. The IBA programme history dates back to 1981.

The IBA Programme is global in scale, and it is anticipated that up to 20,000 IBAs will be identified world-wide, using standard, internationally recognized criteria for selection. Many Regional and national inventories have already been published

A number of national inventories, in the appropriate national languages, have been prepared and published by BirdLife Partners, with support from the BirdLife Secretariat, for example:

Turkey	1989	Ertan, A., Kilic A. and Kasparek, M. Turkiye'nin Onemli Kus Alanlari. Istanbul: Doðal Hayatý Koruma Derneði. 155 pp.

An IBA programme is initiated in four phases, as follows:

- setting up a suitable institutional framework, which usually involves getting the co-operation of non-BirdLife institutions such as government agencies, development NGOs, universities, etc
- a process of identifying potential IBA sites, carrying out ornithological surveys and compiling an inventory.
- setting priorities and implementing advocacy, monitoring and action for key sites. establishing a sustainable management cycle.

Karasu River - a very broad, shingle river plain with islands and marshy areas supporting a rich diversity of riverine and riparian bird life including at least three nationally-threatened species (eg Great Egret (*Egretta alba*), White-winged Black Tern (*Chlidonias hybridus*) and Oystercatcher (*Haematopus ostralegus*)). The river has no protection.

Forest near Guzyurdu Village – the forests along the southern side of the Kelkit Valley support healthy populations of mammals as above, but the globally-threatened Turkish Chamois (*Rupicapra rupicapra asiatica*), classified as Data Deficient, is also present. In addition, wild goat, Eurasian otter (*Lutra lutra*), forest dormouse (*Dryomys nitedula*), which are also globally-threatened, are present along with nationally-threatened brown bear and roe deer species. The locality has no protection or previous recognition. The pipeline skirts the edge of coppice forest.

Kelkit Wildlife Protection Area – about 22,000ha has been established primarily to conserve the Wild Goat, a globally-threatened species classified by IUCN as Vulnerable. Approximately 1,000 individuals are estimated to be within its boundaries. A small portion of the **Wildlife Protection Area** lies within the 500m wide route corridor, but the route itself does not traverse it, crossing about 130m south of the boundary. A case study outlines the key issues associated with the Kelkit Wildlife Protection Area.

Ulas and Alacorak Lakes – these are among the most valuable ecological sites along the route and are a series of five lakes being considered by the Ministry of Environment for designation as **Internationally Important Wetlands** under the Ramsar Convention. The lakes support the globally-threatened White-headed Duck, classified as Endangered and the rarest bird along the pipeline route, and the globally near-threatened Ferruginous Duck. At least 13 nationally-rare species are also present. The pipeline crosses through the centre of the lakes' area but has been routed to avoid the five lakes and the wetland areas. Under the terms of the Ramsar Convention, sites being considered as potential Ramsar sites should be treated as full sites under any planning and protection framework pending a decision. However, the proposed boundaries of the area have yet to be determined. Related mitigation measures for routing near these areas are stated in Section 6.

Sekerpinar Creek – an extensive riparian marsh just south of the village of Kurkcukyurt. It is used as a staging point by the globally near-threatened Great Snipe (*Gallinago media*). The pipeline was re-routed c.1km away to avoid the marsh. The site has no protection.

Zamanti River – a broad floodplain of orchid-covered wet meadows and marshes important for birds including three nationally-threatened species (ie, Common Crane, Whinchat and Icterine Warbler (*Hippolais icterina*)). The site has no protection (for details see Section 6).

Ceyhan River – an important river, somewhat disturbed at the crossing point, but with high diversity of fish and birds including two nationally-threatened species (ie, Common Kingfisher (*Alcedo atthis*) and Pied Kingfisher (*Ceryle rudis*) and a very large colony of sand martins (for details see Section 6).

Karacay Creek – slow-flowing, undisturbed, lowland river with abundant fish and diverse bird life including two nationally-threatened species (ie, Common Kingfisher and White-breasted Kingfisher (*Halycon smyrnensis*)).

KELKIT WILDLIFE PROTECTION AREA
The Kelkit Wildlife Protection Area (c. 22,000ha) has been established primarily to conserve the Wild Goat (Capra aegagrus), a globally-threatened species classified by IUCN as Vulnerable, and the Turkish Chamois (Rupicapra rupicapra asiatica) classified as Data Deficient. Approximately 1,000 individuals are estimated to inhabit the WPA. A small portion of the Wildlife Protection Area lies within the 500m wide route corridor, but the pipeline route itself is located approximately 130m south of the WPA boundary.
Kelkit Wildlife Protection Area
KP 506
KP 491
KP 476
The pipeline route passes through an alpine zone ecosystem south of the Wildlife Protection Area, comprising within which eight globally-threatened plant species have been recorded. Although, the route passes through an area of this alpine habitat that is not part of the Wildlife Protection Area, specific mitigation measures will be applied along the length of the pipeline in this area, including pre-construction surveys to identify and locate threatened plant species, potential translocation of these species, narrowing of the pipeline corridor and measures to reduce the effects of heavy plant and machinery.
One of the major threats to both the Wild Goat and the Turkish Chamois is hunting. Hunting by construction workers will be strictly prohibited.
Further, potential impacts include disturbance if construction workers stray over the boundaries and into the Wildlife Protection Area. Mitigation measures to be applied in the vicinity of the protected area will include ensuring workers keep within the pipeline corridor at all times and ensuring construction vehicles keep to approved access roads.
Construction noise will also have a potential disturbance effect on certain fauna. Reactions will be variable. Some species may become accustomed to noise levels and others may temporarily leave the immediate working area. Construction working hours will be agreed with the relevant authorities prior to mobilisation along this length of the pipeline.
Only minor impacts are expected to the Wildlife Protection Area on the basis of route avoidance and strict adherence to BTC project mitigation measures.
WILD GOAT
btc
2002

There are three sites lying close to the route but not on it. **Kuru Lake**, approximately 1km south of the pipeline, is a large, shallow, eutrophic lake with extensive reedbeds and marsh being considered for designation as an **Internationally Important Wetland** under the Ramsar Convention. At least seven nationally-rare bird species have been recorded. **Aslantas National Park** (7,515 ha), in the Ceyhan River valley, was declared in 1958 for its flora and fauna and in particular, for its historical assets, notably Karatepe and Domuztepe on either side of the Ceyhan Valley, the most important strategic border forts of the Young Hittite Kingdom. It lies 3km south east of the Pipeline Route at its closest point, but the route crosses two small rivers just 1.4km and 2.2km upstream of the boundary of the Aslantas Reservoir, part of which lies within the Park. The reservoir is an irrigation water storage for the Cukurova plain. **Yumurtalik Lagoons Nature Reserve** is recognised as an Important Bird Area (IBA) and is approximately 20km from the end of the pipeline route at the BTC Marine Terminal and is described in detail in Section 11.

In addition to these ecologically important areas, a significant number of smaller, ecological sites have been identified along the pipeline route. Further information on these identified sites is provided in the Impact tables included in the supplement to Volume II of this EIA Report.

5.7.3.4 Areas with high endemism

The BTC Pipeline Route traverses those regions of Turkey with the highest degree of plant endemism representing up to 30% of the total plant species present in Cappadocia and 25% in eastern and northeastern Anatolia (see Figure 5.21). Davis recognises three important centres of endemism within Turkey – two of which fall along the pipeline route where it crosses the Anatolian Diagonal, namely in the vicinity of the Munzur Mountains and the Munzur Valley near Erzincan; and the Anti-Taurus [Ref 24]. In addition, the Taurus Mountains, between Goksun and Kadirli along the pipeline route, possess many endemic species with highly restricted ranges. The BTC Pipeline crosses all three areas. The montane steppe near Erzincan has the highest known concentrations of endemic species.

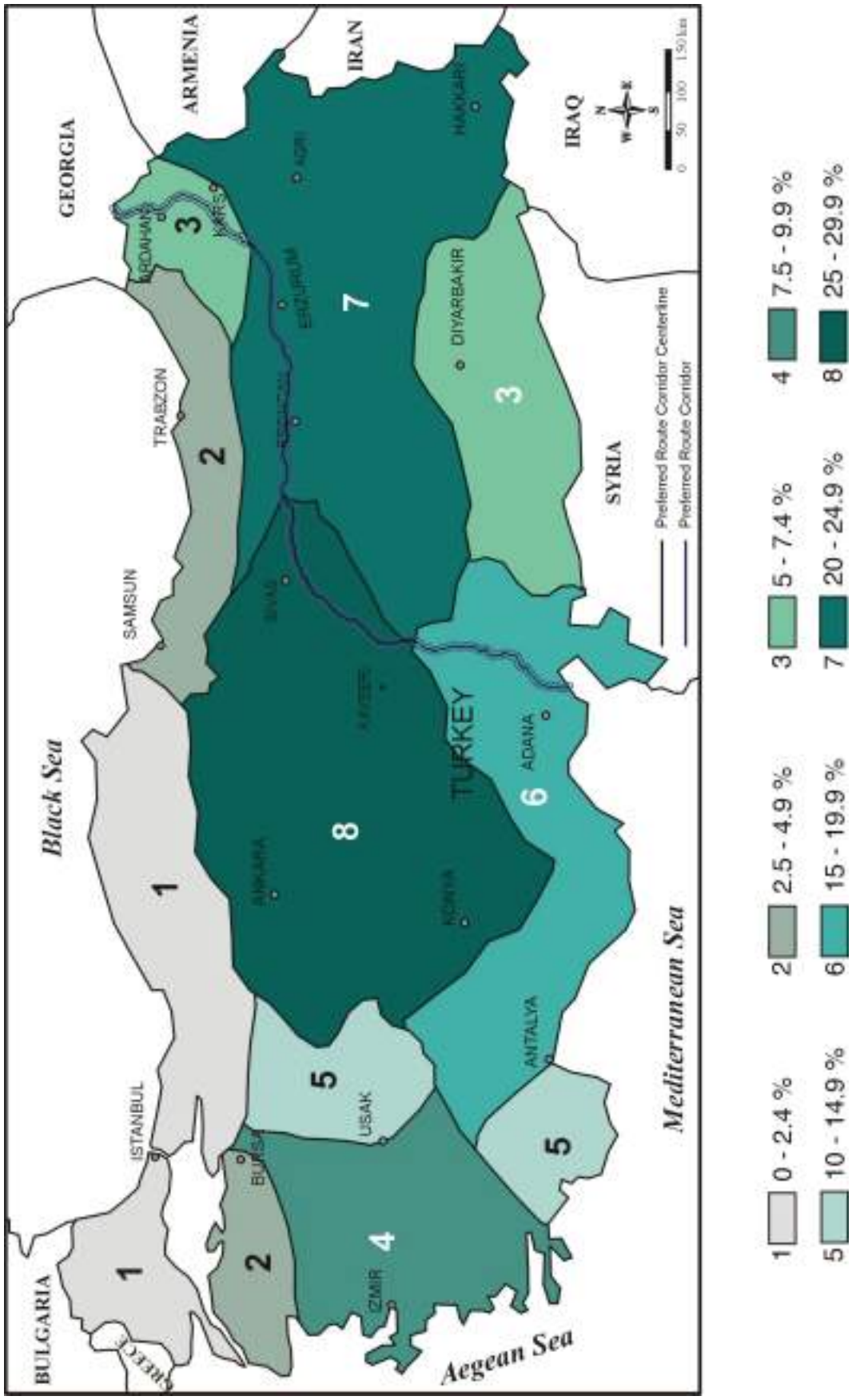


Figure 5.21 Endemism Map of Turkey

5.7.4 Important Species

5.7.4.1 Globally threatened species

The IUCN maintains a list of globally-threatened species of flora and fauna that are categorised according to the degree of threat (see Appendix B1). Field surveys have identified that approximately 10% of Turkey's 1,876 globally-threatened plant species (Walter & Gillett 1998) and 28% of the country's 178 globally-threatened vertebrate animals [Ref 25] may occur within the 500m wide preferred route corridor, (see Table 5.19). On the other hand, it should be noted that these estimates for globally threatened plant species along the BTC Pipeline Route will be much lower for within the directly impacted 28m wide RoW. Conversely, because faunal groups, are mobile, the species determined by surveys within the 500m corridor can also be observed in the RoW. An overview of important flora species within the Pipeline Route corridor is provided in Table 5.20.

Table 5.19 Globally-threatened species present along the 500m preferred route corridor and inshore waters as a proportion of those present in Turkey

	*CR		EN		VU		R		DD		LR		Total	
Plants	N/a		2/47	4%	8/167	5%	173/ 1,608	11 %	4/53	8%	N/a		187/ 1,876	10%
Mammals	0/4	0%	0/1	0%	9/17	53%	N/a		0/0		9/21	43%	18/43	42%
Birds	0/2	0%	1/1	100%	3/8	37%	N/a		2/2	100 %	5/11	45%	8/24	33%
Reptiles	1/4	25%	2/7	28%	½	50%	N/a		0/2	0%	½	50%	5/17	29%
Amphibians	0/0	0/0	0/1	0%	½	50%	N/a		2/5	40%	1/3	33%	4/8	50%
Fish	0/7	0%	0/8	0%	0/7	0%	N/a		7/39	18%	2/5	40%	9/66	14%
Total animals	1/17	6%	2/18	11%	14/36	40%	-		11/ 48	24%	18/ 42	43%	44/158	28%

 # Only, information on the Plants is presented as based on 100m wide route corridor as opposed to 500m.

***CR:** Critically Endangered. A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future

EN: *Endangered.* A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.

VU: *Vulnerable*. A taxon is vulnerable when it is not critically endangered.

LR: *Lower Risk*. A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into two subcategories:
1) Conservation Dependent (cd): taxa which are the focus of a continuing taxon- or targeted habitat-specific conservation programme, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
2) Near Threatened (nt): taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.

DD: *Data Deficient.* A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. Data Deficient is therefore not a category of threat or Lower Risk.

The rarest plant and animal species in global terms occurring along the BTC Pipeline Route corridor including the RoW are listed below.

- *Ophrys reinholdii ssp. leucotaenia* – endangered: an orchid that grows in the pine and oak forests of southern Anatolia and is present along the Pipeline Route near the village of Tokmakli, just north of the Aslantas Barrage Lake.

- *Cyclamen coum* – endangered: a cyclamen that grows in Scot's Pine Forest in North East Anatolia, observed in the pipeline corridor in Posof Forest. Cyclamen coum is also listed in Bern Convention (App. Ib) and CITES. Found in Posof Forest.
- Meadow Viper (*Vipera ursinii*) – endangered: observed on the Pipeline Route near the crossing point of the Kura River.
- White-headed Duck (*Oxyura leucocephala*) – endangered: present, and probably breeds, at Ulas Lakes.

The project Mammal Species Dossier in Appendix B1 provides details on all globally-threatened, nationally-threatened, and internationally protected mammals and implications for the Project.

5.7.4.2 Internationally protected species

Plant species identified along the BTC Pipeline Route that are protected by the 1973 Convention on International Trade in Endangered Species of Flora and Fauna (CITES) agreements, are *Cyclamen persicum* and *Salvia tomentosa*. These plant species are of high commercial importance and the former occurs in high densities along the Pipeline Route. It is strictly prohibited to uproot this species from its natural habitat. For this reason, the translocation of Cyclamen (like other important species) will be assessed within the context of the ecological studies performed during pre-construction. The prescribed preservation of top soil and then its replacement after construction is an effective method for the preservation of Cyclamen. Inspections will be undertaken by both BOTAŞ Environmental Inspectors and independent parties throughout the construction period to ensure that unauthorised removal of Cyclamen does not occur.

A number of mammal species occurring along the route corridor, eg the Eurasian Brown Bear [Ref 28], Eurasian Lynx and Wolf are listed as protected species. The Eurasian Brown Bear is protected by the Bern Convention (1979) (Box 5.4) and European populations of this species are currently listed in Appendix II of CITES (1973).

Box 5.4 The Bern Convention

The Convention on the Conservation of European Wildlife and Natural Habitats - also known as the Bern Convention1

The Convention on the Conservation of European Wildlife and Natural Habitats - also known as the Bern Convention - was adopted on September 1979 in Bern (Switzerland) and came into force on 1 June 1982. It has now 45 Contracting Parties including 39 member States of the Council of Europe, as well as the European Community, Monaco and four African States.

The Convention aims to ensure conservation of wild flora and fauna species and their habitats. Special attention is given to endangered and vulnerable species, including endangered and vulnerable migratory species specified in its appendices.

The Parties agree to undertake all appropriate measures to ensure the conservation of the habitats of the wild flora and fauna species. Such measures should be included in the Parties planning and development policies and pollution control, and particular attention given to the conservation of wild flora and fauna. The Parties agree to promote education and disseminate general information concerning the need to conserve species of wild flora and fauna and their habitats.

The Convention establishes a Standing Committee on which the Parties are represented by their delegates. The Committee's principal task is to monitor the provisions of this Convention in the light of development of the wild flora and the assessment of its needs. For this purpose, the Standing Committee is competent to make recommendations to the Parties and amendments to the appendices where these protected species are specified.

More detailed explanations for CITES and the Bern Conventionare given below.

- **CITES:** Convention on International Trade in Endangered Species of Flora and Fauna is an international agreement between governments. It aims is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

  - Appendix I includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances (eg scientific research).

  - Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival.

- **Bern Convention:** this aims to: 1) conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co-operation of several States; and 2) to promote such co-operation.

  - Appendix I (list of strictly protected flora species): it is strictly prohibited to deliberately pick, cut or uproot plants. The Contracting Party shall, as appropriate, prohibit the possession or sale of these species.

  - Appendix II (list of strictly protected fauna species): each Contracting Party (States that have agreed to be bound by the Convention) shall take appropriate and necessary legislative and administrative measures to ensure the special protection of the wild fauna species. The following actions are prohibited:

- all forms of deliberate capture and deliberate killing;

- the deliberate damage to or destruction of breeding or resting sites;

- the deliberate disturbance of wild fauna, particularly during breeding, rearing and hibernation, insofar as disturbance would be significant in relation to the objectives of this Convention;

- the deliberate destruction or taking of eggs from the wild or keeping these eggs even if empty;

- the possession of and internal trade in these animals, alive or dead, including stuffed animals and any readily recognisable part.

5.7.4.3 Nationally threatened species

Information on the national status of plant species within Turkey has been obtained from Turkish national legislation and the Red Data Book for Turkish Plants [Ref 26]. The rarest plant species in a national context are *Barbarea auriculata var. paludosa* and *Verbascum subserratum* – both Critically Endangered and neither has been observed on the ROW. There are a total of 103 species of nationally threatened plants that occur within the 500m route corridor and of these 79 are also threatened globally. Thus, mitigation measures stated in Section 6 for these species are very crucial. The breakdown of national status of the 103 plant species is – Critically Endangered 2; Endangered 32; Vulnerable 58; Data Deficient 11.

There is no Red Data Book for animals in Turkey and, therefore, little information exists to identify nationally threatened species. Further reference has, therefore been made to species listed in the Bonn (see Box 5.5) and Bern Conventions (see Box 5.4). In addition, for non-bird faunal species, reference has been made to the list of species published by the Turkish Central Hunting Commission for which hunting is prohibited. Whilst the list does not provide information on the status and distribution of species, it is informed by depositions from Turkish ecologists and conservation professionals and may be taken as a broad indication of the vulnerability of a species. The list has been supplemented by the views and insights of Turkey based ecologists.

Box 5.5 The Bonn Convention

Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention)

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention) aims to conserve terrestrial, marine and avian migratory species throughout their range. It is one of a small number of intergovernmental treaties concerned with the conservation of wildlife and wildlife habitats on a *global* scale. Since the Convention's entry into force on 1 November 1983, its membership has grown steadily to include 79 (as of 1 February 2002) Parties from Africa, Central and South America, Asia, Europe and Oceania.

- CMS Bulletins
- The Convention text
- Appendix I and Appendix II (listing the species covered by CMS)
- List of Parties to the Convention
- Tables showing the global coverage of CMS
- List of documents available from the UNEP/CMS Secretariat
- CMS Guide

Parties to CMS work together to conserve migratory species and their habitats by providing strict protection for the endangered migratory species listed in Appendix I of the Convention; by concluding multilateral Agreements for the conservation and management of migratory species listed in Appendix II; and by undertaking co-operative research activities.

CMS has a unique role to play in focusing attention on and addressing the conservation needs of the 85 endangered species presently listed in Appendix I - including, among others, the Siberian crane, White-tailed eagle, Hawksbill turtle, Mediterranean monk seal and Dama gazelle.

Appendix II lists migratory species that require or would benefit significantly from international co-operative Agreements under CMS. These may range from legally-binding treaties to less formal memoranda of understanding. The more formal Agreements should provide for co-ordinated species conservation and management plans; conservation and restoration of habitat; control of factors impeding migration; co-operative research and monitoring; and public education and exchange of information among Parties.

Several Agreements have been concluded to date under the auspices of CMS. They aim to conserve:

- Bats in Europe
- Cetaceans of the Mediterranean and Black Seas
- Small cetaceans of the Baltic and North Seas
- Seals in the Wadden Sea
- African-Eurasian migratory waterbirds
- the Siberian Crane
- the Slender-billed Curlew
- Marine turtles

A Secretariat under the auspices of the United Nations Environment Programme (UNEP) provides administrative support to the Convention. The decision-making organ of the Convention is the Conference of the Parties (COP), which will be holding its Seventh Meeting in Bonn in September 2002. A Standing Committee provides policy and administrative guidance between the regular meetings of the COP. A Scientific Council consisting of experts appointed by individual member States and by the COP, gives advice on technical and scientific matters.

Nationally-threatened birds have been defined in this EIA as species with breeding populations in Turkey estimated to be 500 pairs or less [Ref 27]. There are 15 bird species present along the route corridor whose maximum breeding population in Turkey is 500 pairs or below and another 31 species present within the route corridor whose minimum breeding population in Turkey is 500 pairs or below and which, therefore, may be nationally rare. This excludes those species listed above as globally-threatened species.

Table 5.20 Overview of Important Flora Species Within The Pipeline Route Corridor

Region	Species	Habitat	IUCN 1997	RDB OF TURKEY
North Eastern Anatolia Region	*Acer divergens* var. *divergens*	Scree slopes in gorges, 400-1100 m	-	VU
	Alchemilla procerrima	By streams, c. 2000 m	R	LR (lc)
	Allium sosnowskyanum	Clearings in *Picea orientalis* forest, and *Q. petrae* ssp *iberica* scrub, on rocks, 1270-1650 m	V	LR (lc)
	Bupleurum brachiatum	Dry slopes, screes, 1000-2000 m	-	VU
	Cyclamen coum	Forest and scrub, rocky hillsides, sl-2135 m	-	-
	Draba bruniifolia ssp. *armeniaca*	Rocky slopes, 2400-2700 m	R	LR (lc)
	Cousinia woronowii	Steppe, rocky igneous slopes, grave hills, 1100-2000 m	R	LR (nt)
	Gypsophila simulatrix	Limestone rock and slopes, 500-2000 m	R	LR (lc)
	Lathyrus karsianus	Bands, rocky places and meadows at the edge of *Pinus sylvestris* forest, 2000-2300 m	R	VU
	Onobrychis stenostachya ssp. *Sosnowskyi*	Dry loamy and shaley hillsides, fallow fields, 1600-2500 m	R	VU
	Onosma nigricaule	Pastures, igneous slopes, c 1900 m	R	VU
	Rumex gracilescens	Meadows, 1900-2500 m	R	LR (nt)
	Saponaria picta	Rocky slopes, 1300-1700 m	R	LR (lc)
	Scrophularia versicolor	Weedy waste place, c. 2050 m	R	VU
	Senecio integrifolius ssp. *Karsianus*	Water meadows, stream sides, 1900-2200 m	-	VU
Erzurum Plateau	*Acantholimon kotschyi* ssp.*laxispicatum*	Rocky slopes, sandy banks, calcareous soil, 100-1700 m	-	VU
	Acantholimon spirizianum var. *multiflorum*	Rocky limestone slopes, serpentine slopes, mountain steppe, 1180-2700 m	R	LR (cd)
	Achillea sintenisii	Steppe, calcareous slopes, gypsum hills, 1250-1550 m	R	LR (cd)
	Alyssum anatolicum	Calcareous steppe, 1500-2000 m	-	VU
	Astragalus trachytricus	Mountainous districts, c. 2100 m	R	VU
	Ballota rotundifolia	Igneous slopes, and screes calcareous slopes, 1100-1900 m	R	LR (nt)
	Campanula ledebouriana	Basalt and limestone rocks, 1700-2550 m	R	LR (nt)
	Carduus acanthoides ssp. *Sintenisii*	Fields, igneous banks, 1000-2100 m	R	LR (lc)
	Centaurea hedgei	Clay hills, sandy ground, 500-1500 m	R	VU
	Centaurea schischkinii	Stony slopes, 1600-1750 m	R	LR (cd)
	Consolida cornuta	In grain and fallow fields, 1800-1900 m	R	EN
	Cousinia sintenisii	Steppe, volcanic slopes, fallow fields, 900-1000 m	R	VU
	Elymus sosnowskyi	Dry mountain slopes and rocks, c. 1800 m	R	EN
	Ferula huber-morathii	Stony slopes, 1700-1800 m	V	EN
	Fritillaria alburyana	By late snow patches on screes and rocky places, 2000-2900 m	R	LR (cd)
	Glaucium cappadocicum	Hills, c. 1500 m	R	VU
	Gypsophila tuberculosa	Steppes and dry river banks, 1300-1900 m	R	LR (cd)
	Helichrysum arenarium ssp. *Erzincanicum*	Dry calcareous, sandy soils, steps, banks, 1520-1670 m	-	VU
	Hesperis berviscapa	Rocky places and screes, 1700-2800 m	R	EN
	Hesperis schischkinii	Igneous slopes and fields, 1600-2000 m	R	LR (nt)

Region	Species	Habitat	IUCN 1997	RDB OF TURKEY
	Iris taochia	Open, dryish, non-calcareous rocky slopes, 1600-2000 m	R	VU
	Isatis candolleana	Barren, often eroded slopes of limestone, shale and igneous rock, 900-1900 m	R	LR (lc)
	Isatis erzurumica	Stony slopes and gravely, places, 1250-1700 m	R	LR (nt)
	Lathyrus layardii	Wet meadows and salix scrub, 1575-1800 m	R	VU
	Onobrychis araxina	Meadows, 1600-1900 m	R	VU
	Onobrychis huetiana	Steppe, 1100-1450 m	R	LR (nt)
	Onobrychis stenostachya ssp. *Sosnowskyi*	Dry loamy and shaley hillsides, fallow fields, 1600-2500 m	R	VU
	Onosma arcuatum	Rocky igneous slopes, c. 2000 m	R	EN
	Pimpinella anisetum	Fields, rocky places, woods, 900-3200 m	R	LR (nt)
	Pulicaria armena	Along ditches and in marshlands, 1650-1730 m	R	LR (lc)
	Reseda armena	Bore stony hillsides, 1000-1400 m	R	-
	Scrophularia versicolor	Weedy waste place, c. 2050 m	R	VU
	Stachys subnuda	Limestone crevices and gorges, 1200-3200 m	R	VU
	Tanacetum albipannosum	Rock crevices and rocky slopes, 1550-1700 m	R	LR (cd)
	Tchihatchewia isatidea	Eroded banks and screes, 1000-2000 m	-	VU
	Thesium stellerioides	Sandy hills, c. 1400 m	R	VU
	Thlaspi cilicicum	Mountain slope and woodland, 600-2130 m	R	LR (cd)
	Thymus canoviridis	Cuhion steppe and open ground on limestone, 1900-2250 m	R	EN
	Thymus pectinatus var. *pectinatus*	Open steppe on gypsaceous or calcareous slope, 1100-2160 m	R	LR (nt)
	Verbascum heterodontum	Rocky slopes, *Quercus* scrub, 850-2000 m	R	VU
Erzincan Region	*Acer divergens* var. *trilobum*	Rocky granite slopes, c.1200 m	-	VU
	Alchemilla ciminensis	By streams, c. 2400 m	R	EN
	Alchemilla erzincanensis	By streams, 2450 m	R	EN
	Alyssum lepidoto-stellatum	Calcareous steppe and hills, 1300-1500 m	R	LR (lc)
	Astragalus crinitus	Steppe, 1200-1400 m	R	LR (nt)
	Astragalus elbistanicus	Chalk steppe, 1200-1500 m	R	LR (nt)
	Bupleurum eginense	Pine forest, rocks, scree, 800-1700 m	R	LR (nt)
	Campanula hedgei	Limestone cliffs, igneous rock crevices, 2100-2900 m	R	LR (cd)
	Cousinia sintenisii	Steppe, volcanic slopes, fallow fields, 900-1000 m	R	VU
	Galium hypoxylon	Crevices and metamorphic rocks, slopes, scree, 1900-2700 m	R	VU
	Haplophyllum cappadocicum	Grassy and stony steppe, 700-1500 m	R	LR (nt)
	Hypericum scabroides	Igneous hillsides, 1200-1650 m	R	VU
	Isatis cappadocica ssp. *alyssifolia*	Rocky places and cliffs, 800-2600 m	R	LR (nt)
	Jurinea brevicaulis	Stony igneous hillsides, steppe, bare slopes, 1400-1900 m	R	LR (nt)
	Onosma liparioides	Igneous scree, 2700-2900 m	R	VU
	Thesium aureum	On gravel, 1500-1830 m	R	LR (cd)
	Trigonosciadium intermedium	Fields	R	EN
	Arenaria pseudacantholimon	Stony slopes and screes, 1500-2900 m	R	LR (lc)
	Barbarea auriculata var. *paludosa*	Wet pastures, c. 1650 m	R	CR
	Bupleurum brachiatum	Dry slopes, screes, 1000-2000 m	-	VU
	Campanula ptarmicifolia var. *ptarmicifolia*	Rocky limestone slopes, rocks, steep igneous screes, 1760-2900 m	-	VU
	Consolida olopetala	Dry open slopes, 1200-1500 m	R	VU

Region	Species	Habitat	IUCN 1997	RDB OF TURKEY
	Gypsophila aucheri	Dry stony slopes, 1200-1600 m	R	VU
	Dianthus zederbaueri	Slopes, 1500-2300 m	R	LR (cd)
	Festuca anatolica ssp. *borealis*	Limestone cliffs and screes, rocky meadows, 1600 -3000 m	R	LR (cd)
	Minuartia anatolica var. *scleranthoides*	Dry hillsides, c 1500 m	R	LR (cd)
	Onosma sintenisii	Stony hillsides, gypsum slopes, steppe, 1370-1500 m	R	VU
	Paracaryum corymbiforme	Open slopes, *Quercus*, *Juniperus* scrub, 1500-1800 m	R	VU
	Paracaryum lithospermifolium var. *erectum*	Limestone and banic igneous slope, and screes, 7890 – 3050 m	R	LR (cd)
	Veronica montbretii	Igneous scree, 2700-2900 m	R	VU
Cappadocia Region	*Alyssum lepidoto-stellatum*	Calcareous steppe and hills, 1300-1500 m	R	LR (lc)
	Astragalus crinitus	Steppe, 1200-1400 m	R	LR (nt)
	Aethionema lepidioides	Stony slopes, 1050-1550 m	R	EN
	Alyssum caespitosum	Rocky slopes, 2200-2900 m	R	LR (nt)
	Cousinia sivasica	Serpentine hills, limestone slopes, steppe, 950-1700 m	R	VU
	Dianthus zederbaueri	Slopes, 1500-2300 m	R	LR (cd)
	Isatis aucheri	Rocky slopes, 960-2200 m	R	LR (lc)
	Isatis sivasica (I. glauca ssp. *sivasica)*	Fields, gypsum banks, rocky places, 1200-1400 m	R	VU
	Lepidium caespitosum	Salt marsh and steppe, 900-1300 m	V	VU
	Minuartia anatolica var. *lanuginosa*	Rocks, 1200-1700 m	R	LR (nt)
	Minuartia anatolica var. *scleranthoides*	Dry hillsides, c 1500 m	R	LR (cd)
	Onobrychis stenostachya ssp. *Krausei*	Limestone rocky slopes, c. 1300 m	R	EN
	Tchihatchewia isatidea	Eroded banks and screes, 1000-2000 m	-	VU
	Achillea goniocephala	Steppe, marly slopes, subalpine rocks, 1300-1900 m	R	LR (lc)
	Alyssum lepidoto-stellatum	Calcareous steppe and hills, 1300-1500 m	R	LR (lc)
	Astragalus crinitus	Steppe, 1200-1400 m	R	LR (nt)
	Astragalus cymbibracteatus	Steppe, 1380-1820 m	R	LR (cd)
	Astragalus karputanus	Mountain slopes, c. 1500 m	-	VU
	Astragalus listoniae	Under Quercus and Pinus, c. 1700 m	R	VU
	Astragalus Ulashensis	Mountainous districts, c. 1500 m	-	EN
	Bornmuellera cappadocica	Slopes and pastures, up to 2000 m	R	LR (lc)
	Campanula strigillosa	On limestone and serpentine rocks, 1350-1800 m	R	LR (cd)
	Centaurea sivasica	Steppe, fields, 1250-1500 m	R	LR (cd)
	Cerastium saccardoanum	Slopes, vineyards, cultivated fields, 1000-1600 m	R	LR (cd)
	Crocus kotschyanus ssp. *Cappadocicus*	Short grass, open stony places, sparse scrub, 1100-3100 m	R	LR (nt)
	Dianthus zederbaueri	Slopes, 1500-2300 m	R	LR (cd)
	Minuartia rimarum var. *multiflora*	Rock crevices, 1750-2750 m	R	VU
	Muscari microstomum	River marshes, wet meadows on sticky clay, 1200-1500 m	R	VU
	Onobrychis argyrea ssp. *argyrea*	Steppe and dry slopes, 700-1500 m	R	LR (lc)
	Physoptychis haussknechtii	Steppe, 1500-1600 m	R	EN

Region	Species	Habitat	IUCN 1997	RDB OF TURKEY
	Salvia vermifolia	Igneous and serpentine slopes, c. 1450 m	R	VU
	Salsola stenoptera	Salty places, 900-1300 m	R	LR (lc)
Antitaurus Region	*Achillea magnifica*	Steppe, stony slopes, 900-1250 m	R	LR (nt)
	Allium glumaceum	Rocks, 1800-2000 m	R	LR (cd)
	Allium tauricola	Upper mountain and alpine wind-swept habitats, limestone cliffs and ledges, often growing through spiny astragatus, alpine pastures scree, 1800-2900 m	R	LR (lc)
	Arabis aubrietioides	Rock edges, 900-2400 m	R	LR (lc)
	Astragalus cymbibracteatus	Steppe, 1380-1820 m	R	LR (cd)
	Astragalus elbistanicus	Chalk steppe, 1200-1500 m	R	LR (nt)
	Astragalus sparsipilis	Upland woods,1800-1900 m	R	LR (cd)
	Asyneuma linifolium ssp. *eximium*	Calcareous rock, 1500-2600 m	R	-
	Centaurea derderiifolia	Steppe hills, 1000-1900 m	R	LR (cd)
	Centaurea holtzii	Sandy slopes, open places, c 1400 m	R	VU
	Cerastium saccardoanum	Slopes, vineyards, cultivated fields, 1000-1600 m	R	LR (cd)
	Crocus kotschyanus ssp. *Cappadocicus*	Short grass, open stony places, sparse scrub, 1100-3100 m	R	LR (nt)
	Dactylorhiza osmanica var. *anatolica**	Marshy meadows, by streams and springs, 1000-1900 m	R	LR (nt)
	Doronicum haussknechtii	Stream sides, 1800-2100 m	R	LR (cd)
	Ferula longipedunculata	Rocky slopes, 1900 m	V	EN
	Fritillaria aurea	Forest, rock edges, snow patch hollows, usually on limestone, 1800-3000 m	R	LR (lc)
	Galium cornigerum	Limestone cliffs and rocks, 1500-2900 m	R	LR (nt)
	Hedysarum candidissimum	Calcareous steppe and fallow fields, 800-1500 m	R	LR (nt)
	Minuartia dianthifolia ssp. *Cataonica*	Rocks, 1550-2750 m	R	LR (nt)
	Minuartia rimarum var. *multiflora*	Rock crevices, 1750-2750 m	R	VU
	Muscari microstomum	River marshes, wet meadows on sticky clay, 1200-1500 m	R	VU
	Onobrychis sulphurea var. *sulphurea*	Dry slopes, 1400-1600 m	-	VU
	Paracaryum reuteri	Rocky limestone slopes, 1830-3050 m	R	LR (nt)
	Phlomis brunneogaleata	Fallow fields, c. 1300 m	V	EN
	Phryna ortegioides	Stony slopes, 1000-2100 m	R	LR (nt)
	Salvia eriophora	Limestone slopes, 1525-1880 m	R	VU
	Silene caryophylloides ssp. *Stentorian*	Rocky places, 1600-2100 m	R	LR (lc)
	Thlaspi densiflorum	Slopes and screes, 1000-1600 m	R	LR (cd)
	Verbascum melilltenense	Pastures, steppe, wheat fields, 800-1680 m	R	LR (nt)
	Verbascum leianthoides	Mountain slopes, 1525-1900 m	R	VU
Taurus Mountains	*Alkanna cappadocia*	Dry slopes, steppe, 1100-1700 m	R	LR (lc)
	Allium tauricola	Upper mountain and alpine wind-swept habitats, limestone cliffs and ledges, often growing through spiny astragatus, alpine pastures scree, 1800-2900 m	R	LR (lc)
	Allium tchihatschewii	Hard rocky slopes, 1000-2000 m	R	LR (lc)
	Bupleurum zoharii	Maquis, fields, roadsides, s.l.-1200 m	R	VU
	Centaurea antitauri	Rocky mountain slopes, 1700-2100 m	R	VU
	*Cephalanthera kotschyana**	Mountain deciduous forest, *Quercus* scrub, 850-1740 m	R	LR (lc)

Region	Species	Habitat	IUCN 1997	RDB OF TURKEY
	Chionodoxa forbesii	Open mountainsides, *Pinus* and *cedra* forest, 1000 - 2500 m	R	LR (cd)
	Corydalis solida ssp. *Tauricola*	Forests, slopes, hedges, 500-1800 m	R	LR (lc)
	Cyclamen pseudo-ibericum *	Forest and scrub on limestone metamorphic or igneous rocks, 550-1500 m	-	EN
	Erodium micropetalutum	Rocky limestone slopes and by rivulets, 1700-2400 m	R	LR (nt)
	Galium antitaurica	Rocks, 2000-2800 m	R	LR (cd)
	Gentiana boissieri	Grass on limestone bedrock, 1700-2700 m	R	VU
	Grammosciadium confertum	Wheatfields, c. 1900 m	R	VU
	Helianthemum antitauricum	Rocky limestone slopes and in *Pinus nigra* forest, 1800-2100 m	R	LR (cd)
	Johrenia silenoides	Hill tops, forests, etc, 800-1600 m	R	LR (nt)
	Kundmannia syriaca	Limestone cliffs, 600-1800 m	R	LR (cd)
	Lamium garganicum ssp. *Nepetifolium*	Shady limestone rocks, crevices, 760-1800 m	R	LR (lc)
	Micromeria cremnophila ssp. *Amana*	Crevices of sloping limestone rocks, 600-2000 m	R	LR (lc)
	Ophrys reinholdii ssp. *leucotaenia**	*Quercus* and *Pinus* forest, calcareous soil	E	VU
	Trifolium rousseanum	Rocky ground, c. 150 m	R	VU
	Sideritis cilicica	Open *P. brutia* forest, limestone slopes, maquis, 600-950 m	R	EN
	Silene inclinata	Slopes, 400-1000 m	R	LR (cd)
	Tanacetum haradjanii	Limestone rocks, 1150-2000 m	R	LR (cd)
	Thlaspi cilicicum	Mountain slope and woodland, 600-2130 m	R	LR (cd)
	Verbascum luridifolium	Limestone slopes, 900-1950 m	R	LR (cd)
	Verbascum hadschinense	Limestone rocks, dry slopes, c. 1150 m	R	EN
Cukurova Plain	*Centaurea calcitrapa* ssp. *cilicica*	Fields, roadsides, c 400 m	R	LR (cd)
	Centaurea lycopifolia	Maquis, scrubs, rocks, 50-1800 m	R	LR (nt)
	Anthemis pungens	Corn fields, 400-1650 m	R	LR (nt)
	Ophyrs transhyrcana ssp. *Amanensis*	Grassy slopes, phrygona maquis, *Pinus* forest, sl-850 m	R	LR (cd)

 # Only, information on the Plants is presented as based on 100m wide route corridor.

***CR:** Critically Endangered. A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future

EN: *Endangered.* A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.

VU: *Vulnerable*. A taxon is vulnerable when it is not critically endangered.

R:

LR: *Lower Risk.* A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into two subcategories: Conservation Dependent (cd): Taxa which are the focus of a continuing taxon- or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
Near Threatened (nt): Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.

DD: *Data Deficient.* A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. Data Deficient is therefore not a category of threat or Lower Risk.

Table 5.21 Overview of Important Fauna Species Within The Pipeline Route Corridor

Region	Species	Common Name	IUCN	Turkey status	BERN	CITES
North Eastern Anatolia	**Mammals**					
	Canis lupus	Grey Wolf	-	-	App. II	App. I and II
	Capra aegagrus	Wild Goat	VU	√	App. II	-
	Capreolus capreolus	Roe Deer	-	√	App. III	-
	Lynx lynx	Eurasian Lynx	-	-	App. III	App. II
	Martes foina	Beech Marten	-	-	App. III	-
	Martes martes	European Pine Marten	-	-	App. III	-
	Meles meles	Eurasian Badger	-	√	App. III	-
	Mustella erminea	Stoat	-	√	App. III	-
	Mustella nivalis	Weasel	-	√	App. II	-
	Myotis bechsteini	Bechstein's Bat	VU	-	App. II	-
	Myotis myotis	Greater Mouse Eared Bat	LR/nt	√	App. II	-
	Pipistrellus pipistrellus	Common Pipistrelle	-	√	App. III	-
	Rhinolophus euryale	Mediterranean Horseshoe Bat	VU	√	App. II	-
	Sciurus anomalus	Caucasian Squirrel	LR/nt	√	App. II	-
	Ursus arctos	Brown bear	-	√	App. II	Apps. I and II
	Birds*					
	Accipiter gentilis	Northern Goshawk	-	Nt	App. II	-
	Accipiter nisus	Sparrowhawk	-	-	App. II	-
	Acrocephalus schoenobaenus	Sedge Warbler	-	-	App. II	-
	Actitis hypoleucos	Common Sandpiper	-	-	App. II	-
	Aegypius monachus	Cinerous Vulture	LR/nt	Nt	App. II	-
	Anas crecca	Teal	-	Nt	App. III	-
	Aquila heliaca	Imperial Eagle	VU	Nt	App. II	-
	Charadrius dubius	Little Ringed Plover	-	-	App. II	-
	Cinclus cinclus	Dipper	-	Nt	App. II	-
	Circus aeruginosus	Marsh Harrier	-	Nt	App. II	-
	Falco cherrug	Saker Falcon	-	Nt	App. II	-
	Gypaetus barbatus	Lammergier	-	Nt	App. II	-
	Gyps fulvus	Griffon Vulture	-	Nt	App. II	-
	Hieraaetus pennatus	Booted Eagle	-	Nt	App. II	-
	Melanitta fusca	Velvet Scoter	-	Nt	App. III	-
	Motacilla cinerea	Grey Wagtail	-	-	App. II	-
	Phoenicurus ochruros	Black Redstart	-	-	App. II	-
	Phylloscobus collybita lorenzii	Mountain Chiffchaff	-	-	App. II	-
	Phylloscopus (throchiloides)nitidus	Green Warbler	-	-	App. II	-
	Saxicola rubetra	Whinchat	-	-	App. II	-
	Tetrao mlokosiewiczi	Caucasian Black Grouse	DD	-	App. II	-
	Tringa ochropus	Green Sandpiper	-	-	App. II	-

Region	Species	Common Name	IUCN	Turkey status	BERN	CITES
	Reptiles					
	Vipera ursinii	Meadow Viper	EN	-	App. II	App. I
	Amphibians					
	Hyla arborea	European Tree Frog	LR/nt	-	App. II	-
	Mertensiella caucasiaca	Caucasian Salamander	VU	-	App. III	-
	Pelodytes caucasicus	Caucasian Parsley Frog	DD	-	App. III	-
	Triturus karelinii	Southern Crested Newt	DD	-	App II	-
	Fishes					
	Barbus plebejus	Italian Barbel	LR/nt	-	-	-
	Cyprinus carpio	Common Carp	DD	-	-	-
	Salmo trutta labrax	Black Sea Salmon	-	-	-	-
Erzurum Region	**Mammals**					
	Canis lupus	Grey Wolf	-	-	App. II	App. I and II
	Cricetulus migratorius	Grey Hamster	LR/nt	-	-	-
	Miniopterus scheibersi	Schreiber's Long Fingered Bat	LR/nt	-	App. II	-
	Mustella erminea	Stoat	-	-	App. III	-
	Vormela peregusna	European Marbled Polecat	VU	√	App. II	-
	Birds*					
	Acrocephalus schoenobaenus	Sedge Warbler	-	-	App. II	-
	Anas acuta	Pintail	-	Nt	App. III	-
	Anas clypeata	Shoveler	-	Nt	App. III	-
	Anas crecca	Teal	-	Nt	App. III	-
	Aquila nipalensis	Steppe Eagle	-	Nt	App. II	-
	Asio otus	Long-eared Owl	-	Nt	App. II	-
	Carpospiza brachydactyla	Pale Rock Sparrow	-	Nt	App. III	-
	Chlidonias leucopterus	White-winged Black Tern	-	Nt	App. II	-
	Circus aeruginosus	Marsh Harrier	-	Nt	App. II	-
	Grus grus	Common Crane	-	Nt	App. II	-
	Haematopus ostralegus	Oystercatcher	-	Nt	App. III	-
	Hieraaetus pennatus	Booted Eagle	-	Nt	App. II	-
	Himantopus himantopus	Black- winged Stilt	-	-	App. II	-
	Larus genei	Slender-billed Gull	-	-	App. II	-
	Luscinia svecica	Bluethroat	-	Nt	App. II	-
	Milvus migrans	Black Kite	-	Nt	App. II	-
	Motacilla citreola	Citrine Wagtail	-	Nt	App. II	-
	Motacilla flava	Yellow Wagtail	-	-	App. II	-
	Nycticorax nycticorax	Night heron	-	-	App. II	-
	Phalaropus lobatus	Red-necked Phalarhope	-	-	App. III	-
	Podiceps grisegena	Red-necked Grebe	-	Nt	App. II	-
	Saxicola rubetra	Whinchat	-	Nt	App. II	-
	Sylvia nisoria	Barred Warbler	-	Nt	App. II	-
	Tringa glareola	Wood Sandpiper	-	-	App. II	-
	Tringa ochropus	Green Sandpiper	-	-	App. II	-
	Tringa totanus	Redshank	-	-	App. III	-

Region	Species	Common Name	IUCN	Turkey status	BERN	CITES
	Vanellus vanellus	Lapwing	-	-	App. III	-
	Reptiles					
	Emys orbicularis	European Pond Turtle	LR/nt	-	App. II	-
	Amphibians					
	Hyla arborea	European Tree Frog	LR/nt	-	App. II	-
	Fishes					
	Barbus capila	Bulatmai Barbel	-	-	-	-
	Barbus plebejus	Italian Barbel	-	-	-	-
	Chondrostoma regium	Nose Carp	-	-	-	-
	Cyprinus carpio	Common Carp	DD	-	-	-
	Leiciscus cephalus	Chub		-	-	-
	Salmo trutta labrax	Black Sea Salmon	-	-	-	-
Erzincan Region	**Mammals**					
	Canis lupus	Grey Wolf	-	-	App. II	App. I and II
	Capra aegagrus	Wild Goat	VU	√	App. II	-
	Capreolus capreolus	Roe Deer	-	√	App. III	-
	Cricetulus migratorius	Grey Hamster	LR/nt	-	-	-
	Dryomys nitedula	Forest Dormouse	LR/nt	-	App. III	-
	Lutra lutra	Eurasian Otter	VU	√	App. II	-
	Martes foina	Beech Marten	-	-	App. III	-
	Martes martes	European Pine Marten	-	-	App. III	-
	Meles meles	Eurasian Badger	-	√	App. III	-
	Mustella erminea	Stoat	-	√	App. III	-
	Mustella nivalis	Wild Weasel	-	√	App. II	-
	Rupicapra rupicapra asiatica	Turkish Chamois	DD	√	App. III	-
	Ursus arctos	Brown Bear	-	√	App. II	App. I and II
	Birds*					
	Burhinus oedicnemus	Stone-Curlew	-	-	App. II	-
	Chlidonias leucopterus	White-winged Black Tern	-	Nt	App. II	-
	Cinclus cinclus	Dipper	-	Nt	App. II	-
	Egretta alba	Great Egret	-	Nt	App. II	-
	Haematopus ostralegus	Oystercatcher	-	Nt	App. III	-
	Hieraaetus pennatus	Booted Eagle	-	Nt	App. II	-
	Luscinia svecica	Bluethroat	-	Nt	App. II	-
	Milvus migrans	Black Kite	-	Nt	App. II	-
	Pernis apivorus	Honey Buzzard	-	Nt	App. II	-
	Saxicola rubetra	Whinchat	-	Nt	App. II	-
	Reptiles					
	Emys orbicularis	European Pond Turtle	LR/nt	-	App. II	-
	Mabuya vittata	Banded Skink	-	-	App. III	-
	Amphibians					
	Hyla arborea	European Tree Frog	LR/nt	-	App. II	-
	Fishes					
	Chondostroma regium	Nose Carp	-	-	-	-
	Leuciscus cephalus	Chub	-	-	-	-

Region	Species	Common Name	IUCN	Turkey status	BERN	CITES
Cappodacia Region	**Mammals**					
	Canis lupus	Grey Wolf	-	-	App. II	App. I and II
	Dryomys nitedula	Forest Dormouse	LR/nt	-	App. III	-
	Lutra lutra	Eurasian Otter	VU	√	App. II	-
	Meles meles	Eurasian Badger	-	√	App. III	-
	Mustella erminea	Stoat	-	√	App. III	-
	Birds*					
	Acrocephalus arundinaceus	Great Reed Warbler	-	-	App. II	-
	Anas clypeata	Shoveler	-	Nt	App. III	-
	Anas crecca	Teal	-	Nt	App. III	-
	Anas platyrhynchos	Mallard	-	-	App. III	-
	Anas querquedula	Garganey	-	Nt	App. III	-
	Anser anser	Greylag Goose	-	Nt	App. III	-
	Ardea cinerea	Grey Heron	-	-	App. III	-
	Ardea purpurea	Purple Heron	-	-	App. II	-
	Aythya ferina	Pochard	-	Nt	App. III	-
	Aythya nyroca	Ferruginous Duck	LR/nt	Nt	App. III	-
	Chlidonias hybridus	Whiskered Tern	-	-	App. II	-
	Chlidonias niger	Black Tern	-	Nt	App. II	-
	Ciconia ciconia	White Stork	-	-	App. II	-
	Ciconia nigra	Black Stork	-	Nt	App. II	App. II
	Circus aeruginosus	Marsh Harrier	-	Nt	App. II	-
	Circus pygargus	Montagu's Harrier	-	Nt	App. II	-
	Egretta alba	Great Egret	-	Nt	App. II	-
	Egretta garzetta	Little Egret	-	-	App. II	-
	Gallinago media	Great Snipe	LR/nt	-	App. II	-
	Grus grus	Common Crane	-	Nt	App. II	-
	Himantopus himantopus	Black-winged Stilt	-	-	App. II	-
	Hippolais icterina	Icterine Warbler	-	Nt	App. II	-
	Jynx torquilla	Wryneck	-	Nt	App. II	-
	Locustella lusciniodies	Savi's Warbler	-	-	App. II	-
	Motacilla citreola	Citrine Wagtail	-	Nt	App. II	-
	Motacilla flava	Yellow Wagtail	-	-	App. II	-
	Oxyura leucocephala	White-headed Duck	EN	Nt	App. II	App. II
	Philomachus pugnax	Ruff	-	-	App. III	-
	Podiceps grisegena	Red-necked Grebe	-	Nt	App. II	-
	Pyrrhocorax pyrrhocorax	Chough	-	-	App. II	-
	Saxicola rubetra	Whinchat	-	Nt	App. II	-
	Sylvia nisoria	Barred Warbler	-	Nt	App. II	-
	Tadorna ferruginea	Ruddy Shelduck	-	-	App. II	-
	Tadorna tadorna	Common Shelduck	-	Nt	App. II	-
	Tringa glareola	Wood Sandpiper	-	-	App. II	-
	Tringa totanus	Redshank	-	-	App. III	-
	Vanellus vanellus	Lapwing	-	-	App. III	-
	Reptiles					
	Emys orbicularis	European Pond Turtle	LR/nt	-	App. II	-

Region	Species	Common Name	IUCN	Turkey status	BERN	CITES
	Fishes					
	Anguilla anguilla	European Eel	-	-	-	-
	Capoeta capoeta angorae	Transcaucasian barp	-	-	-	-
	Chondostroma regium	Nose carp	-	-	-	-
	Leuciscus cephalus	Chub	-	-	-	-
	Salmo trutta macrostigma	Brown Trout	-	-	-	-
Antitaurus Region	**Mammals**					
	Canis lupus	Grey Wolf	-	-	App. II	App. I and II
	Birds*					
	Ciconia nigra	Black Stork	-	Nt	App. II	App. II
	Cinclus cinclus	Dipper	-	Nt	App. II	-
	Falco naumanni	Lesser Kestrel	VU	-	App. II	-
	Saxicola rubetra	Whinchat	-	Nt	App. II	-
	Sylvia nisoria	Barred Warbler	-	Nt	App. II	-
	Reptiles					
	Coluber austriaca	Smooth Snake	-	-	App. III	-
	Mabuya vittata	Banded Skink	-	-	App. III	-
Taurus region	**Mammals**					
	Canis aureus	Golden Jackal	-	-	-	-
	Canis lupus	Grey Wolf	-	-	App. II	App. I and II
	Dryomys nitedula	Forest Dormouse	LR/nt	-	App. III	-
	Hyaena hyaena	Striped Hyaena	LR/nt	-	-	-
	Hystrix indica	Indian Crested Porcupine	-	√	-	-
	Meles meles	Eurasian Badger	-	√	App. III	-
	Miniopterus scheibersi	Schreiber's Long-fingered Bat	LR/nt	√	App. II	-
	Rhinolophus blasii	Blasiu's Horseshoe Bat	LR/nt	√	-	-
	Rhinolophus euryale	Mediterranean Horseshoe Bat	VU	√	App II	-
	Rhinolophus mehelyi	Mehely's Horseshoe Bat	VU	√	App. II	-
	Sciurus anomalus	Caucasian Squirrel	LR/nt	√	App. II	-
	Birds*					
	Accipiter gentilis	Northern Goshawk	-	Nt	App. II	-
	Falco peregrinus	Peregrine	-	Nt	App. II	App. I
	Francolinus francolinus	Black Francolin	-	Nt	App. III	-
	Sylvia nisoria	Barred Warbler	-	Nt	App. II	-
	Reptiles					
	Testudo graeca ibera	Asia Minor Spur-thighed Tortoise		-	App. II	-
Cukurova Plain	**Mammals**					
	Herpestes ichneumon	Egyptian Mongoose	-	-	App. III	-
	Hystrix indica	Indian Crested Porcupine	-	√	-	-
	Rhinolophus mehelyi	Mehely's Horseshoe Bat	VU	√	App. II	-
	Birds*					
	Ceryle rudis	Pied Kingfisher	-	Nt	App. II	-

Region	Species	Common Name	IUCN	Turkey status	BERN	CITES
	Alcedo atthis	Common Kingfisher	-	Nt	App. II	-
	Crex crex	Corncrake	VU	Nt	App. II	-
	Prinia gracilis	Graceful Prinia	-	Nt	App. II	-
	Halcyon smyrnensis	White-breasted Kingfisher	-	Nt	App. II	-
	Reptiles					
	Emys orbicularis	European Pond Turtle	LR/nt	-	App. II	-
	Fishes					
	Cyprinus carpio	Common Carp	DD	-	-	-
	Orthrias tschaiyssuensis	Loach sp.	VU	-	-	-
	Clarias lazera	Clarias sp.	-	-	-	-

Nt: Nationally threatened bird species (see Section 5.8.5 Important Species/ Nationally threatened Species)
√: Those species listed by the Central Hunting Commission Decisions as protected for the 2000-2001 Hunting Season.
* All bird species listed here are protected by the Central Hunting Commission Decisions.

5.7.4.4 Endemic and restricted range species

A total of 507 endemic plant species occurs within the 500m route corridor. Of these, 267 are classified as threatened; including 153 threatened both globally and nationally; 31 globally-threatened but are not at risk in Turkey; and 83 threatened in Turkey but are not at risk globally.

Within the 100m wide corridor, a total of 61 endemic plant species have been recorded.

There are no fauna species that are endemic to Turkey. However, two restricted range bird species are present: the Caucasian Black Grouse (*Tetrao mlokosiewiczi*) and the Caucasian Chiffchaff (*Phylloscopus lorenzii*). Only the former has been recorded in the vicinity of the BTC Pipeline Route. Two restricted range herpetofauna species are found in the Caucasus Mountains and the mountains of north-eastern Turkey: the Caucasian Salamander (*Maertensiella caucasica*) and the Caucasian Parsley-frog (*Pelodytes caucasica*). Both species have been recorded from within the 500m corridor in the Posof Wildlife Reserve. The subspeciated Asia Minor Spur-thighed Tortoise (*Testudo graeco ibera*) is also present along the BTC Pipeline Route.

5.8 CULTURAL HERITAGE

5.8.1 Overview

Cultural heritage management for the Project started in the earliest stages of route development, with the clear objective of selecting and developing a pipeline route that avoids as many known cultural resources as possible. The different phases during which cultural heritage considerations influenced the development of the Project were as follows.

- *Phase 1*: Basic Engineering baseline studies involved collection of desktop information utilising previous studies and archaeological work and field studies to optimise the 500m corridor.

- *Phase 2*: Detailed Engineering baseline studies involved an extensive and intensive investigation of the pipeline with local cultural heritage experts walking the route in company with engineers to evolve the most acceptable pipeline route.

- *Phase 3*: where re-routing is not an option, archaeological evaluation (involving both non-intrusive techniques such as remote sensing as well as the excavation of trial trenches) will proceed at selected locations in order to determine the nature and extent of archaeological sites.

- *Phase 4*: observation of construction activities and recording of features exposed by trench digging will be undertaken by archaeological work teams (an archaeological watching brief). When archaeological deposits are encountered the appropriate chance finds procedure will be instigated.

- *Phase 5*: the results of the archaeological work will be analysed and reports prepared by archaeological specialists and the Ministry of Culture.

Phase 1 is completed, and Phase 2 is nearing completion with a view to moving it into Phase 3 pre-construction should the results of intensive surveys indicate it to be necessary. The future management activities, primarily associated with the pre-construction and construction phases have been addressed in the Cultural Heritage Management Plan (see Appendix C7).

5.8.2 Sources of information

5.8.2.1 Phase 1

Cultural assets along the pipeline route were initially identified during the Basic Engineering phase of the Project by a review of the following:

- literature;
- historic maps;
- previous cultural heritage works and surveys;
- Ministry of Culture registers/ inventories for known cultural heritage sites;
- initial responses to consultation.

Based on information gathered during the desk studies, sites of potential cultural heritage value were identified during a field survey conducted in August to November 2000 in the Basic Engineering phase. A walkover field survey of the route focused on known and potential cultural heritage sites and features. The principal aim of this field inspection was to determine the extent and condition of cultural heritage areas (known and potential) along the BTC Pipeline Route. The preliminary field inspections were carried out to verify official records and literature data. A total of 95 cultural heritage sites were identified within the 500m corridor based upon the studies described above [Ref 29].

5.8.2.2 Phase 2

After these preliminary field trips, further field studies were carried out as part of the Detailed Engineering baseline surveys and during the rerouting and route narrowing phases (from 500m to the 100m corridor). During these field studies, further verification of previously identified sites was undertaken and key issues for route narrowing shared with the engineering teams.

The aims of these walkover surveys were to:

- determine the quality and density of findings;
- determine the physical extent of the surface findings;
- determine the nature of the findings (eg, remains, artefacts, mounds or tumuli);

- identify geological formations that might be an indicator of occupied cave or shelter sites.

Each location with a potential historical, archaeological or cultural significance was photographed and its coordinates logged using a Global Positioning System instrument. Areas that have yielded archaeological remains and finds in the past (eg ceramic pieces or pot sherds) were evaluated and dated by documenting age as well as historical period. All surface findings were recorded in order to inform the evaluation of each site's density and extent. After inspection, all findings were left in their original position. Finally, all the locations of these cultural heritage sites were mapped on 1:25,000 topographical maps.

The Ministry of Culture (MoC) were advised of the newly identified sites and features. MoC survey teams subsequently visited and surveyed these sites during August 2001.

A subsequent series of detailed cultural heritage investigations of the route were undertaken from September to December 2001. One reconnaissance team and five field-teams surveyed the 500m pipeline corridor for the length of the pipeline. In some areas this was extended to a 2km wide corridor to account for potential re-routes that were under consideration at the time of the survey. This survey focussed on comprehensive field-walking of the route in order to verify previous observations, to identify previously identified sites and to prioritise areas of potential archaeological or cultural heritage importance for further intrusive investigation. An extensive/selective methodology was applied to these field studies. This technique concentrates the greatest efforts on areas with a high probability of finding archaeological materials, such as river basins and valleys. In these areas detailed observations were made and all possible sources of information (visible ruins, potsherds, objects, landscape anomalies) were utilised to identify ancient settlements. In other areas, such as high plains or mountain regions, where there is a lower potential for ancient human settlements, brief observations were made to gain a general assessment of the potential use of such areas during ancient times. A total of 179 sites were found within the 2km corridor during this series of field investigations.

As required under the *Law on the Protection of Cultural and Natural Assets* administrators and experts from Erzurum, Kayseri and Adana Directorates of Councils for Preservation of Cultural and Natural Entities, were informed of the recorded sites and experts from the Ministry of Culture and Adana Council for Preservation of Cultural and Natural Entities directly participated in the studies.

The findings of this and previous studies have been mapped and incorporated into the project GIS system and have been taken into consideration in the further definition of the BTC Pipeline Route to ensure that areas of known or potential cultural heritage value are avoided as far as practicable by the BTC Pipeline Route. It is noted that in determining the anticipated boundaries of the identified sites a conservative approach has been taken.

5.8.2.3 Phase 3

Approximately 12 of the sites identified during the surveys described above may require additional investigation (intrusive and non-intrusive) prior to construction to ensure that impacts on cultural heritage resources are minimised during construction of the BTC Pipeline. Such sites include the following:

- sites identified as potential archaeological or cultural heritage sites for which further investigation is required to ascertain the exact nature of the site;
- sites where further detailed investigation is required to ascertain the exact boundaries of the site;

- sites where further site investigation is required to determine a safe route for the BTC Pipeline taking into account other route constraints.

Due to seasonal weather constraints during the detailed investigations described above, this additional work will be undertaken prior to any construction activities. Detailed investigations will utilise surface observations, geophysical survey and/or excavation works as necessary. Changes to the route alignment in these areas will be made as necessary to avoid impacts to these sites during construction. The sites or potential sites at which further investigation will be undertaken are indicated in the Impact Tables in Supplement 1 to Volume II.

5.8.3 Historical background of regions on the BTC Route

5.8.3.1 General

Turkey has been a cradle of many different cultures and civilisations and has served as a bridge between eastern and western cultures. A brief summary of the history of Anatolia will provide a framework for the remainder of this section.

The earliest settlements in Anatolia date from the Palaeolithic age. The first villages were established in Anatolia during the transition phase from hunter-gatherer to food production in the Neolithic Age approximately 9000-5000 BC. Two of the most advanced and earliest settlements are Catalhoyuk and Hacilar near Konya in central Anatolia.

The first great cultures arose around 3,000 BC in the late Bronze Age. The Hattis are amongst the oldest settlers in Anatolian history, ruling central Anatolia around 2500-2000 BC. During the end of the third millennium BC a large-scale southward migration of Indo-European people took place. During this time the Hittite people moved through Caucasia to central Anatolia and settled alongside the Hattis. While never destroying their cities or the people, by 1750 BC the Hittites had replaced the Hattis as the rulers of Anatolia, and set up their first kingdom with its capital at Bogazkoy, renamed Hatusa, west of the proposed BTC Pipeline Route. The Great Hittite Kingdom then expanded (so that it bordered the Egyptian civilisation) and flourished for almost 600 years. Meantime, the Hurri civilisation, ruled by the Mitanni kingdom of Indian descent, was established in eastern Anatolia.

At the end of this period, the Hittite Kingdom collapsed when new waves of migrating people arrived. Not until 1000 BC did a new civilisation, the Urartus, rule eastern Anatolia. While western Anatolia saw several new civilisations during the ensuing years, the next major change in eastern Anatolia was the conquest of the region by the Persians in about 500 BC. This was followed in due course by the Greek conquest under Alexander the Great and subsequently by the Romans.

In the west, the Romans were followed by a thousand years of Byzantine civilisation, but in central and eastern Anatolia, the Seljuk Turks arrived from 1071 AD, bringing with them the religion of Islam. During this era, the road system was re-developed, and the period is characterised by great learning with advanced studies in geography, astronomy, medicine, architecture and philosophy all taking place. This civilisation was replaced gradually by the Ottomans who ruled for 600 years and whose great achievements peaked in the mid 16th Century. In 1923, Mustafa Kemal Ataturk replaced the Ottomans imperial administration with the modern Republic of Turkey.

5.8.3.2 Northern pipeline section – north-east Anatolia

This region, which includes the modern cities of Erzincan, Erzurum, Kars and Ardahan, contains two of the important main access roads in East Anatolia. The first one is the Karasu Aras road connecting Erzurum to the Caucasians. The other one is the Erzurum Iran Transit road. This road, merging with the road coming from the Caucasians in the vicinity of Horasan, extends to Iran via Eleskirt, Agri and Gurbulak. Finds dating back to the prehistoric era are encountered in the region, particularly within Kars Province, which is a strategically important area and has been a transit region throughout history. Finds in this area include hand axes from the Old Stone Age, tools probably belonging to the Musturiyen period in Borluk valley, and black obsidian and microlites in Aras valley. Similarly, at Hasciftlik Village near Kars, tools and microlite tools of obsidian and flint from the Epipaleolitic period are encountered. Ruins from the later Neolithic period are also found. The find from the Calcholithic period (ca 5000-3000 BC) and Early Bronze Era (ca 3000-2000 BC) in North East Anatolia have been found at excavations in the Buyuk Tuy region. These findings indicate that the Erzurum Plain was used for settlement from BC 4000 and that grain agriculture and stockbreeding were important aspects of daily life.

There is documentary evidence dating to three thousand years ago, that the mountainous area to the north of Sumer and Akad provinces, namely Northeast Anatolia, was called Subartu and the residents at this region were called Subar or Subir. Although the archaeological excavations do not verify these data completely, the presence of settlement in the Erzurum Plain during this period is almost certain.

The Middle Bronze Age (ca. 2000-1450 BC) period began with the use of writing in Anatolia. During this period the Hittites had an influence in Anatolia both politically and culturally. Based on records from Egypt and Bogazkoy, in the first half of 2000 BC, Northeast Anatolia was ruled by Hurris and in the second half, by Hayasa and Azzis.

At the beginning of the 12th Century BC, during the Aegean migration when the Troia settlement was totally devastated, the biggest political power of Anatolia, the Hittite Empire, disappeared from historical records. After the Dark Era, when written documents were absent, the north of Anatolia was ruled over by Urartu. This is indicated by findings discovered at Bingoldag, Yazilitas, Hasankale, Umudum Hill and Guzelhisar in the vicinity of Erzurum. During this period the region was named Hayasan, Dayaeni-Diauehi. However, Urartu began to weaken and disappeared completely following incursions by Kimmer and İskit coming down from the Caucasians from the beginning of the 8th Century BC.

The famous Persian king Syros, who seized sovereignty by ending the Mede Kingdom in Iran, entered the inner parts of Cappadocia in 547 BC and afterwards, as a result of conquering the Lydia king Kroissos, had sovereignty over almost all of Anatolia. This sovereignty continued up to 330 BC and was brought to an end by the destruction of the Persians. However, there is little information regarding the north-east of Anatolia during Persian rule. It is known from the work 'The Return of the Elevens', by the famous writer Xenophanes, that the Persian King had gone up to Trabzon following the Euphrates River valley from the Mesopotamia to the north. However, again in this period Kars Province and its north was seized by the Great Saka Emperor Tunga and afterwards by Karsaks who ended Saka sovereignty in 145 BC. The Karsaks ruled the region up to the 5th Century AD.

In Anatolia the death of Alexander the Great in the last quarter of the 4th Century BC and the failure to leave an heir for his great empire resulted in the seizure of this territory by Seleukos.

Northeast Anatolia was then ruled by Seleukos followed by the Parths, Sassanids and Byzantines, respectively.

From the 10th Century AD, Turkish incursions from the north were first started by the settlement of the Oguz clans in the vicinity of Kars. After the Malazgirt war in 1071, Byzantine sovereignty was replaced by Turkish sovereignty in Anatolia. Later, sovereignty belonged to Saltik, Mongols, Karakoyunlu, Timur and Akkoyunlu respectively. From the 16th Century, sovereignty was gained by the Ottoman Empire and the area served as a military base, first against Iran and then against the Russians and was the scene of many wars.

5.8.3.3 Southern pipeline section - Sivas, Kayseri, Kahramanmaras and Adana Provinces

The area covering Sivas, Kayseri, Kahramanmaras and Adana Provinces contained many different people and cultures and possessed various names. The oldest historical data within this area pertains to the Neolithic period, dated approximately 8000-5000 BC, during which residents of the region had begun a sedentary life consisting of agriculture and stockbreeding. Among these areas, the locations in proximity to the proposed BTC Pipeline and where archaeological findings are common are Velican, Imamoglu, Tilan Tumulus, Tarmil Tumulus and Cukurkopru tumuli all of which are located within the borders of Adana Province. Three tumuli in Sivas, two tumuli in Kayseri, one tumulus in Kahramanmaras and twelve tumuli in Adana are from the Calcholithic period and Early Bronze Age.

During the Middle Bronze Age (ca 2000-1450 BC) the Hittite Empire, which had a great political and cultural influence in Anatolia, was referred to as Kizzuwatna within its own boundaries as can be seen from Anatolian cuneiform documents in Cukurova from 2000 BC. In Hittite cuneiform documents from this period, the Sivas district is referred to as Upper State/Kur-uru-ugu-ti in the Hittite administrative classification. From this period, Adatepe II, Sultantepe, Bozhuyuk, Tilova tumulus, Cbre tumulus, Tilan tumulus, Alapinar and Fiar are found in Adana. Fiar was one of the sacred settlement areas throughout all historical periods in Anatolia. It was called Kummani in the Hittite era and Kommana in the classical era. In terms of the Middle Bronze Age, Sariz in the vicinity of the BTC Pipeline Route in Kayseri and Halep Bridge in Sivas are important.

At the beginning of the 12th Century BC, the Hittite Empire disappeared from historical records. After the Dark Era in this region, including the south of Middle Anatolia, Cukurova, the south-east of Anatolia and North Syria, small states referred to as Late Hittite Principalities were formed. These states represent a continuation of the great Hittite Empire but ethnically were formed from people mixed with Arami who migrated to this region. Among these states, there are Que in Cukurova and Tabal in Kayseri district. From the period between the 12th-and the 6th Centuries BC, Karatepe, Domuztepe, Sirkeli and Misis in Cukurova, Kurubel and Hunu in Kahramanmaras are centres where findings and ruins from the Late Hittite period are found. From the end of the 8th Century BC to the end of the 7th Century, it is believed that this region endeavoured to become a state of the Assur empire ruling in Mesopotamia. Although it appears that the Assur sovereignty reached the area, the empire could not capture the area. Later, it appears that the Babylonian Empire controlled the region. After the sovereignty of Babylon, which continued up to the middle of the 6th Century BC, Kyros, who seized sovereignty by ending the Mede kingdom in Iran, entered the inner parts of Cappadocia in 547 BC. In western records describing these periods, it is understood that Adana and Kahramanmaras provinces are included in the boundaries of Kilikya district; and Sivas and Kayseri provinces in the Cappadocia district. While local Kilikya residents are mentioned in the records, the Greeks referred to the residents of Cappadocia as Syrians. Administratively, both of these districts were under the control of Persia during the reign of the Persian King Darius and every year they paid high taxes to Persia.

At the end of the 4th Century BC and with the arrival of Alexandros the 3rd to Anatolia, Cappadocia accepted Macedonian sovereignty. The Kilikya district was an important locality for Macedonians. Although the area does not possess evidence of settlements, frequent military bases at strategic locations in the district are anticipated. Along the BTC Pipeline Route there are no known important centres representing the Hellenistic Age, however, there are some small areas with minor findings from the Hellenistic Era.

Between the 2nd and 1st Centuries BC, Cappadocia district was under the control of the Ariarathes family. At the beginning of the 1st Century BC, it was seized by the Mithridates family. The district was then declared a state of the Roman Empire. Between 235-284 AD, during the chaos period in the Roman Empire, all of Cappadocia was exposed to Goth incursions and Kilikya to Sasani incursions. This chaos period was ended by political, military and social reformation in 284-305 AD after which Constantine, who took the control of the empire in 306 AD, legalised Christianity. Christianity brought forth new arrangements, which also affected the Cappadocia and Kilikya districts. The ruins of the religious and administrative centres established in these districts can still be seen on the surface.

5.8.4 Cultural Heritage Sites along the BTC Route

All sites and potential sites identified during cultural heritage studies [Ref 29] in both the Basic Engineering and Detailed Engineering are shown on the route maps in Supplement 1 to Volume II. Although most of the sites are outside the area potentially impacted by project activities, for the sake of completeness all identified sites are depicted on the maps. Those sites within the 100m pipeline route corridor are described in the accompanying Impact Tables. Photographs of a selected number of sites are contained in Plate 5.36 to Plate 5.40. It is noted that not all of the cultural heritage sites depicted on the maps in Supplement 1 to Volume II have been registered and declared as cultural heritage sites by the Ministry of Culture as a number of sites are still undergoing the registration process.

Table 5.22 contains a summary of the cultural heritage sites identified within the 100m route corridor. This table also notes whether these sites have been registered by the Ministry of Culture (MoC). The registration decision letter of the MoC Adana Preservation Council on the Cultural and Natural Assets is given in Appendix A8. Further details regarding the nature of these sites and the mitigation measures adopted by the Project to avoid impacting these sites are contained in the Impact Tables in Supplement 1 to Volume II.

Table 5.22 Summary of Cultural Heritage Sites Along the Pipeline Route and in its Vicinity

Approximate Kp (3d)	Site Name	Type Of Site	Baseline (Status)
4	Kiliselik Area	-	First Degree
13	Kiliselik Area	-	Proposed for Registration
16	Dogrular Pasture	-	Proposed for Registration
17	Meri (Mere) Castle	Castle	First Degree
17	Keletenler	-	Proposed for Registration
40	Yusufkoy	Abandoned plateau settlement	Proposed for Registration
41	Taslipinar	-	Proposed for Registration
53	Karahuseyinin Pegler	-	Proposed for Registration
53-56	Hanak Road	Old Road	Proposed for Registration
54	Sanguletin Pegler	-	Proposed for Registration
61	Purto Plateau	-	Proposed for Registration
64	Rum Cemetery	Cemetery	Proposed for Registration
64	Kayabasi	-	Proposed for Registration
66	Ziyaret	-	Proposed for Registration
67	Cuma Village	-	Proposed for Registration
75	Kilise	Church	Proposed for Registration
85-86	Area near Cobanli	-	Proposed for Registration
86-87	Kuruhacivan	-	Proposed for Registration
88	Bahcecik	-	Proposed for Registration
98	Area near Dagci	-	Proposed for Registration
99	Saricayir Area	-	Proposed for Registration
107	Area near Buyuk Bogatepe	Flat Settlement	Proposed for Registration
114	Area near Ortakilise Hill	-	Proposed for Registration
124	Area near Hınzırık Plateau	-	Proposed for Registration
125	Area near Hınzırık Plateau	-	Proposed for Registration
132	Carkiklar Ridge	-	Proposed for Registration
133	Area near Kulahtepe	Monumental Tomb	Proposed for Registration
138	Area near Hasbey 1	-	Proposed for Registration
139	Area near Hasbey 2	-	Proposed for Registration
139	Kurugol	-	Proposed for Registration
140	Area near Hasbey 3	-	Proposed for Registration
143	Topkaya	-	Proposed for Registration
146	Area near Yenice	-	Proposed for Registration
148	Area near Akcakale	-	Proposed for Registration
149	Area near Kale	-	Proposed for Registration
153	Area near Sarigun	-	Proposed for Registration
156-157	Area near Beykoy 1	-	Proposed for Registration
157	Abandoned Ruins	-	Proposed for Registration
157-158	Area near Beykoy 3	-	Proposed for Registration
158	Area near Beykoy 2	-	Proposed for Registration
159	Area near Baskoy	-	First Degree
159	Zavot Ruins	-	First Degree
191	Nekiryolak Ridge	-	Proposed for Registration
192	Area near Yenigun	-	Proposed for Registration
195	Area near Yenikoy	-	Proposed for Registration
196	Area near Kurbancayiri 1	-	Proposed for Registration
197	Area near Kurbancayiri 2	-	Proposed for Registration
197	Area near Kurbancayiri 3	-	Proposed for Registration

Approximate Kp (3d)	Site Name	Type Of Site	Baseline (Status)
237	Kirkdikme 1	-	Proposed for Registration
237	Kirkdikme 2	-	Proposed for Registration
240	Celmiktas Hill	-	Proposed for Registration
243	Yapagili Mound	-	Proposed for Registration
245	Cakmak Ridge	Flat Settlement	Proposed for Registration
250	İstiklal Hill 1	-	Proposed for Registration
251	İstiklal Hill 2	-	Proposed for Registration
261	Tepecik Mound	-	Proposed for Registration
264	Mahmutdede Tomb	-	Proposed for Registration
264	Seyyidehanım Tomb	-	Proposed for Registration
268	Goller Area Settlement 1	-	Proposed for Registration
269	Goller Area Settlement 2	-	Proposed for Registration
270	Bekleduzu Settlement	-	Proposed for Registration
275	Eskikoy Area Settlement 1	-	Proposed for Registration
275	Eskikoy Area Settlement 2	-	Proposed for Registration
281	Military Shelters 1	-	Proposed for Registration
288-289	Military Shelters 2	-	Proposed for Registration
292	Tetikom Hill	-	Proposed for Registration
292	Tetikom Mound	Mound	Proposed for Registration
298-300	Tasmasor Area	Flat Settlement	First - Third Degree
309	Ortaduzu	Flat Settlement	Proposed for Registration
314-315	Cayirca-Beypinari	Flat Settlement	Proposed for Registration
316-318	Beypinari-Kahramanlar	Flat Settlement	Proposed for Registration
318	Kahramanlar (Karaz) Mound	-	Proposed for Registration
318	Karaz Mound	-	Proposed for Registration
318	Kahramanlar Cemetery	-	Proposed for Registration
323	Alaybeyli	Flat Settlement	Proposed for Registration
328	Poccik Road	Flat Settlement	Proposed for Registration
350	Abdalcik Mound	-	Proposed for Registration
350	Abdalcik Cemetery	-	Proposed for Registration
403	Kucuktepe Settlement	-	Proposed for Registration
418	Tasinonu	Flat Settlement	Proposed for Registration
424	Balikli 2	Flat Settlement	Proposed for Registration
424	Balikli 1	Flat Settlement	Proposed for Registration
426	Algiz Mound	-	Proposed for Registration
427	Algiz	Flat Settlement	Proposed for Registration
428	Yesilkaya Mound	-	Proposed for Registration
430	Yesilkaya	Flat Settlement	Proposed for Registration
438	Yaylakent	-	Proposed for Registration
535	Bakacak	Flat Settlement	Proposed for Registration
545	Akcakoy	Flat Settlement	Proposed for Registration
593	Etnographic Alaouite Cemetery	Cemetery	First Degree
597-598	Kemreli	-	Proposed for Registration
609	Cetelik Tumuli	Tumulus	First Degree
609	Cetelik Settlement	-	First Degree
621	SW of Kilickoy Village	Old Settlement	Proposed for Registration
625	Kaletepe Mound	-	First Degree
636	Sucak Settlement	Flat Settlement	Proposed for Registration
660	Topcuyenikoy Mound	-	First Degree
670	Karapinar Mounds	2 mounds	First Degree
674	Kaletepe	-	First Degree

Approximate Kp (3d)	Site Name	Type Of Site	Baseline (Status)
683	Akpinartepe Mound	-	First Degree
701	Sivritepe Graveyard	-	Proposed for Registration
701	Sivirtepe 2	Flat Settlement	Proposed for Registration
709	Bestepeler Village cemetery	-	Proposed for Registration
713	Ziyaret Hill	-	First Degree
713	Yassı Hill	-	First Degree
752	Pasakoy	-	Proposed for Registration
754	Ciftetepe	-	Proposed for Registration
757	Tumulus	-	Proposed for Registration
757	Bescardak	-	Proposed for Registration
758	Yeldegirmeni Tumulus	-	First Degree
766	Hoyuktepe (east)	Settlement Mound	Proposed for Registration
804	Hilmiye Graveyard	Graveyard	Proposed for Registration
805	Hacitim Hill	-	Proposed for Registration
805	Roman Bridge and Road	-	Proposed for Registration
806	Roman Bridge	-	First Degree
806	Hacitimpinari Ridge	-	First Degree
806	Roman Bridge	-	First Degree
835	Kirkgecit Mound	-	Proposed for Registration
835	Kirkgecit Caravanserai	-	Proposed for Registration
836	Tumulus (Kirkgecit Village)	-	Proposed for Registration
842	Alafli Tower	-	First Degree
842	Settlement on NE slope of Mecit Hill	-	First Degree
842	Salderesi Area	Low Settlement Mound	Proposed for Registration
852	Gedik area	-	Proposed for Registration
852	Kocakayanın Boynu	-	Proposed for Registration
852	Kocakaya	-	Proposed for Registration
856	Kizilburun Hill	-	Proposed for Registration
856	Yunaktasi Area	-	Proposed for Registration
857	Eskihamam Area	-	Proposed for Registration
858	Mezarliktepe Mound	-	Proposed for Registration
858	Killiktepe	Settlement Mound/Tumulus	First Degree
873-875	Karayurt Mound	-	Proposed for Registration
876	Cukurpinar Area	Flat Settlement	Proposed for Registration
879	Yayagecidi	-	First Degree
879	Kemer Mound	-	First Degree
880	Golbasi Rock	-	First Degree
881	Kurudere Mound	-	Proposed for Registration
914	Gumgum Hill	Flat Settlement	Third Degree
922-924	Tasoluk Koyici	Classical Monumental Site	Third Degree
944	Meryemcil Castle	Castle	Proposed for Registration
987	Minnetpinari	Old Settlement	Proposed for Registration
1000	Oren Dosu	Old Settlement	Third Degree
1002	Urlu Graveyard	-	Proposed for Registration
1012	Ruin-1 (Catak Location)	-	Proposed for Registration
1019	Karagedik Area	Old Settlement	Proposed for Registration
1067	Gokdere	Ancient Settlement	Proposed for Registration
1075	Kurtkulagi	-	Proposed for Registration

(Information Dated: September 2002)

Plate 5.36 General View of Mere Castle (between Posof and Horasan)

Plate 5.37 Tasmasor Archaeological Area (between Horasan and Cayirli)

Plate 5.38 Cemetery of Koyunkaya Village (between Cayirli and Imranli)

Plate 5.39 Kaletepe Settlement (between Imranli and Sariz)

Plate 5.40 Meryemcil Castle (between Sariz to Ceyhan)

5.9 AIR QUALITY AND NOISE

5.9.1 Air Quality

5.9.1.1 Summary of desk-based assessment

Data on sulphur dioxide (SO2), particulate matter (PM), hydrocarbons (HC) and nitrogen oxides (NOx), has been provided by the Ministry of Health and assessed by the Environmental Statistics Department of the State Institute of Statistics [Ref 34].

The data represents air quality in provincial centres. With the exception of Erzurum and Erzincan, the proposed route is located some distance from the source of data. Air pollution data for city centres have been included since this is the only available data and, along most parts of the route, these cities are the major, if not sole, air pollution sources. Erzurum and Erzincan are only about 5km from the route corridor and pollution loads can be expected to be transported over such distances. Air pollution levels along the route itself are likely to be significantly less than the figures given.

The two primary causes of air pollution in Turkey are urbanisation and industrialisation. Factors arising from urbanisation that exacerbate air pollution include but are not limited to:

- population density;
- urbanisation in areas with constrained dispersion due to topographical and meteorological conditions;
- polluting heating systems (ie low-quality fuel such as lignite coal and inefficient combustion techniques);
- an increase in the number of motor vehicles (due to hydrocarbon (HC), nitrogen oxide (NO_x) and carbon monoxide (CO) emissions);
- inefficient disposal of wastes.

The most conspicuous example of urban air pollution caused by a combination of the above factors is at Erzurum, which has mountains on three sides that shelter the city and cause frequent temperature inversions in winter. As a result, pollutant emissions are not dispersed.

Along the proposed BTC Pipeline Route, Adana is particularly affected by industrial air pollution.

Air pollution increases considerably in cold weather due, amongst other factors, to emissions from residential heating. Thus, air quality has been evaluated with respect not only to the annual averages of pollutants, but also to the winter values (ie data obtained in the October-March period).

According to the SIS data, annual averages[1] for Turkish cities are as follows:

- SO_2 concentrations are third highest in Kayseri, and seventh highest in Kahramanmaras;
- PM concentrations are the highest in Kayseri and in Sivas.

1 Annual average SO_2 pollution and rate of change values computed using data obtained at least for nine months (minimum for 21 days per month) in a year.

Similarly, winter (October 1999 – March 2000) averages for Turkish cities are as follows:

- SO_2 concentrations are ninth highest in Kayseri;
- PM concentrations are the highest in Kayseri and Sivas.

The BTC Pipeline Route traverses primarily rural countryside, which is generally distant from the effects of the types of industrial and urban air pollution described above. However, there may be some influence on air quality along the Pipeline Route close to areas such as near Erzincan and Erzurum. For the purposes of the air quality assessments contained in Section 6 and 7 of this report, existing air quality is assumed to be high along the route of the pipeline and at the pumping station locations.

5.9.1.2 Site specific surveys

As part of the EIA process, site specific surveys were undertaken at each of the sites proposed for location of the five major AGIs (PT1/2/3/4 and IPT1). The results of these surveys are presented in Section 7.8 (Air Quality Impacts).

5.9.2 Noise

Noise surveys [Ref 35 and Ref 36] were conducted, in September 2001 and July/August 2002, in order to provide background noise measurements at a representative number of locations along the pipeline route. The aims of the survey were to:

- provide background noise levels for subsequent noise assessments;
- provide noise data against which project performance during the construction and operation phases can be compared.

In establishing the noise measurement programme, the following factors were taken into consideration:

- significance of noise levels generated by the project activities;
- existing noise sources near the project locations;
- proximity of population centres sensitive to the project noise sources;
- diurnal and weekly variations in ambient noise levels.

Daily continuous (24 hours) measurements were undertaken at villages near two proposed pumping station sites (PT1 and PT2) and at the proposed BTC Marine Terminal site; these features will be the major noise sources during both the construction and operation phases. The results of these measurements are presented in Section 7 and Section 10 respectively.

In addition, hourly measurements were conducted at a number of villages close to the BTC Pipeline Route that may be impacted temporarily by construction activities. The locations of the other two pumping stations (PT3 and PT4) had not been finalised at the time of this first survey. The coordinates of the PT2 station were changed subsequent to completion of the survey and a second survey round was undertaken to measure baseline noise at the remaining locations.

The results of the survey described above indicate that background noise levels in the rural sections of the route are within the range of 35 - 50 dBA (daily average L_{eq} values-equivalent noise levels) and these maybe considered as typical for rural locations [Ref 32]. The measurement at receptors away from the industrial activities and dense population movements,

for example, were Kahramanlar (50.8 dBA), Armutveren (46.3 dBA), Kayinli (53.3 dBA), Pasayurdu (52.6 dBA) and Golovasi (37.2 dBA).

Noise levels are higher closer to main roads, industrial facilities (eg existing BOTAŞ Ceyhan Marine Terminal), and city centres such as Posof District Centre and vary within the range 50-65 dBA. Residential areas such as Sogutlukaya (59.6 dBA), Asikuzeyir (57.5 dBA), Purudere (59.5 dBA), Gunyazi (63.4 dBA) and Karatepe villages (54.5 dBA) are examples of this level of background noise (Plate 5.41).

Plate 5.41 Noise Measurement Survey

Additional details of diurnal changes, differences between noise levels on weekdays and weekends are presented in the reference document (Noise Survey Report) available at BOTAŞ office.

An assessment of noise impacts due to construction of the pipeline are contained in the **Impact Tables** in Supplement 1 to Volume II and due to construction and operation at the pumping stations in Section 7.

5.10 NATIONAL SOCIO-ECONOMIC OVERVIEW

The key socio-economic characteristics of Turkey are outlined in Box 5.6 below.

Box 5.6 National Socio-Economic Overview

Country: Turkey **Language:** Turkish **Capital City:** Ankara **Currency:** Turkish Lira	
ECONOMY * GDP (USDbn) : $444 GDP- (per capita USD) : $6,800 GDP – (real growth rate) : 6% (2000 estimates)	**POPULATION AND SOCIETY*** Population Size (million)** : 66.5m Population Growth Rate 2001(%)** : 1.24% (July 2001 estimate) Life Expectancy at Birth (%) : 71.24
EMPLOYMENT * Total Labour Force : 23million Agriculture : 38% Services : 38% Industry : 24% Unemployment Rate : 5.6%	**PRINCIPAL RELIGION** Muslim (mostly Sunni) : 99.8% Other (Christian and Jews) : 0.2%
STRUCTURE OF OUTPUT *** Agriculture of GDP : 16% Industryof GDP : 25% Services of GDP : 59% Import of GDP : 31% Export of GDP : 24%	**EDUCATION *** Adult Literacy : 85% Male Literacy : 94% Female Literacy : 77%
	SOURCES: * Central Intelligence Agency 2000:World Factbook ** Central Intelligence Agency 2001:World Factbook *** WB 2000:World Bank **** UNDP 2001:United Nations Development Programme

5.10.1 Administrative Structure

An understanding of the administrative structure in Turkey is essential for informing the practical realities of the Project mitigation measures (see Figure 5.22). This is because implementation will frequently require the involvement of a range of authorities, at the settlement level through to the provincial level. The administrative structure also provides insight into: 1) the balance of power within a settlement (or district); 2) how this power is allocated and administered; and 3) the decision-making structures regarding allocation of resources (eg land, services etc). These insights are essential in order to understand the socio-economic profile of the survey area.

The component administrative units in Turkey, are listed below.

- **Central Administration**: this is defined within the Constitution as comprising the Executive Branch of administration. The President, as Head of State is elected for a

one-time term of seven years and oversees the working of the Constitution and the functioning of the organs of the State. The Prime Ministry is responsible for overseeing the Council of Ministries, which implement the general policies of government through the line Ministries [Ref 3] Box 5.8 provides an overview of the varying types of development plans utilised in Turkey.

- **Local Representatives of the Central Administration**:

  - **Province:** according to the State Institute of Statistics (SIS), there are 81 provinces in Turkey, organised on the basis of their geographical location, economic conditions and public service requirements. Provinces are the principal administrative unit for central government activities at the local level. The head of the province is the Governor (Vali) whose primary responsibility is the administration of the provincial government. The Central Administration within the provinces includes the Provincial General Assembly and Provincial Standing Committee.

  - **Sub Province:** provinces are divided into: 1) sub-provinces, governed by the Sub-Governor (Kaymakam); and 2) districts, headed by the District Director (Bucak/Muduru). Sub-provinces comprise the sub-provincial centre and surrounding settlements. The Sub-Governor is responsible for ensuring the well-being and security of the population within the sub-province. Within sub-provinces there is a Sub-provincial General Assembly and Sub-provincial Standing Committee. Within the districts there are District Administrators [Ref 3].

- **Local Administration**:

  - **Municipality**: every community with a population of 2,000 or more is eligible to establish a municipal administration. A municipality can be established following a decision by the Provincial General Assembly based on available funds and the potential for revenue generation. A municipality would typically be administered by a Municipal Council, Municipal Standing Committee and a Mayor (all elected for a term of five years). The Municipality is responsible for a range of functions, including town planning, public health, infrastructure provision and traffic management.

  - **Provincial Local Administration**: the Governor, the representative of the central administration, is also the head of the provincial local government and its chief executive. The Governor generally acts in line with the decisions made by the Provincial General Assembly. The Provincial General Assembly, the most authoritative body of the organisation, consists of members elected for a term of four years and is responsible for approving the provincial budget and making decisions regarding the institutional services of the province. The Standing Provincial Council, composed of four members elected for a term of one year by the Provincial General Assembly from its own members, reviews and approves fiscal matters, and provides information on local government operations to the Mayor [Ref 3].

  - **Village Administration**: this is concerned with the smallest unit of local government, the village, which comprises people with common property such as a mosque, school and pasture and who live in either scattered or closely packed dwellings with a population of less than 2,000 inhabitants. There are three administrative bodies in the village, namely the Village Assembly (all members of

the village aged over 18 years), the Council of Village Elders (four to six elected members) and the Village Head Person (Muhtar) who is appointed every five years.

The Muhtar is the chief executive of the village, responsible for handling village administrative issues and representing the local government. The Muhtar is generally male, however, in one village surveyed as part of this EIA, a woman had recently served as the village head. For the most part, settlements along the pipeline route are nucleated and centred on a main core (ie settlement centre), with very few individual dwellings separated by significant distances from this centre. Several other associated core areas known as *mezras* are typical in settlements where substantial pastoral activity is carried out or small clusters of houses exist. Despite this centralised structure, the villagers typically own and/or use extensive land around the village. Box 5.7 outlines the terminology used in this report to distinguish settlement types within the survey area.

Box 5.7 Defining Rural and Urban Settlements

For the purpose of this report, villages are defined as '**rural settlements**', and district centres/ municipalities are defined as '**urban settlements'**. Both district centres and villages are referred to as "settlements". "Community" is used as a broader term that embraces the distinct social networks that can exist within any settlement

Urban settlements: provincial, sub-provincial and district capitals (referred to as district centres) and municipalities, all with a population of more than 2,000 inhabitants.
Rural settlements: settlements with less than 2,000 inhabitants.

Box 5.8 Development Plans

Plans for all official and private developments are subject to Development Law N^{o}. 3194 and its related provisions. Development plans, supervised by the Ministry of Public Works and Settlement, are categorised by size into the three types listed below :

- **Regional Plans** – prepared by the State Planning Organisation;
- **Regulative Development Plans** – prepared and administered by the municipalities for those areas under their control and by the Governorship outside of these areas;
- **Environmental Master Plans** – prepared and administered by the Ministry of Public Works and Settlement in cooperation with relevant administrations. These may be delegated to the relevant municipality or governorship.

The pipeline route passes within the boundaries of four development plans, all concerned with water supply within the municipalities of Koprukoy, Ulas, Sariz, and Andirin.

(Source: Consultation with local authorities)

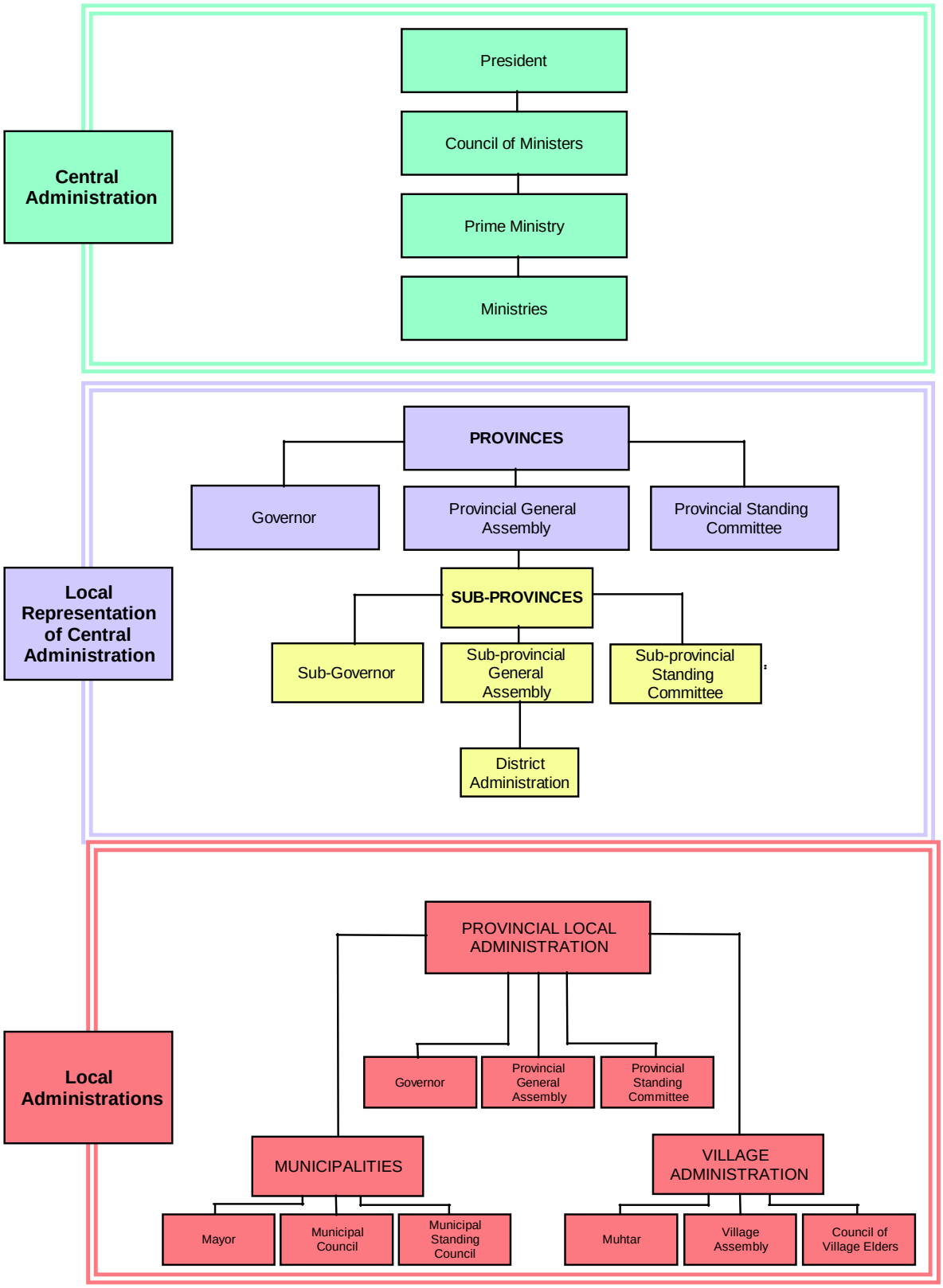


Figure 5.22 Administrative Structure of Turkey

5.11 ROUTE SOCIO-ECONOMIC OVERVIEW

Based on the extensive field surveys and public consultation undertaken, the ten provinces through which the pipeline route passes have been divided into three broad regions: North Eastern Anatolia; Central Anatolia; and the Mediterranean. These regions can be differentiated according to variations in environmental, demographic, natural resource, income and wealth, livelihood and infrastructure characteristics (see Table 5.23).

Table 5.23 Socio-economic Overview of the Pipeline Route

ISSUE	REGION ONE: NORTH-EASTERN ANATOLIA	REGION TWO: CENTRAL ANATOLIA	REGION THREE: MEDITERRANEAN
Provinces	Ardahan, Kars, Erzurum.	Erzincan, Gumushane, Sivas, Kayseri.	Kahramanmaras, Osmaniye, Adana.
Environment / Climate	Harsh climate limiting agriculture, through to continental climate and steppe grassland on the Erzurum Plain.	Continental climate through to arid climate and karst topography with low soil productivity.	Montane steppe associated with the Taurus mountains through to the very fertile Cukurova plain.
Demographic	High average household size typical of more traditional and patri-local family structures. Low urbanisation. Out migration experienced from rural areas.	Out-migration particularly from rural areas. Approximately 50% of the surveyed population live in urban areas, although Gumushane has much lower density and urbanisation levels.	Densely populated and urbanised (50-70% of the population live in urban areas). Recent increase in population due to young in-migration particularly from South East Anatolia. More nuclear families typical of urbanised areas.
Religion/ Culture	Generally Sunni Muslim (with the exception of Ardahan: 18% Alevi). Generally Turkish speakers, although some respondents in Ardahan and Kars speak Kurdish as their mother tongue. Very few respondents speak other languages such as Arabic or a European language.	45% of respondents in both Erzincan and Gumushane are Alevi, and 8% in Sivas. There are some Kurdish speakers (primarily as a second language) in Kayseri and Gumushane. A small proportion of respondents speak Eastern European languages such as Serbian.	Multicultural but vast majority are Turkish speaking Sunni Muslims. Less than 5% of respondents speak Circasian, Arabic, Azeri or Kurdish (primarily as a second language).
Resource Ownership and Use	Mainly private ownership followed by communal ownership. Land holdings are larger due to more extensive agriculture, animal husbandry and low population density. Low level of mechanisation. High dependency on land. Few land titles (except in Erzurum).	Mainly private ownership followed by communal ownership. Relatively even land distribution with the exception of Gumushane. Grain is the main agricultural output, although animal husbandry is also important.	Mainly private owner cultivated and state land. Smaller land holdings due to high pressure for land. Increased polarisation (eg uneven distribution) of land between owners. Greater diversity of agricultural output due to increased soil fertility and use of irrigation. More market orientated.

ISSUE	REGION ONE: NORTH-EASTERN ANATOLIA	REGION TWO: CENTRAL ANATOLIA	REGION THREE: MEDITERRANEAN
Income and Wealth	Generally lower levels, although Ardahan and Erzurum have elevated levels in part due to border trade in the former and greater diversification of output in the latter.	Relatively low levels of assets and income with the exception of Erzincan.	Relatively higher per capita income correlating with higher levels of development and greater industrialisation (surveyed settlements still very dependent on agriculture).
Livelihoods	Livestock is one of the most important income generating activity. Small scale, non – intensive, low valued added agriculture. Essentially subsistence, with wheat and maize dominating. Industrial activity of any scale is limited to Erzurum.	Agriculture and animal husbandry are the most important income generating activities. Sales to market are of greater importance in Erzincan. Construction and manufacturing are of limited importance in Sivas.	More intensive and market orientated farming and higher levels of mechanisation. Industrialised sector is diversified and expanding, particularly in Adana. Higher levels of unemployment in surveyed settlements correlating with high in-migration.
Infrastructure/ Utilities	Relatively poorer provision of infrastructure particularly for sewage, water and waste. Erzurum has better infrastructure correlating with the higher number of urban settlements surveyed. Telecommunication networks are generally available, electricity supply is irregular and roads are often closed for a few days in winter.	Sivas and Gumushane have relatively poor infrastructure particularly for waste and sewage disposal. Investment in Erzincan after the 1992 earthquake has resulted in better provision. Telecommunication networks are available, electricity supply is generally regular and some roads are closed for brief periods in winter.	Kahramanmaras and Adana have relatively better provision correlating with higher development and according to the State Institute of Statistics (SIS) greater public investment expenditure. However formal waste and sewage disposal systems are still lacking. Telecommunication networks are available, electricity supply is in some areas variable and roads are generally not closed during winter.

* Patrilocal: a system of marriage where the wife goes to live with the husband's group

Source: [Ref 31][1]

1 The findings are based on information given by Muhtar and households. In some cases, the findings could contradict the results of other surveys (eg Census data or in the case of land, the Designated State Authority (DSA).

Plate 5.42 Ardahan Landscape

Plate 5.43 Erzurum Settlement

Plate 5.44 Yenigun Settlement, Osmaniye

Plate 5.45 Sarikamis Region, Kars

5.12 DEMOGRAPHIC AND MIGRATION PATTERNS

5.12.1 Overview

It is important to document existing population levels, migration patterns and gender/age structures as a benchmark for future change. This is particularly salient in view of the possibility of in-migration and out-migration as a direct result of the Project. Understanding the demographic characteristics of an area also allows for the prediction and assessment of the types of impacts likely to be experienced as a result of the proposed development. For example, the existing ratio between numbers of residents and available services will provide an indication of the ability of the survey area to absorb additional populations. Similarly, the existing ratio between men and women will provide a preliminary indication of the numbers of men currently working elsewhere as migrant labours. This in turn, has implications for the stability of the household unit and availability of men (or women) to take on unskilled work associated with the Project.

Box 5.9 provides an overview of the demographic and migration highlights along the 4km pipeline corridor. The remainder of the Section provides a more detailed review of population levels and change, gender and age distribution, religion, language characteristics and social traditions, and culminates with a summary table of findings by province (Table 5.24).

Box 5.9 Overview of Demographic Baseline

- ***Population Distribution:*** Adana is the most densely populated province along the pipeline route. However, Erzurum and Ardahan have the highest proportion of their province population within the 4km pipeline corridor (19% and 16% respectively), partly because the district centres of Ardahan, Posof and Pasinler are included within the corridor.
- ***Population Change:*** between 1990 and 1997, all surveyed northern and central provinces with the exception of Erzurum and Kayseri experienced a decrease in overall population, whereas the southern provinces of Kahramanmaras, Osmaniye and Adana experienced an increase 18% of surveyed settlements, primarily district centres, have experienced in-migration over the past five years correlating with the high levels of out-migration from rural areas due to poverty, high unemployment and the desire to obtain better education for children. Erzincan experienced rapid growth and in-migration during the rebuilding following an earthquake in 1992.
- ***Gender Distribution:*** there exists an even gender distribution for all provinces with the exception of Osmaniye where there is a notable gender imbalance in rural settlements potentially due to out-migration of males (particularly from 'forest villages') seeking employment in more urbanised areas.
- ***Age Distribution:*** dependency ratios are particularly low in Erzincan and Adana correlating with: 1) high numbers of migrants of working age seeking employment; and 2) the trend for more nuclear families in urbanised areas. The dependency ratio is higher in the northern provinces due to the tendency for larger families, reflecting both traditional values and reduced access to family planning.
- ***Religion:*** all surveyed inhabitants within Kars, Erzurum, Osmaniye and Adana are Sunni Muslims. The highest numbers of Alevi Muslim respondents were found in Gumushane (44%), Erzincan (44%), Ardahan (18%), Sivas (8%) and Kayseri (4%).
- ***Language:*** all survey respondents speak Turkish. A few respondents speak Kurdish as their main language, the highest numbers located in Kayseri (4%) and Ardahan (3%), although more speak Kurdish as their second language 57%, 17% and 13% in Kars, Ardahan and Gumushane respectively. Circasian is spoken in 4% of surveyed settlements.
- ***Social Traditions:*** settlement elders play an important role within settlements in Turkey. Women are generally less engaged in settlement affairs, particularly in more isolated settlements in northeastern and central provinces where communities are more close knit, and 'religious conservatism' reduces exposure of women to 'outsiders'.

Source: [Ref 31]

5.12.2 Population levels and distribution

Table 5.24 provides census data for the total population and number of settlements in each of these provinces. The table also compares this provincial information with population and settlement numbers within the 4km pipeline (consultation) corridor]; and against the number and population levels of settlements surveyed in the 2001 settlement survey.

Figure 5.23 illustrates the three broad socio-economic regions along the pipeline route and the population distribution of the settlements surveyed and provinces through which the pipeline passes.

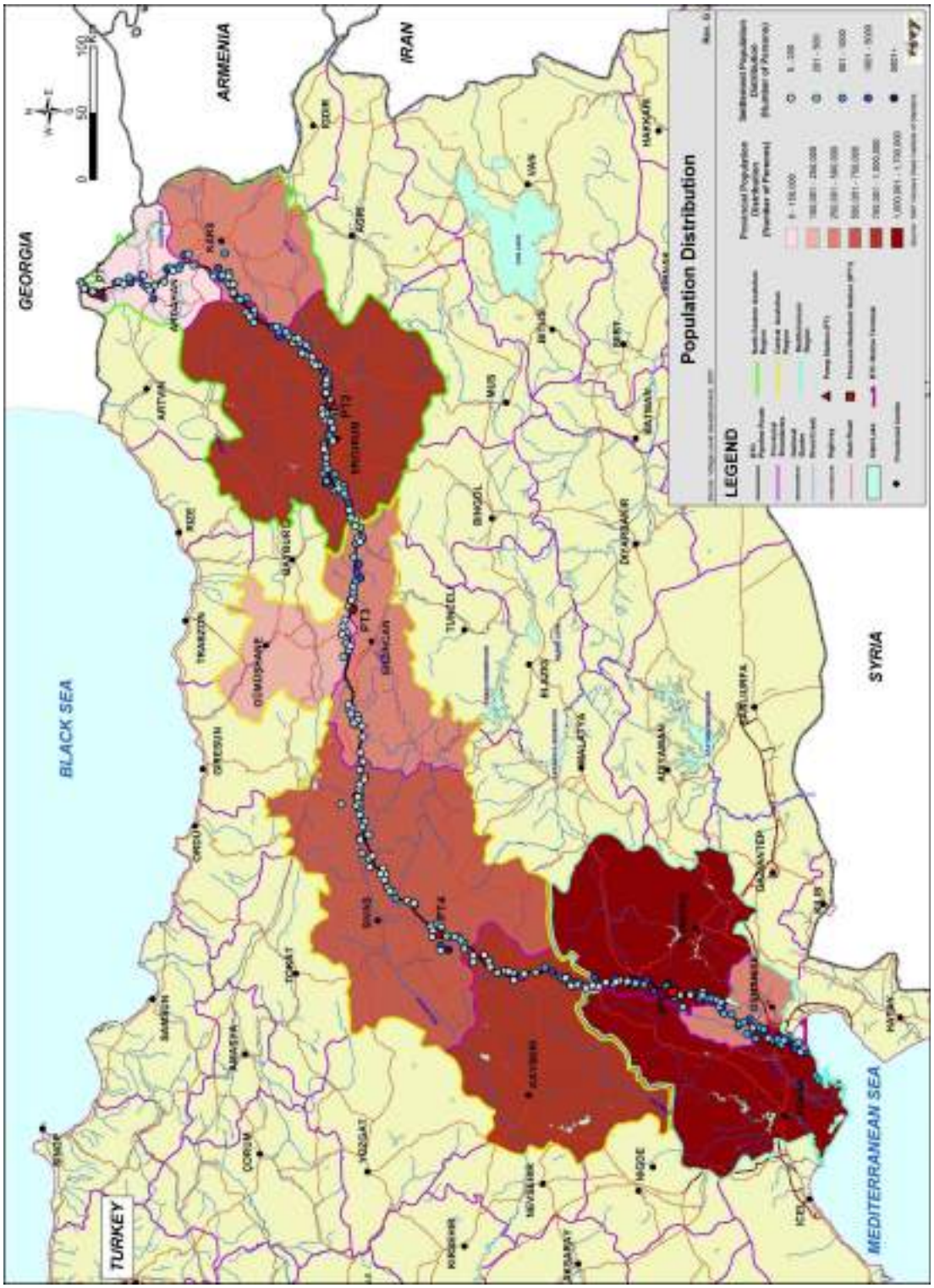


Figure 5.23 Population Distribution along the Pipeline Route

Table 5.24 Summary Table of Socio-economic Study Area

PROVINCE	PROVINCIAL (1997)*		4 KM PIPELINE CORRIDOR (1997)*			BASELINE SURVEY STATISTICS 2001 ***			
	Total population	Total number of districts in province	% of provincial population in 4km corridor	Number of Settlements in 4km corridor	Total Population in 4km corridor	Number of settlements surveyed (in 4km corridor)	Total population of surveyed settlements (in 4km corridor)	Settlements Surveyed (number of households surveyed)	Total number of households surveyed
Ardahan	128,606	5	16	32	23,673	9	19,356	Koyunpinar Koyu (11), Kucuk Sutluce (11), Kartal Pinar (11), Orta Gecit (11), Burmadere (11), Turkgozu (11), Dagci (10), **Ardahan** Merkez Ilce **(57), **Posof Merkez** (55)	188
Kars	322,973	7	6	20	9,088	9	7,500	Darbogaz (11), Akcakale (11), Karaurgan (12), Kars Baskoy (11), Yenikoy (11), Sarigun (11), Karakale (11), Hasbey (11), Beykoy (11)	100
Erzurum	873,289	18	19	41	28,479	11	21,840	Beypinari (11), Cigdemli (11), Cayirtepe (10), Sogucak (11), Caykoy (11), Kandilli (11), Alvar (11), Altinbasak (11), Epsemce (11), gAsagi Cakmakli (11), **Pasinler Merkez** (56)	165
Erzincan	280,118	8	14	37	20,633	11	18,572	Vermli (11), Yayla Kent (11), Harman Tepe (11), Yurtbasi gDogankent (11), Yesil Kaya, Cadirkaya (11), Yaylacik (11), Ulucak (11), Balikli Koy (11), Erzincan Baskoy (12), **Tercan Merkez** (56)	167
Gumushane	153,990	5	1	10	1,256	5	1,105	Gulluce (10), Gunbatar (10), Gozyurdu (11), Akdag (11), Bindalli (11)	53
Sivas	698,019	16	6	45	9,270	14	7,211	Harmandali (11), Kurkcuyurt (11), Karasar	199

PROVINCE	PROVINCIAL (1997)*		4 KM PIPELINE CORRIDOR (1997)*			BASELINE SURVEY STATISTICS 2001 ***			
	Total population	Total number of districts in province	% of provincial population in 4km corridor	Number of Settlements in 4km corridor	Total Population in 4km corridor	Number of settlements surveyed (in 4km corridor)	Total population of surveyed settlements (in 4km corridor)	Settlements Surveyed (number of households surveyed)	Total number of households surveyed
								(12), Kizilhoyuk (13), Mutubey (11), Taslihoyuk (11), Kuzkoy (9), Pasakoy (11), Uyanik (11), Celalli (11), Sivritepe (11), Nasir (11), **Imranli Merkez** (55)	
Kayseri	974,035	16	7	22	10,047	7	7,684	Tasoluk (11), Corekdere (11), Ayranlik (11), Tekneli (13), Fettahdere (12), **Sariz Merkez** (57)	126
Kahramanmaras	1,008,107	9	20	19	29,661	11	28,363	Gokceli (11), Akifiye (11), Findikli Koyak (11), Yiricek Koyu (11), Bektasli (11), gDegirmendere (11), Kumarli (11), Bozhoyuk (11), K.maras Tasoluk Koyu (11), **Goksun Merkez** (55), **Adirin Merkez** (55)	209
Osmaniye	438,372	6	3	6	4,131	4	3,800	Sakarcalik (11), Kayasuyu (11), gCigcik Koyu (11), Asagibozkuyu (11)	44
Adana	1,682,483	13	9	16	11,984	7	10,611	Hamdilli (11), gKurtkulagi (11), Imran (11), Gunyazi (11) Catakli (11), Erenler (11), Kurpinar (11)	77
TOTAL / AVERAGE	**6,559,992**	**103**	**2**	**248**	**148,222**	**88**	**126,042**	**-**	**1,328**

*** Source: Census Data (1997) State Institute of Statistics**
**** District Centres are in bold**
***** Source: Settlement Survey 2001**

- **Provincial Population Levels[1]:** the southern pipeline provinces of Adana and Kahramanmaras have the highest number of inhabitants (approximately 1.7 million and 1 million respectively). The northern provinces have fewer inhabitants, for example 129,000 and 323,000 for Ardahan and Kars respectively. The provinces with the highest percentage of their population within the 4km pipeline corridor are Kahramanmaras (20% or 29,661 inhabitants), Erzurum (19% or 28,500 inhabitants) and Ardahan (16% or 23,673). Conversely, only 0.8% of the population in Gumushane province (1,256 inhabitants) and 2% in Osmaniye province (4,131 inhabitants) reside within the pipeline corridor (see Table 5.24).

- **Provincial Population Densities:** average density for the pipeline provinces is 50 inhabitants per km^2, lower than the national average of 73 inhabitants perkm^2. Population density generally increases from north to south broadly reflecting levels of development and migration patterns. Adana is the most densely populated (112 inhabitants per km^2) and the only province where density exceeds the national average. Kars, Gumushane and Sivas are the least densely populated with 36, 26 and 27 inhabitants per km^2 respectively. [Ref 30]

- **Provincial Population Distribution:** at least 50% of inhabitants in Sivas (50%), Kayseri (64%) and Adana (70%) are located in urban areas. The urbanisation level of the latter province is higher than the average of 65% for Turkey. Conversely, Kars and Gumushane have the highest proportion of rural dwellers (68% and 65% respectively) of the pipeline provinces, correlating with the lower levels of development in these provinces.

- **Surveyed Settlement Size:** the 88 settlements surveyed within the 4km pipeline corridor range from small rural settlements (eg Kuzkoy, a village in Sivas with 40 inhabitants) to urban district centres. The district centres vary in character. For example, Posof with 2,370 inhabitants retains the characteristics of a village, whilst (Goksun) with 32,000 inhabitants has a more urbanised social structure.

- **Surveyed Settlement Distribution**: six of the ten pipeline provinces have at least one or, in the case of Ardahan and Kahramanmaras, two urban settlements within the 4km pipeline corridor. This leads to higher population levels within the corridor for these provinces. For example, Ardahan, Erzurum, Erzincan and Kahramanmaras, each with at least one urban area, have 16%, 19%, 14% and 20% of their respective provincial populations within the pipeline corridor.

- **Surveyed Household Size**: the average household size for the surveyed pipeline corridor of 6.3 inhabitants is marginally higher than the provincial average (5.7). Generally, households are smaller in the more urbanised southern provinces such as Adana, where families are more nuclear compared with northern provinces where families have more children and exhibit more traditional patrilocal[2] family structure.

1 State Institute of Statistics (SIS 1997)
2 A system of marriage where the wife goes to live with the husband's group.

5.12.3 Population change

- **Provincial Population Change**: annual population levels for all provinces along the north-eastern and central portions of the pipeline decreased between 1990-1997, with the exception of Erzurum, which experienced a small annual growth (0.4%). Ardahan and Sivas both experienced notably high population decreases (see Figure 5.24). All of these northern and central provinces are included in the State Planning Organisation's 'Priority Regions Development Plan' in an attempt to counter this trend. Conversely, the four southern provinces have experienced annual growth in population levels over the same period (and only the latter two are Priority Development Regions). These regions experienced much earlier industrialisation, beginning in the early 1930s / 1940s and intensifying over subsequent decades, attracting significant immigration to district centres (urban areas) within the provinces.

- **Population Changes in Surveyed Settlement**: the Muhtars from 27% of the surveyed settlements have observed no change in settlement size over the past five years. These settlements are scattered along the pipeline corridor. The following trends were observed in the remaining 83% of settlements surveyed.

  - ***Natural increase[1]:*** the Muhtars from 16 of the 88 settlements surveyed (including four settlements in both Sivas and Osmaniye) stated that population levels in their settlements had increased. In Sivas, this was attributed to higher birth rates. Osmaniye, recently separated from Adana province, is composed of several isolated settlements (known as 'forest villages') with limited access to educational and health facilities, potentially hindering access to birth control.

  - ***In-migration:*** approximately 18% of the surveyed settlements, including six of the eight district capitals, have experienced 'stepped' in-migration from nearby settlements[2]. Erzincan has been the most popular destination for migrants (six of the 12 surveyed settlements have experienced in-migration), particularly in the rebuilding phase following the *'Erzincan earthquake'* in 1992 after which the State undertook an extensive infrastructure investment programme[3].

  - ***Out-migration:*** all rural areas, with the exception of Adana and Erzincan, have experienced out-migration. Sivas has experienced particularly high out-migration (notably of Alevi Muslims). Limited employment opportunities are the most common cause of out-migration according to the surveyed Muhtars (See Box 5.10). Some households, for example in Ardahan, are dependent on income sent from family members in Istanbul, Ankara, Izmir and European countries.

- **Seasonal Migration of Individuals**: this is driven by factors such as lack of employment opportunities, seasonal unemployment during the winter, and a shortage of education facilities in settlements. Approximately 8% of surveyed households have family members living outside of their (generally rural) settlement for some part of the year. Seasonal migration levels are particularly high in Kars, Gumushane, Sivas and Kayseri, where overall seasonal migration involves 10-15% of settlement inhabitants.

1 Birth rates exceed death rates (correlating with access to medical care, family planning, education levels etc).

2 'Step-wise' migration is common throughout Turkey and is where villagers firstly migrate to local district centres, before later moving to larger more distant metropolitan centres and then potentially to other European countries.

3 This provided incentives for the expansion of existing small businesses, creating an impetus for change. Hence a livened economy and credit incentives culminated in regional development. Many of the migrants were Alevi Muslims who now comprise 44% of the surveyed population in Erzincan.

On the whole, teenagers are the most common seasonal migrants (57% of seasonal migrants) followed by the household head (41%). 82% of individuals living outside of their settlement send money home to their household and tend to live outside the settlement between January and May when there is less agricultural work to be had.

- **Seasonal Migration of Entire Settlements**: in some provinces, whole households and often most of the villagers leave their settlements for the winter. This is particularly common in Kayseri. In some cases, those leaving the settlements during winter return in the summer months specifically to harvest crops and undertake agricultural activities. Some of these households maintain a house in a district centre or larger settlement and only use the village property during harvesting months. In other cases, the village property is shared by more than one family thereby enabling a winter residence to be maintained elsewhere. This scenario is the most common, as it unlikely that many villagers have more than one well-maintained residence, particularly given their dependency on agricultural activities as their main source of livelihood.

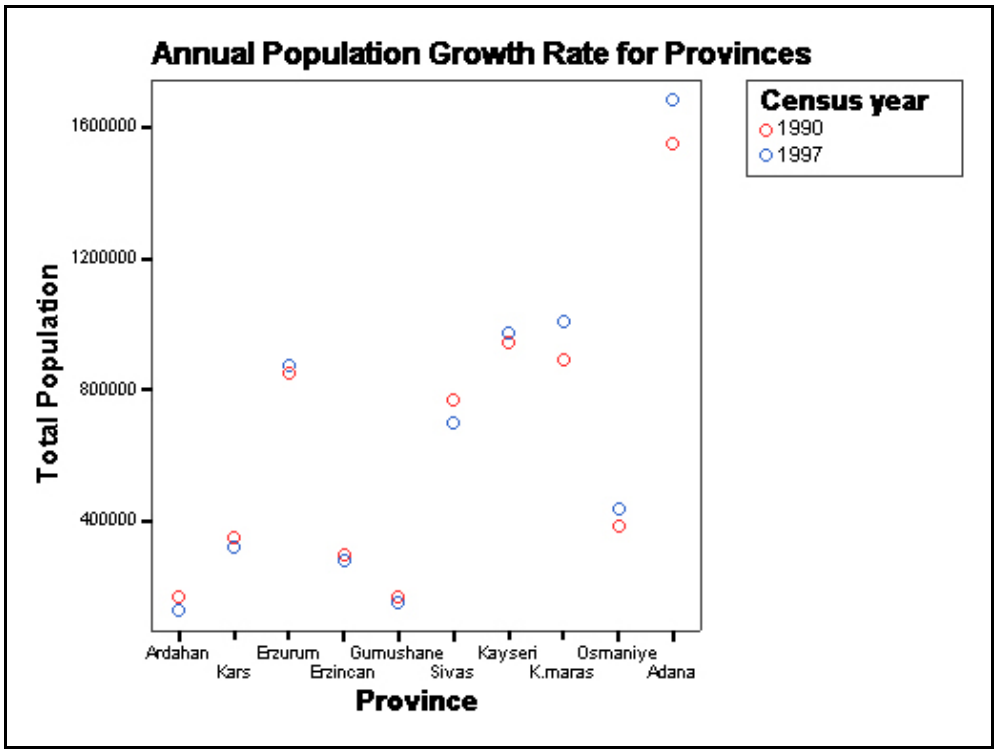


Figure 5.24 Annual Population Growth Rate between 1990-97 for Surveyed Provinces

Box 5.10 Reasons for Migration

'A lack of adequate utilities such as a school and health clinic leads to migration from our village during winter'
(Source: Community Meeting, Gumushane).

'There is migration to district centres or nearby cities during winter due to a lack of schooling services in the village.' For example, around 80% of the population of Tekneli village migrate to Adana during winter due to unemployment and inadequate schooling facilities in the village.

(Source: Community Meeting, Kayseri)

5.12.4 Gender distribution

The gender ratios for the pipeline provinces as a whole and for the surveyed settlements are relatively even [Ref 29].

Only Erzurum, Gumushane and Osmaniye exhibit slightly elevated levels of females, most likely explained by the out-migration of males seeking employment. The imbalance is most marked in surveyed settlements in Osmaniye (eg 57% females to 43% males). Linked to this, Osmaniye is ranked the lowest of the surveyed provinces in terms of levels of wealth (a combination of income and assets), a key 'push' factor for male out-migration.

5.12.5 Age distribution

Both Census data for each pipeline province and survey data for each of the surveyed settlements, indicate that there are more children in the northern provinces than in the south. For example, at least 40% of the population comprises of children or teenagers under the age of 18 in: Ardahan (41%); Kars (42%); Erzurum (42%); and Osmaniye (50%). These findings correlate with the larger average household size (at least six members) in each of these provinces, substantiating the finding reported earlier, that families in these provinces have more children (see Section 5.12.2).

In the southern provinces, Census data show age pyramids of a different structure. The percentage population of elders (>55) is low (for example 8% in Adana, Osmaniye and Kahramanmaras). There are two possible explanations: 1) people die at a younger age in these provinces as indicated in the survey of settlements neighbouring the marine terminal; and/or 2) these provinces include a larger number of young migrants mostly from South-Eastern Turkey.

5.12.6 Religion

The religious composition of the people that reside within the pipeline corridor provides an indication of socio-cultural values and beliefs, levels of conservatism, and the existence of different ethnic groups within the survey area. All of these factors have implications as to the nature and extent of impacts likely to be experienced within the pipeline corridor, particularly with regard to disturbance from construction camps and the associated workforce on neighbouring settlements, and for ensuring distribution of benefits to the different ethnic groups.

1997 Census data[1] suggest that 99% of the population of Turkey is Muslim (See Plate 5.46). Although the census does not provide specific information on different Muslim sects within this religion, it is common knowledge that there are two main Muslim sects in Turkey, the Sunni and the Alevi. These sects usually live side-by-side without discordance, although inter-marriage is rare.

Of the 88 surveyed settlements, 20 have Alevi inhabitants. These are located in Ardahan, Gumushane, Erzincan, Sivas, Kayseri and Kahramanmaras. Of these, only ten settlements (according to the Muhtars) are exclusively Alevi[2], four are less than 50% Alevi and the remaining six less than 10% Alevi. Settlements with a significant concentration of Alevi tend to be associated with generally smaller families and higher levels of education and literacy.

1 The latest census data (2000) is not yet available for all ten provinces through which the pipeline passes, therefore 1997 Census data is used.

2 It is politically incorrect in Turkey to ask individuals whether they are Alevi. Therefore, this question was only posed at the settlement level and the Muhtar was asked to respond on behalf of the inhabitants.

Plate 5.46 Mosque in Kayseri

5.12.7 Language

Since 1965, no official data have been collected on ethnicity in Turkey. It was advised that the baseline survey use language as a proxy for ethnicity for a number of reasons, not least because villagers themselves tend to not want to be identified as inhabiting, for example a 'Ciracasian' settlement and secondly, because it is politically insensitive to discuss ethnicity[1]. As with religious composition, languages within the pipeline corridor can be used to provide an indication of socio-cultural values and beliefs, levels of conservatism and the existence of different ethnic groups within the survey area. In the last five decades, rural to urban migration has significantly increased cultural mixing throughout Turkey, particularly in the larger settlements. This trend was observed in the surveyed communities. The following conclusions emerged:

- **Turkish:** is the official and most widely spoken language in Turkey. It is understood and spoken by almost all of the respondents in the survey (see Figures 5.25 and 5.26).

- **Kurdish:** 24 of the surveyed Muhtars (out of 96 settlements[2]) stated that Kurdish is spoken by some inhabitants of their settlement. These settlements are generally not homogeneous Kurdish settlements, but comprise a mixture of different ethnic groups. They are scattered throughout the pipeline provinces. According to the settlement survey, Kars was the province with the largest population of Kurdish speakers. A small proportion (0.2%) of household surveyed in Kars ranked Kurdish as the first language spoken by the household and 57% as the second language. The highest number of surveyed households ranking Kurdish as their first language was in Kayseri (4% of respondents), whereas in Gumushane and Ardahan, 17% and 13% of surveyed households respectively speak Kurdish as their second main language. Nevertheless, for the majority, Kurdish has lost its primacy in everyday language and a mixture of Turkish and Kurdish is spoken.

1 It is important to bear in mind that there is not always a direct correlation between Kurdish speakers and population of Kurdish origin because other groups will also speak Kurdish. Religious differences were often emphasised during the survey more than ethnicity, with respondents in some of the villages visited rejecting their ethnicity and cultural identity. Source: KORA, Middle East Technical University (*pers. comms*). [Ref 7]

2 This only accounts for those Muhtars surveyed during the pipeline settlement surveys and does not include the responses of Muhtars from additional consultation undertaken (eg at the pump station, marine terminal, construction camp locations or via telephone interviews).

- **Circasian[1]:** the third most commonly spoken language in the surveyed settlements (primarily as a second language) is Circasian (in 4% of the surveyed settlements). The majority of Circasians (both men and women) also speak Turkish and only rarely speak dialects of Circasian. Only two Muhtars stated that a majority (80% and 100%) of their settlement inhabitants speak Circasian. The Circasians are known for their strong traditions and efforts to preserve their cultural identity.

- **Other:** Arabic, Azeri and various Eastern European languages are also spoken by some inhabitants within the surveyed settlements. There is a low concentration of Arabic speakers in the surveyed settlements most likely correlated with settlement *Imams* (religious officers) and those graduated from Imam Hatip High Schools (religious vocational schools) rather than ethnic Arabs. Migrants who arrived from Slavic countries throughout the 20th Century are generally the main speakers of East European languages.

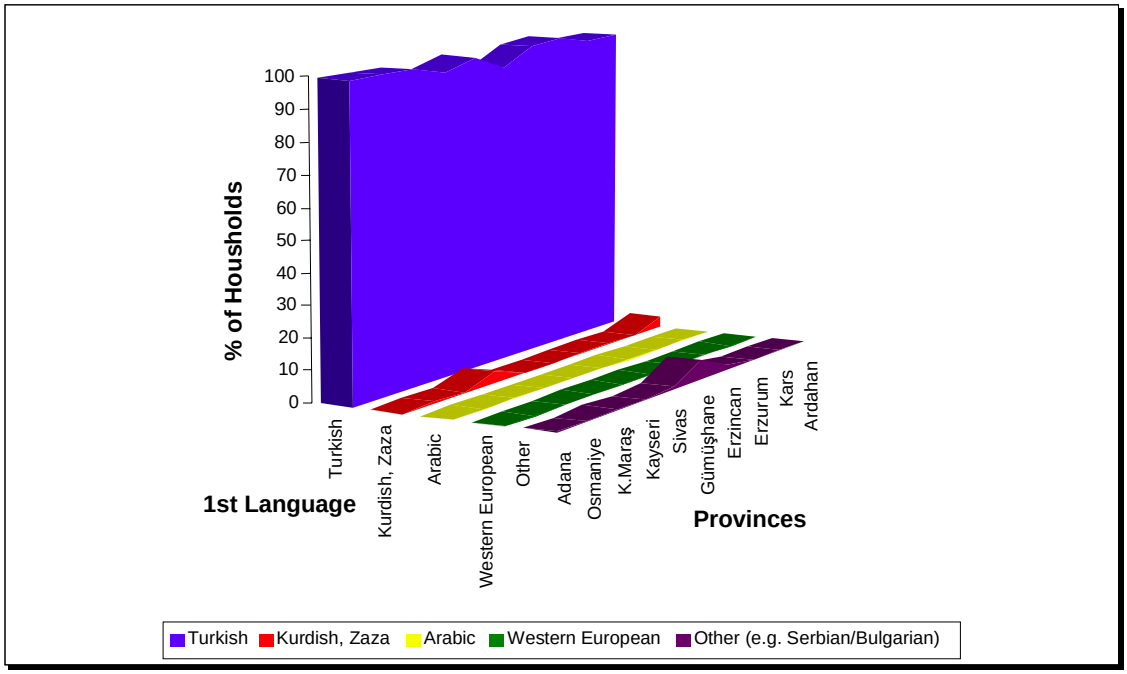


Figure 5.25 Primary Language Spoken in Surveyed Households

1 The Circasians are by origin from the Caucasus, but migrated to Anatolia approximately 150 years ago. They are scattered all over Anatolia, but there is a significant concentration in Kayseri and Kahramanmaras.

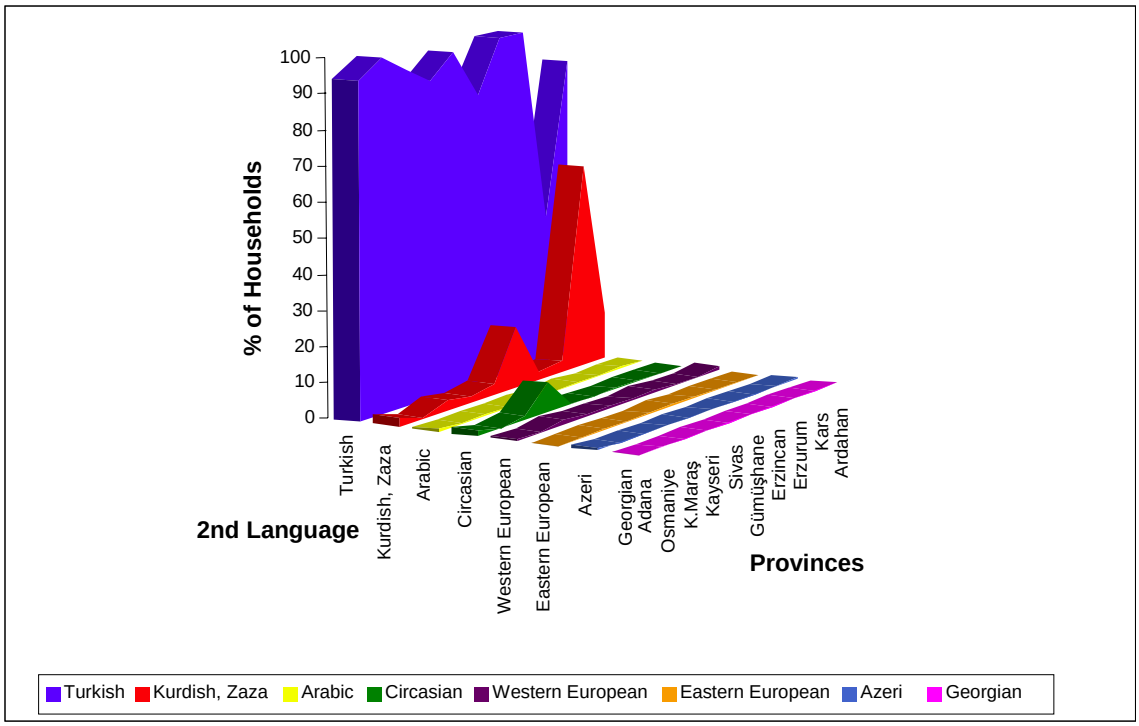


Figure 5.26 Secondary Language Spoken in Surveyed Households

Information on the relative availability of health and education facilities for each of the different ethnic groups is provided in Section 5.15.

5.12.8 Social traditions

The following social traditions characterise the surveyed settlements.

- **Village Elders:** the village elders (both men and women) are viewed as the prime source of wisdom and experience within a settlement. They are responsible for passing cultural traditions and village history to younger generations and are perceived as primary contributors to community stability and development. Often community organisations, pioneered by village elders, contribute to village development, revitalisation and mobilisation. During the consultation, village elders were seen to be both respected and influential.

- **Gender Roles:** generally women enjoy less status within families and within the community than men. Men are the owners of most of the land and business enterprises and are generally better educated. Women are often less informed and secluded from intra-family and village affairs. Women were more difficult to engage in the consultation process (partly because of domestic duties) and, when spoken to, were notably more interested in health and safety issues. However, the position of women varies with ethnic and religious groups, and according to their wealth and education. For example, the Alevi Muslims claim to have a more egalitarian relationship between men and women and in general, the Circasian and Alevi women were more forthcoming and interested in the pipeline issues. In one Circasian village (Tasoluk), women were keen to work in pipeline construction.

- **Conservatism:** although there exist provincial variations, the eastern parts of Turkey are typically the most conservative for a number of reasons (see Plate 5.47). Broadly it can be said that conservatism could be a factor of an individual's socio-economic

situation, educational qualifications or could be attributed to regional traditions. More specifically, and firstly, these areas have only recently begun to experience industrial development and until recent improvements in the road network, were more isolated. Hence inhabitants in such areas are less use to seeing 'outsiders' and have a more closed community structure. Secondly, religion is increasing in importance in some eastern provinces such as Erzurum, where religious observance within close knit communities leads to a more conservative existence. For example, a number of settlements in northern Kahramanmaras are characterised by religious 'conservatism'. Thirdly in some areas, tribal networks also exist, although they appear to be losing importance. In Kayseri, the 'conservative' structure of some settlements (generally of the Avsar[1] Tribe) has deterred out-migration. Women from these more conservative settlements are rarely exposed to outsiders. This attitude was evident in the reluctance of men in certain settlements to allow women to attend the consultation meetings.

Feedback from consultation reflecting social traditions is provided in Box 5.11.

Plate 5.47 Women in Conservative Dress in Yurtbasi, Erzincan

1 Avsar Turks are a Turkish (Turkomen) tribe of Central Asian origin commonly found in Kayseri and Kahramanmaras.

Box 5.11 Community Feedback on Social Traditions

One villager whispered in the ear of a consultation meeting facilitator that he and his friends *'want to work in the Project with our families even though it is against our social norms. We want to break these norms as the younger generations*'.
Source: Construction Camp Consultation Meeting, Erzurum

Mehmetbey is a Circasian village with reportedly strict traditions and social norms. Villagers identify themselves as a '*tribal community'*. The young males requested a meeting in a separate room to the other men in the village as '*the young people cannot talk while the elders are present'*.
Source: Construction Camp Consultation Meeting, Kahramanmaras

Villagers from Cayirtepe are concerned that *'foreign workers may disturb the social relations* [*of the village*] *because of the cultural difference'*.
Source: Community Meeting, Erzurum

Concerns were expressed during consultation about the potential behaviour and nationality of construction workers and their impact on local communities, reflecting the social traditions and cultural values of certain settlements towards 'outsiders'.

'*Workers must be recruited from Erzurum, because foreign workers may disturb the social relations because of cultural differences'*
Source: Consultation in Erzurum

Villagers are very conservative and caution should be taken by construction workers to avoid inappropriate behaviour.
Source: Observation from Consultation in Gumushane

5.12.9 Demographic summary

Table 5.25 below summarises the demographic data collected by province.

Table 5.25 Demographic Summary by Province

PROVINCE	POPULATION CHARACTERISTICS OF URBAN AREAS *	POPULATION CHARACTERISTICS OF RURAL AREAS *	PROVINCE POPULATION DENSITY perkm^2**	GENDER DISTRIBUTION (F/M) (%) *		AGE DEPENDENCY RATIO***
Ardahan	Some in-migration	Out-migration	-	49	51	-
Kars	-	Some out-migration	36	52	48	0.75
Erzurum	Stable	Some out-migration	47	49	51	1.00
Erzincan	Some in-migration	Stable	34	52	48	1.20
Gumushane	-	Some out-migration	26	52	48	0.98
Sivas	Some out-migration	Out-migration	27	51	49	1.04
Kayseri	Some out-migration	Some out-migration	56	49	51	1.14
Kahraman-maras	In-migration	Some out-migration	62	51	49	0.98
Osmaniye	-	Some out-migration	-	57	43	1.15
Adana	-	Stable	112	50 [1]	50	1.15

* Source: [Ref 31]. Not all provinces surveyed have urban areas (district centres) within the 4km corridor.
** Source: 1990 Census, Statistical Yearbook of Turkey, 1993. This source does not include information for Ardahan and Osmaniye, as they were not independent provinces at this time.[Ref 43]
*** Defined as the number of working adults between the ages of 15-54 per dependent (children <19 and retired adults >55)

5.13 LAND OWNERSHIP AND USE

5.13.1 Overview

As described in Section 4, the pipeline will require the temporary occupation of 20m (with the exception of forest areas which will be 14 m) and a permanent land take of 8m of land[2]. In specific locations land take will be reduced to avoid sensitive ecological and archaeological resources. Determining the impact of this loss requires an understanding of existing landownership patterns, land use and the availability of land in the area. The following review of land use, covers both crops and livestock and the seasonality of these activities. This allows for an understanding of their relative importance as sources of livelihood, and thus, the extent of the impact associated with the loss of land.

Land will also be required for the three main construction camps (temporarily); four pump stations, one pressure reduction station and 52 small block valve stations (permanent acquisition); additional land will be required for the construction camps at each of the AGIs and for access roads, during both the construction and operational phase. Should these sites be

1 Although an uneven gender balance was very marked in the settlements neighbouring the marine terminal development, at the provincial level, Adana exhibits an even gender balance.

2 As no permanent expropriation of forestry lands is allowed, a passage permit of 49 years will be obtained in accordance with Article 17 of the Forestry Law No 6831.

located in areas where availability of land is low, there may be implications for the levels of livelihood in the surveyed settlements.

The pipeline route passes through a number of geographically distinct areas with varying environmental and social characteristics impacting upon resource ownership and use. The route can broadly be divided into the following regions.

- *North Eastern Anatolia*: (Ardahan, Kars, Erzurum) characterised by a harsh climate, generally limited to agriculture and more commonly associated with highland animal grazing (with only small pockets of valley bottom agriculture) through to the more continental climate and steppe grasslands of the Erzurum plain with more intensive irrigated agriculture. The grasslands suffer from erosion as a result of overuse including overgrazing.

- *Central Anatolia*: (Erzincan, Gumushane, Sivas, Kayseri) characterised by a continental climate through to the more arid climate and karst topography of Sivas, where underlying gypsum limits agricultural productivity, causing animal husbandry (sheep are particularly widespread) to dominate.

- *Mediterranean*: (Kahramanmaras, Osmaniye, Adana) characterised by montane steppe associated with the Taurus mountains, flat upland plains cultivated for cereals, and irrigated valleys (eg the Goksun valley) descending onto the wide, flat, fertile, and irrigated Cukurova plain. The latter is intensively cultivated with small fields of vegetables, cereals and warm, dry and temperate conditions. The plain is one of the most fertile parts of Turkey.

Box 5.12 provides an overview of resource ownership and use along the pipeline corridor. This is followed by a more detailed review of land ownership and use culminating in a summary of findings by province.

Box 5.12 Overview of Land Ownership, Distribution and Use along the Pipeline Corridor

Dependency on Land: 65% of households surveyed along the pipeline corridor (rising to 82% of rural households) *own* or *use* land. The remainder are not directly dependent on land as a source of livelihood.

Land Ownership: 62% of land belonging to the surveyed settlements is *privately owned* and *used*. *Communal* land is the second most common form of landownership particularly in northern and central Anatolia, where animal husbandry is more important. *State* land replaces communal land in the southern provinces of Adana and Osmaniye. Few households have land titles for their largest land plot, including 79% and 52% of households in Kars and Ardahan, but dropping to 3% in Erzurum. The average land holding is 68 hectares, ranging from 35 hectares (Gumushane) to approximately 100 hectares (Kars). Land holdings broadly decrease in size towards the southern portion of the pipeline where there is increased competition for land.

Land Distribution: there is unequal distribution of land between households in the pipeline corridor. Land is particularly unevenly distributed in southern provinces (with the exception of Osmaniye). Households in northern and central provinces have access to a large number of land plots suggesting a greater degree of fragmentation but also indicative of the mountainous terrain and the distribution of potentially cultivable land.

Land Use - Crops: grain is the most commonly grown crop (used primarily for animal feed and household consumption) although sugar beet replaces grain in some areas of Erzurum, where it is refined in nearby industrial facilities. Kahramanmaras has high crop diversification correlating with greater availability of irrigation in its southern region. The majority of households produce only one crop per year with the exception of a few households in Adana where irrigation makes multi-cropping possible. Two thirds of surveyed households use seasonal irrigation facilities, with notably high use in Gumushane and Erzincan.

Input costs are highest for cotton, followed by sugar then grain. Costs are particularly high in Adana due to greater use of seasonal employees, irrigation and high cotton production and in Ardahan where there are a small number of market gardens. Adana and Osmaniye exhibit elevated grain production relating to the high agricultural fertility of the Cukurova plain. 75% of settlements surveyed have experienced a recent decrease in agricultural productivity.

Land Use - Livestock: cattle are the dominant form of livestock followed by sheep – the latter being particularly important for households in Gumushane, Erzincan and Kayseri. Ardahan leads cattle production and exhibits the highest average herd size of nine (higher than an approximate average of four for Turkey). Small herds in Adana, Kahramanmaras and Osmaniye indicate subsistence farming and potentially a shortage of grazing land. Seasonal grazing is common in Kahramanmaras and Gumushane, and takes place throughout the pipeline corridor between April and October (primarily on communal land). 6% of households graze livestock throughout the year, although predominantly in the southern provinces. Goat herding is most evident in the more mountainous provinces (eg Osmaniye, Kahramanmaras and Gumushane).

Land Use - Bee Keeping and Fishing: bee keeping is important for 82%, 76% and 62% of settlements in Kars, Kayseri and Sivas respectively although only a small number of households are dependent on bee keeping as their main income source. Fishing is important, mostly for household consumption, in 30 settlements (five and six of which are in Sivas and Kahramanmaras respectively).

(Source: [Ref 31])

5.13.2 Land ownership and distribution

In accordance with international standards, a detailed study of land acquisition is currently being undertaken to address land impacts along the pipeline corridor (see the overview of the land acquisition process in Appendix C9). This study will ensure that all affected persons are fairly and equitably compensated for their land and assisted in restoring their livelihoods. As stated in Section 5.13.1, State forestry lands cannot be purchased in accordance with the Forestry Law No 6831, a usage permission of 49 years will be obtained for routing through such land under Article 17 of the same law.

The process will provide more detailed information on the different forms of resource ownership. However, the settlement and household surveys undertaken as part of this EIA have found the following.

- **Dependency on Land:** of the 65% of surveyed households owning or cultivating land, 82% are located in rural areas and 33% in urban areas. This suggests that between 18-35%, of the population (rural and urban) along the pipeline route are landless and dependent on other sources of livelihood. In excess of 80% of surveyed households in Kars, 85% in Gumushane and 82% in Osmaniye use or own land as a source of livelihood whereas commercialisation of agriculture in the southern provinces (eg Adana and Kahramanmaras) has meant that fewer households between 30 – 50% are dependent on other sources of livelihood.

- **Land Ownership in Turkey:** the state has *historically* been the largest landowner in Turkey – a direct legacy of Turkey's imperial past. This has spawned a diversity of land ownership patterns evident in present day Turkey including: 1) state owned (although often used informally by local villagers); 2) privately owned with or without title deeds and either owner cultivated or rented; and 3) communally owned by the settlement inhabitants (eg grazing areas, and not cultivated land, as defined by law). Leased land or land shared between the family can also be sharecropped where payment is in kind[1] to either the landowner or to other family members (see Figure 5.27 and 5.28).

- **Land Ownership in the Pipeline Corridor:** the largest proportion of land within the pipeline corridor (62% of surveyed settlement land) is owner cultivated. Communally owned land is the second most common (19%) followed by state land (7%). Only 6% of land is *'used but not owned'* ie land is leased out by absentee landowners (see Figure 5.28).

  - **Owner cultivated:** the percentage of owner cultivated land is highest in Kars, (75% of land in surveyed settlements), Kayseri (75%) and Erzurum (73%). Less than 50% of land in settlements surveyed in Adana and 54% of land in settlements surveyed in Sivas own and cultivate their own land. This correlates with a broad trend in these provinces to rent land.
  - **Communal land:** Kahramanmaras, Ardahan and Sivas have the highest percentages of communal land, 36%, 33% and 27% respectively. In northern provinces, communal land is mostly used for animal grazing. For example, in Ardahan, Kars and Erzincan more than 90% of communal land is used for animal grazing compared with 50% in southern provinces, an indication of the declining importance of animal husbandry in the latter. Only in 5% of surveyed settlements (all in the north) has a formal decision been taken to make use of communal land. For example in Akcakale (Kars) the Privy Council of the Governor played an important role in deciding the use of communal land, allowing villagers to informally divide state pasture land amongst themselves.
  - **State owned:** State owned land replaces communal land as the second most important ownership type in the two southern provinces of Osmaniye and Adana. The latter in particular has experienced a high proportion of state land expropriation for a number of development projects (eg the Adana-Yumurtalik Free Trade Zone close to the existing BOTAŞ Marine Terminal in Ceyhan).

1 eg a share of the output for example, grain, meat, eggs rather than a cash payment.

- **Land Titles**: the percentage of households currently using land without a title deed is notably high in the northern provinces of Kars and Ardahan (79% and 52% respectively). Conversely, only 3% of respondents in Erzurum stated that the largest piece of land currently used by their household is without a title deed. There exist a number of reasons why a land user may not hold a legal title for his/her land: 1) the land is leased from a non-family third party; 2) the land officially belongs to the state or a private owner but is unofficially occupied by the user; or 3) land is officially owned by a deceased person because of unregistered transactions. Insecurity regarding expropriation of land due to lack of title deeds and compensation is discussed in Box 5.13.

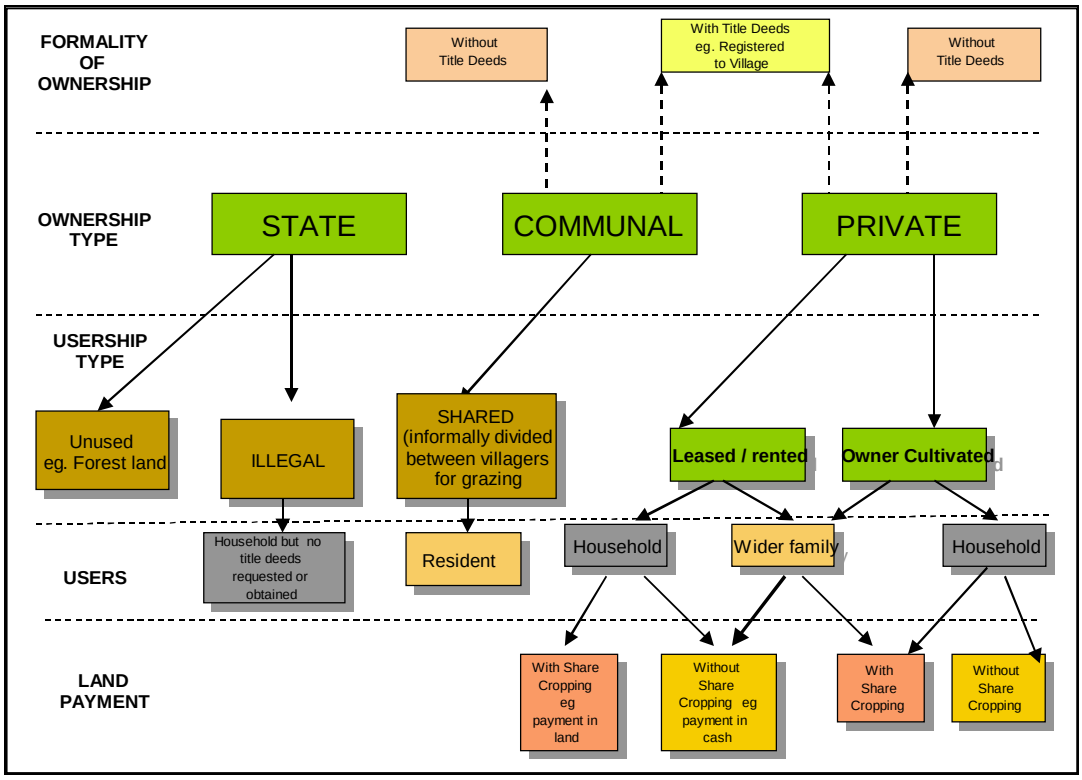


Figure 5.27 Summary of Land Ownership Types

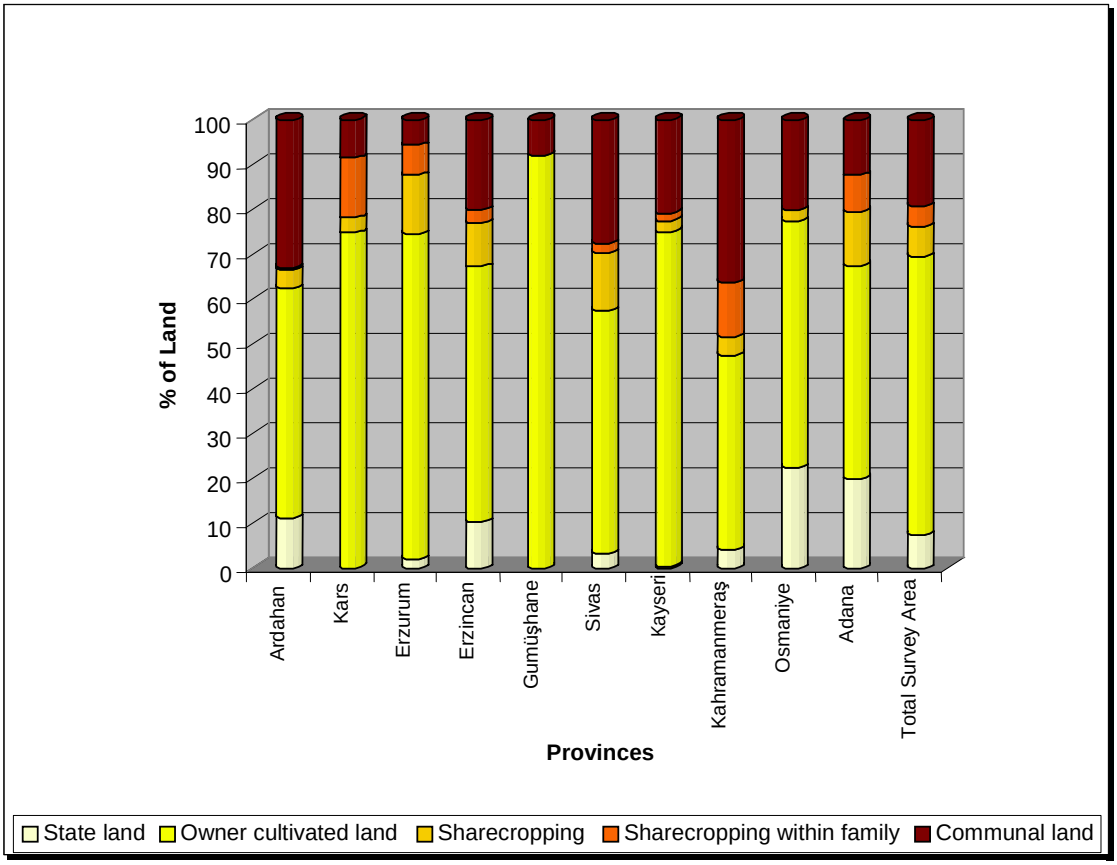


Figure 5.28 Land Tenure in the Surveyed Provinces

Box 5.13 Respondent Concerns over Land Tenure

Most of the land users in the region do not have a legal title deed, only right of possession/proprietorship. The dominant form of resource ownership is petty ownership, where land is in the process of fragmentation associated with inheritance. Land registers are also regarded as outdated.
(Source: Observations from Kahramanmaras Consultation Meetings)

Villagers asked about payment for trees that may be felled during construction, how the payments will be determined and what criteria will be applied for trees of different ages and species.
(Source: Consultation of Osmaniye)

Concerns over the potential impacts of construction on land tenure were commonly raised.
"However hard you try to convince me [otherwise], this pipeline is going to destroy my land and my crop, no matter what you tell us, I know one thing for sure: the productivity of my field will decrease. My field will become useless."
(Source: Consultation in Kahramanmaras)

Some villagers are keen to receive expropriation payments for their lands that have low yields.
(Source: Consultation in Kahramanmaras)

In some parts of Adana the land is irrigated and fertile and it is likely there will be high demands for expropriation payments. In other areas there are settlements mostly using State land with few title deeds.
(Source: Consultation in Adana)

The members of the village stated "*we will not let anyone on our land if money has not been deposited in our bank accounts for land acquisition*".
(Source: Consultation in Kahramanmaras)

- **Average Land Holding:** the average holding for surveyed households in the pipeline corridor is 68 hectares per household. This is less than the average of approximately 111 hectares for Turkey in 1991, [Ref 30], although it is likely that subsequent fragmentation could have reduced this national average (see Figure 5.29). Landholdings are smaller in southern provinces of the pipeline compared with the North Eastern and Central Anatolian provinces (eg Kars, Erzurum, Erzincan, Sivas and Kayseri) where holdings are in excess of 80 hectares. This correlates with the higher population densities and land fertility experienced in southern provinces, which has increased land competition and reduced landholding size in these southern provinces. For all surveyed provinces, average land holding size can be categorized as medium in size with the exception of Kars where land holdings in this low density more hostile environment are upper-medium in size (eg 101 hectares) [1].

- **Sale and Purchase of Land:** limited sale and purchase of land occurs in the surveyed provinces. Changes in resource ownership are mainly the result of inheritance culminating in further fragmentation. However, the land market is more active in Adana, the most economically developed province. With the absence of an active market, there is little information on land prices.

- **Land Fragmentation in Turkey:** the transition from the old Ottoman Empire to the Republic in 1923, was accompanied by a complex process throughout Turkey of land concentration (into the hands of a minority), and fragmentation (into the hands of many) resulting in a complex mosaic of ownership with no distinct geographical pattern. A common practice in Turkey, although not officially recorded, is 'petty' ownership. This is where land is fragmented by inheritance into many smaller plots, and in many cases the legal heirs may not have completed the formalities for land transfer.

- **Fragmentation in the Pipeline Corridor:** the average household in the pipeline corridor owns or has access to just under five physically separate pieces of land, indicating a high degree of land fragmentation (see Figure 5.30 Average Plot Size). When compared to the survey average household landholding of 68 hectares this suggests an average plot size of 13 hectares. Households in southern provinces have fewer land plots compared with northern and central provinces, where households have access to a larger number of plots indicating greater fragmentation. For example, households in Kars own on average just under seven plots compared with three plots in Adana where land competition, increasing land sales and more nuclear households has resulted in fewer plots per household.

- **Land Distribution**: there is a considerable inequality in the distribution of land. This is clearly shown in Figure 5.29 (Mean and Median Land Holding) where mean land holding for each province is larger than the median suggesting an uneven distribution with a few landholders owning large land plots, skewing the results and raising the mean [2]. The following conclusions can be drawn.

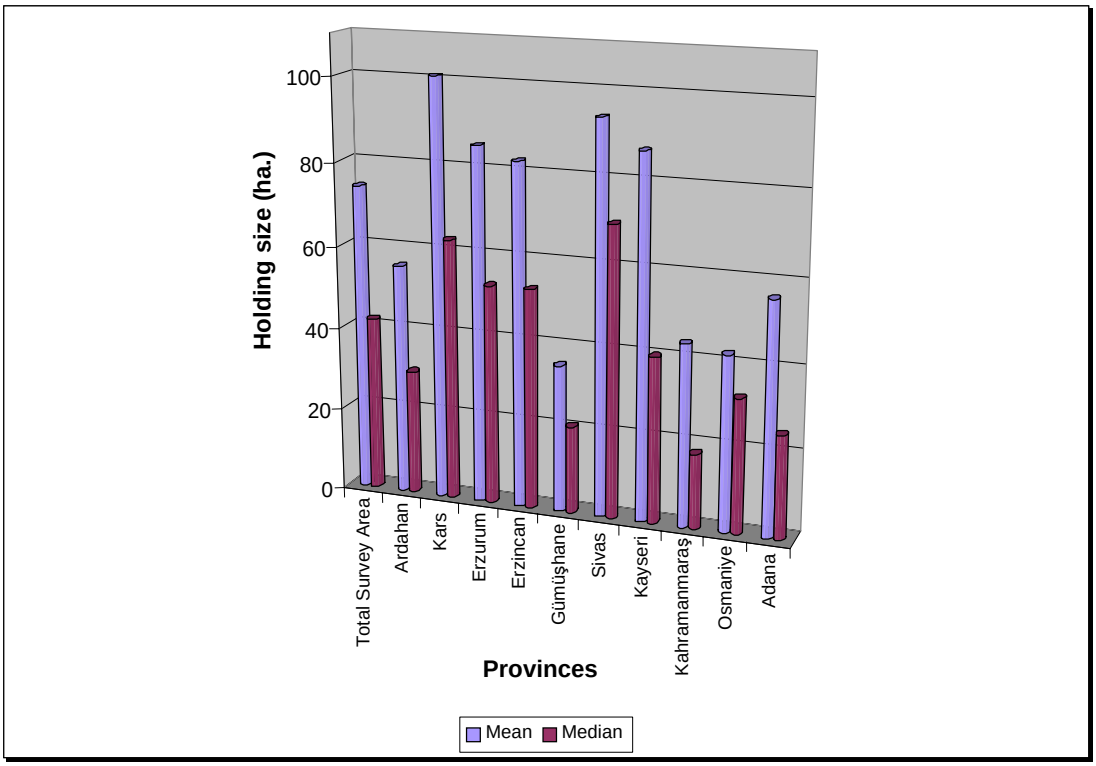
    - Nearly 15% of all households surveyed along the pipeline route own or cultivate land plots smaller than 10 hectares. This is generally considered insufficient even for subsistence farming particularly if the land is poor. Despite the number of

1 Land holdings have been categorised as follows: small (0-19 hectares); medium-sized (20-99), upper medium-sized (100-500), and large (500+).

2 Both mean and median are measures of the "average" of a given sample. The mean (or arithmetic average) is the sum divided by the sample number. The median is the central number once all values are ordered from smallest to largest and is therefore not sensitive to extreme values (unlike the mean).

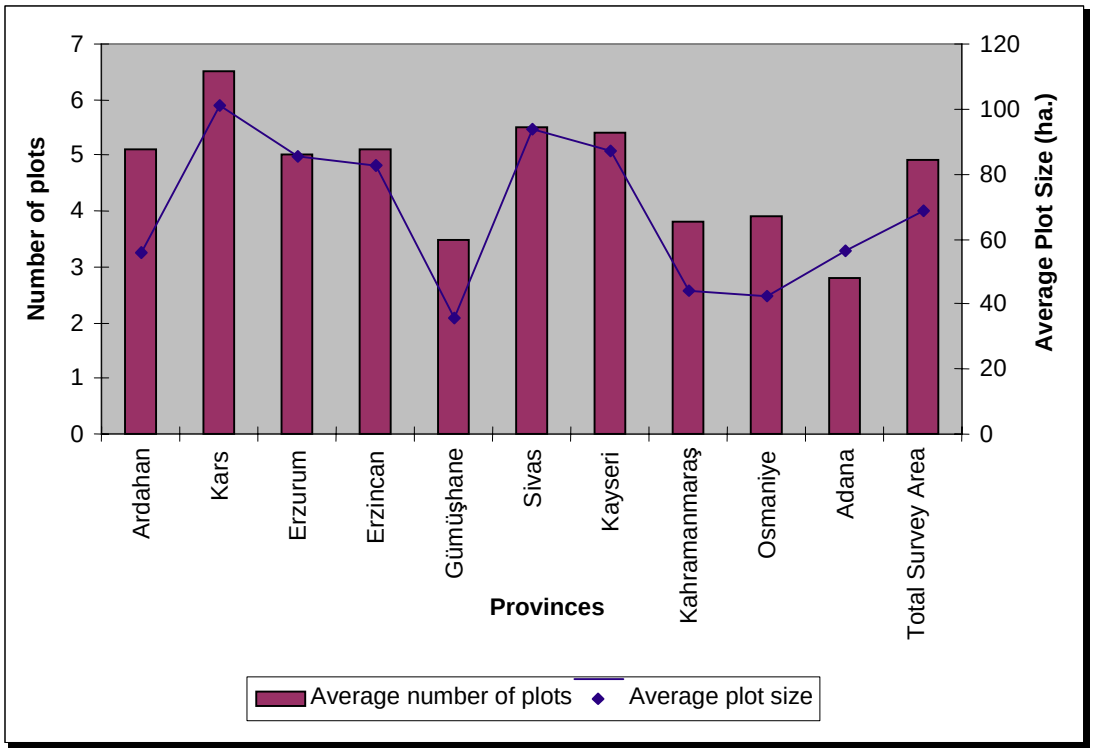
households with less than 10 hectares, this land in total comprises a very small percentage (1.4%) of all land used/ owned in the pipeline corridor.

- 50% of households own or cultivate land holdings of less than 30 hectares, yet still own only 13% of all land in the pipeline corridor.
- Fewer than 18% of all surveyed households own 56% of all land in holdings of more than 100 hectares.
- Land is unevenly distributed, particularly in the southern provinces (with the exception of Osmaniye), where large amounts are held by a small number of landowners. For example, in Kahramanmaras, the top 5% of landowners in this province own just over 51% of the land. This correlates with the position of Kahramanmaras as a transition province between the northern region (comprising high altitude valleys suitable only for small scale land owners) and the milder and flatter southern area with more fertile and irrigated land more suitable for large-scale intensive farming. Inevitably, land distribution varies between rural and urban areas.



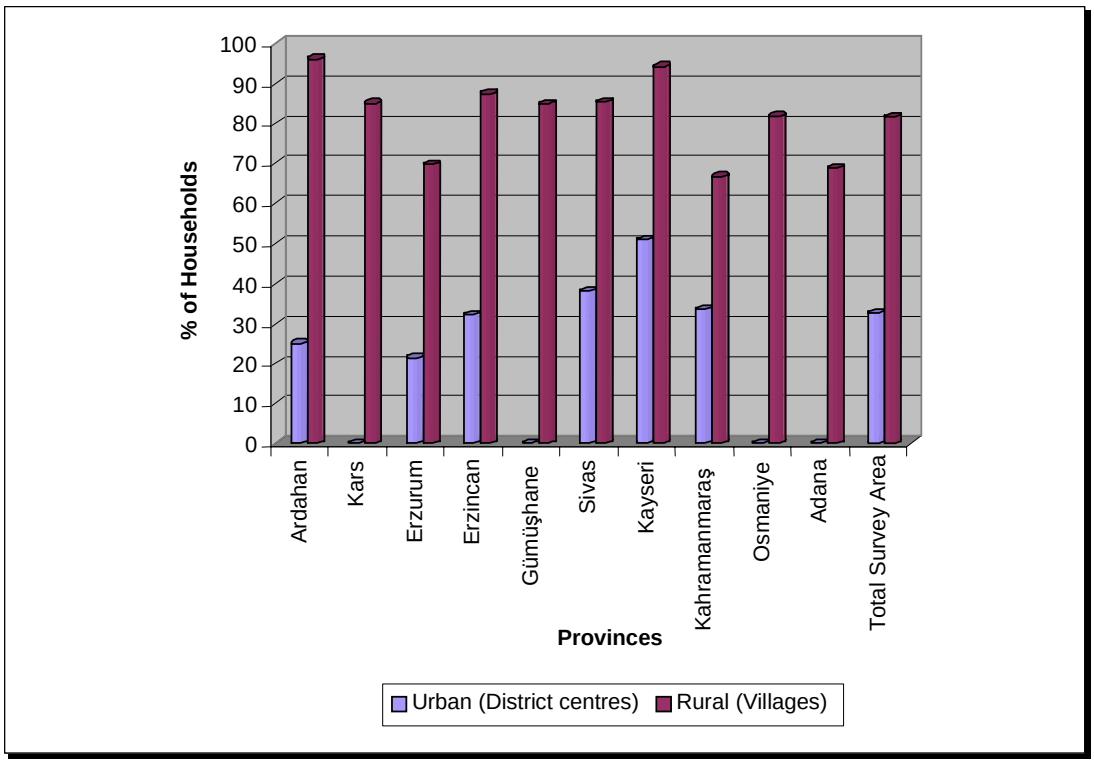
Source: Household Survey 2001 [Ref 31]

Figure 5.29 Mean and Median Land Holding Sizes in the Surveyed Provinces



Source: Household Survey 2001 [Ref 31]

Figure 5.30 Average Plot Size and Number of Plots in the Surveyed Provinces



Source: Household Survey 2001 [Ref 31]
N.B Only six surveyed provinces include urban areas (eg district centres) within the 4km corridor.

Figure 5.31 Ownership and Cultivation of Land in the Surveyed Provinces

5.13.3 Soil capability

Agricultural land in Turkey is classified according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use for food production. Table 5.26 below provides the relevant definitions of the General Directorate of Rural Services (GDRS) soil capability classes.

Table 5.26 Land Use Capability Classes and Suitability for Cultivation

Capability class	Suitability for cultivation	Agricultural limiting factors
I	Suitable for cultivating most of the crop types.	Very few or no limitations.
II	Suitable for long-term cultivation of a large variety of crops.	Requires special mitigation measures against soil and water losses.
III	Suitable for cultivation of appropriate types of crops, implementing special protection measures. Generally, requires special care when used for agricultural purposes.	Prone to erosion and requires artificial drainage when cultivated.
IV	Suitable for cultivation of a few special agricultural species by appropriate ploughing. Generally, requires special care when utilised for agricultural purposes.	Severe limitations in terms of soil depth, stone content, moisture and slope.
V	Flat or mild sloped, stony or very wet soil, not suitable for cultivation by ploughing. Generally, utilised as meadows or forest area.	Poor drainage and structure not suitable for ploughing.
VI	Not suitable for cultivation by ploughing. Mostly utilized as pastureland or forest area.	Very severe limitations in terms of slope and shallow soil.
VII	Not economical for agricultural purposes, but suitable for poor pastureland or forestation.	Limitations in terms of shallow soil, stone content, slope and erosion.
VIII	Not suitable for vegetation. Can be utilized as recreation area or as shelter area for wildlife.	Devoid of soil.
Source: General Directorate of Rural Services (GDRS)		

Agricultural lands have an important role in the economy and social life of eastern and southeastern Turkey. Approximately 67% of all the soils that the BTC Pipeline Route traverses can be classified as supporting some form of agricultural activity (capability classes I through IV). Furthermore, the highest quality agricultural soils (Capability Classes I and II) constitute approximately one-third (33%) of the soils along the pipeline route. The distribution of the soils with the Capability Classes I and II are illustrated in the baseline sensitivity maps in Supplement 1 to Volume II.

5.13.4 Land-use classification

The distribution of the major land use categories along the BTC Pipeline Route is shown in Table 5.27.

Table 5.27 Land-use categories crossed by the pipeline centreline (%)

	POSOF - HORASAN	HORASAN - CAYIRLI	CAYIRLI - IMRANLI	IMRANLI - SARIZ	SARIZ-CEYHAN	TOTAL (%)
Meadow	12.5	3.7	0.7	1.9	0.4	4.0
Scrub	0.00	0.2	1.4	0.8	14.2	3.3
Rain-fed agriculture (fallowed)	30.1	57.8	26	71.6	17.4	41.6
Rain-fed agriculture (not fallowed)	0.00	0.00	0.00	0.00	15.1	3.0
Irrigated agriculture	1.1	25.8	17.7	4.9	33.3	15.8
Pastureland	53.7	12.1	50.1	20.7	11.6	29.4
Forest	2.7	0.00	2.7	0.00	7.8	2.6
Other	0.1	0.5	1.4	0.2	0.2	0.4
Total length (km)	224.0	193. 5	186.4	248.5	210.4	1,062.74*

- Total length of the route is calculated based on 2-D and Lambert projection system.
- Source: GDRS (General Directorate of Rural Services) maps with a scale of 1:100.000. In addition, consultation with local authorities to obtain information on development planning in the regions traversed by the pipeline was undertaken.

Land use along the BTC Pipeline Route is described below in terms of five distinct sections of the route.

- **Georgian border to Horasan**: rugged mountain scenery with patches of forest and green sub-alpine meadows interspersed with high, gently undulating volcanic plateaux with more arid, stony and rocky steppe grasslands. Sheep and cattle grazing are the dominant agricultural activities on the extensive pasturelands. Population density is extremely low in this section of the route and confined to isolated villages and towns, although some winter ski centres have developed in the Sarikamis area.

- **Horasan to Cayirli and Cayirli to Imranli**: these semi-arid sections are shielded by the Otlukbeli Mountain range to the north and the Palandoken, Munzur and Tecer mountain ranges to the south. Forests and trees are fairly sparse and steppe with scattered shrubs is widely distributed on the plains. A network of irrigation canals and ditches exist in the river basins of the Pasinler and Erzurum plains, which sustain extensive agricultural activities such as cultivation of cereals, sugar beets, potatoes, and fruit orchards. Elsewhere the high pastures are extensively used for grazing livestock, mainly sheep, cows and goats. The principal industrial activities are limited to the Ilica district. Very few small towns and some remote villages are located in these sections.

- **Imranli to Sariz:** this section of the BTC Pipeline Route includes undulating rounded hills, high and low plateaux and plains in the river basins. Irrigated lands are occasionally found in this section. The highland areas are covered by rain-fed agricultural and fallow lands and cereals, sugar beet and potatoes are cultivated. There are only a few hamlets located here, each bordered by hedges and fences surrounded by irrigated lands. Population density is very low and the area is remote from major towns and villages.

- **Sariz to Ceyhan:** the BTC Pipeline Route passes through the Anti-Taurus and Taurus Mountains. Towards the Mediterranean, precipitation increases leading to increasing forest cover, and cultivated fields begin to dominate. Livestock grazing of mainly sheep and goats is dominant in the meadow areas located on the high plateaux. Sparse cultivated fields are present at lower altitudes near rivers and streams where terraces are well developed. Further south the pipeline crosses the alluvial Cukurova Plain. This plain supports extensive agriculture irrigated by a network of canals and ditches. Cultivated fields of mostly cotton, rice and maize dominate the landscape. A high population density has caused farmland to be used for residential dwellings and industrial developments.

5.13.5 Land Use: Crops

- **Type of Crops**: grain crops (eg wheat, barley) are the most widespread crops both in rural and urban areas along the pipeline corridor with the exception of the more urbanised settlements of Erzurum, where sugar beet is more common (see Figure 5.32). Following grain, rural households prefer to produce fodder (associated with low input prices) with the exception of Kahramanmaras and Erzincan where fodder is replaced by vegetables and sugar beet respectively. Urban settlements, particularly in Erzurum and Erzincan, produce higher proportions of industrialised crops (used as inputs in industry) such as sugar beet. Cotton[1] is grown primarily in rural areas of the southern provinces of Kahramanmaras, Osmaniye and Adana – where irrigation is both economically and environmentally more feasible and where mechanisation is available (eg 39% of households in Gumushane have tractors compared to 9% in Gumushane). The availability of mechanisation for agriculture is a key determining factor in the viability of household revenue from agricultural activities. Kahramanmaras exhibits a high rate of product diversification, growing cotton particularly in the southern region and trees for fruit, nuts and timber in the northern high altitude valleys.

Plate 5.48 Hay Bales in Alvar, Erzurum

1 Cotton along with grape plants is broad leaved and therefore more sensitive to dust.

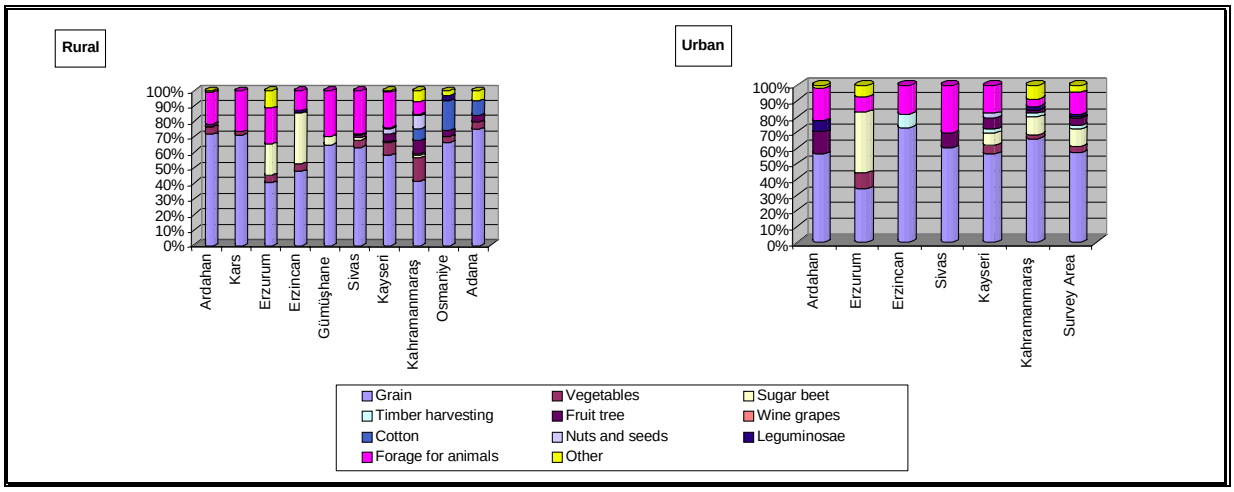


Figure 5.32 Land Use in the Urban and Rural Areas of the Surveyed Provinces

Plate 5.49 Cereal Crop in Osmaniye (Yenigun)

Plate 5.50 Tractor in Erzurum

- **Forestry:** this is a primary employment sector in Kahramanmaras (where wood is used for fuel and/or construction). Fruit tree harvesting is more important in Adana. Approximately 10% of respondents from settlements surveyed in Ardahan are involved in conservation forestry in the Posof Nature Reserve. With the exception of Adana, where fruit bearing trees are grown, forestry is primarily linked with high altitude areas.

Plate 5.51 Logging in Ardahan

- **Cropping Patterns:** for the majority of surveyed households (ranging from 65-98% of those surveyed in each province), only one crop is produced per year. Only rarely (eg in fertile areas with a more amenable climate such as Adana) is multi-cropping carried out. The most important times of year for harvesting are difficult to surmise, as these are crop specific. Usually in surveyed settlements, however, the most important months are March to June in southern areas and June to September in northern provinces.

- **Use of Irrigation:** while according to the Muhtars, two thirds of surveyed settlements have irrigation facilities (see Section 5.15) on land owned and used by inhabitants (see Figure 5.34), 62% of surveyed households do not have access to water to irrigate their own land. This indicates uneven distribution of irrigation within settlements. There are also provincial disparities. For example, all settlements surveyed in Gumushane and Erzincan have irrigation facilities on land owned and used by inhabitants (although 49% and 47% of households respectively have no access). A high number of households in Adana have access to irrigation (correlating with climatic and edaphic [soil] characteristics) enabling maximum yields and profit. Conversely, in Sivas and Ardahan, irrigation is only available in 40% and 27% of settlements respectively.

- **Cost of Production[1]:** average input costs (September 2001) are highest for cotton (USD 1,620 per household per year), vegetables (USD 1,197) and grain (USD 1,007). Conversely, animal fodder production has the lowest average production costs (USD 391) because production is less labour and capital intensive. Agricultural production costs are particularly high for Adana relating to a historical and traditional tendency to employ seasonal workers rather than unpaid family workers. High average production costs in Ardahan also relate to the use of irrigation in the small market gardens owned by a small number of households.

1 Information on costs and revenues associated with different crops have not been normalised to costs per yield per hectare, but should be used as an indicator of costs/ revenue variations between provinces.

- **Crop Yields:** grain productivity is higher in the southern provinces of Adana and Osmaniye (on average approximately 26,000 kg and 14,000 kg per household respectively for the last harvest). This is most likely explained by the more amenable physical and climatic conditions and higher investment (eg in fertiliser) in these provinces. Ardahan experiences the highest levels of vegetable productivity (the provincial average for the last season was 8,500 kg) correlating with high input costs.

- **Changes to Yields:** more than 75% of rural households and 58% of urban households stated that they have experienced a reduction in agricultural production in the last five years. A number of explanations were proposed by survey respondents for this trend including: low rainfall; low agricultural wages; inflation (5% or respondents); pests (5%), the cost of fertilisers (4%); the current economic crisis (3%); unproductive land (3%); and poverty (3%). It is likely that soil erosion from over cropping, particularly in central and northern portions of Anatolia along with overgrazing are also responsible for this trend.

- **Subsistence Versus Market Production:** in general, rural areas are dominated by household consumption (subsistence) of the majority of agricultural products including vegetables, fruit and animal fodder. However, sugar beet is the most common product sold to markets particularly in Erzurum and Kahramanmaras (see Figure 5.33).

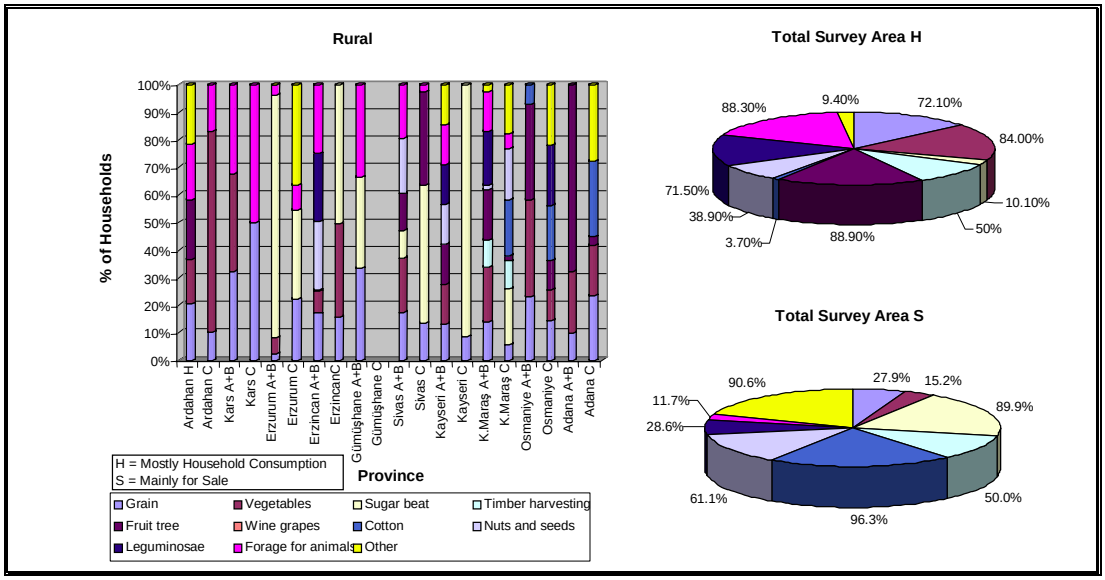


Figure 5.33 Use of Agricultural Products in Rural Areas of the Surveyed Provinces

Figure 5.34 Distribution of Seasonal Irrigation in Surveyed Settlements

Box 5.14 Community Feedback on Agriculture

Harmandali is a unique settlement in that it has established a 'water cooperative' to allow wet agriculture / irrigated farming.
(Source: Consultation in Sivas)

The Mediterranean climate of the region dictates that two crops per year can be harvested. This has implications for higher living standards.
(Source: Community Meeting in Kahramanmaras)

'We are concerned about dust from construction affecting our potatoes, which we cultivate around 100m from the proposed construction site'.
(Source: Community Meeting in Erzurum)

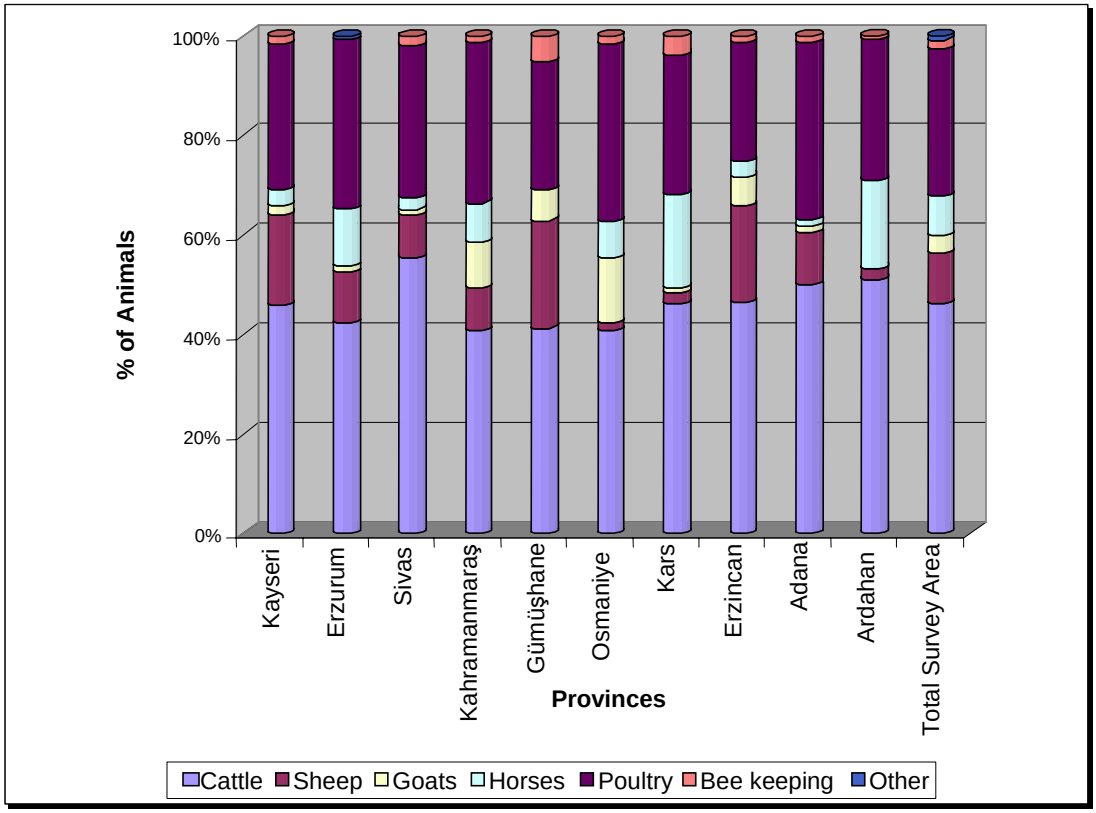
Residents in Tasoluk are also concerned about the impact of dust associated with construction on cultivated land.
(Source: Consultation in Kayseri)

There are a high number of landless peasants (approximately 20 households) in the village who rely on temporary or seasonal employment for their livelihoods.
(Source: Community Meeting in Kahramanmaras)

Residents state *"we will not harvest our crops as usual if the construction will affect it. We want to know the consultation schedule so we can plan our harvests."*
(Source: Community Meeting in Osmaniye)

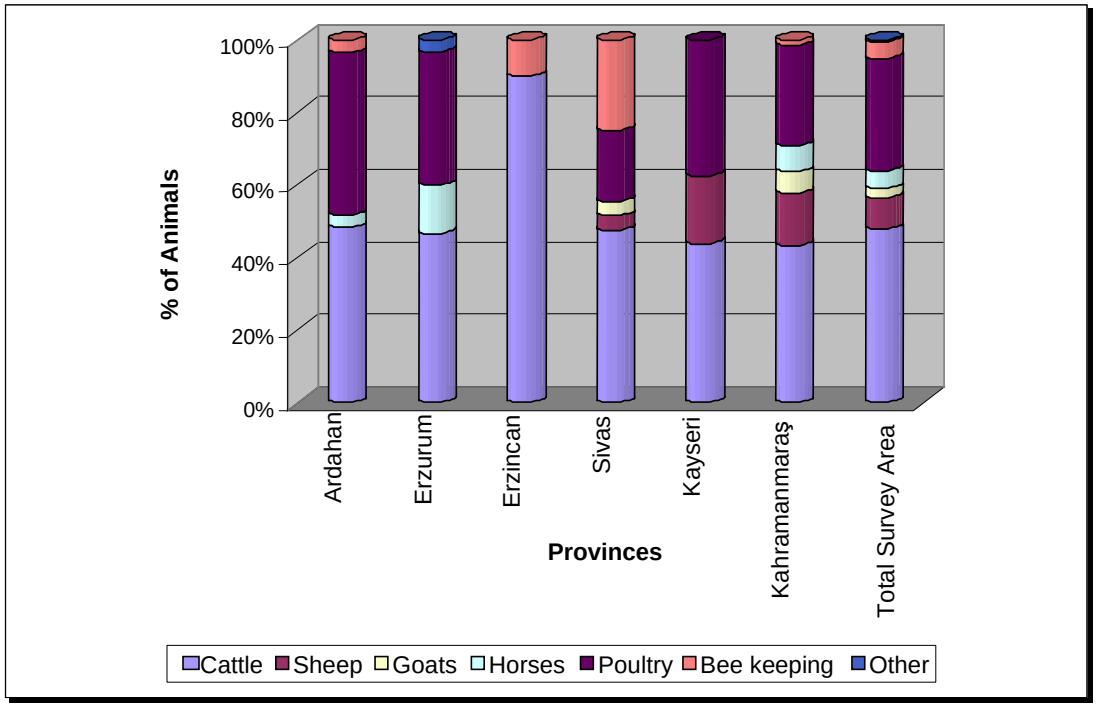
5.13.6 Land use: livestock, beekeeping and fisheries

Animal husbandry is the primary employment sector for 21% of all surveyed respondents and the secondary employment sector for 68% of surveyed respondents in the pipeline corridor (see Figure 5.35 and 5.36). It is particularly important in Kars where it is the main employment sector for 58% of surveyed households and the second main employment sector for 51% of households. The dominance of this less capital-intensive activity in Kars, correlates with its location in the northern, climatically harsher region of the pipeline where land plots are larger and where settlements are the poorest (after Osmaniye) in terms of income levels. Although milk and meat are the most common animal products, honey and kosar cheese are increasingly important and households are keen to diversify their outputs (eg develop leather industries or dairies). In Sivas, poverty and concomitant out-migration, have negatively affected agricultural activities to the extent that there are insufficient young adults to tend livestock. As a consequence, animal husbandry is carried out by herdsmen who receive annual payments from villagers.



Source: Household Survey 2001

Figure 5.35 Animals Kept in Rural Settlements in the Surveyed Provinces



Source: Household Survey 2001

NB: Only six surveyed provinces included urban areas (eg district centres) within the 4km corridor.

Figure 5.36 Animals Kept in Urban Settlements in the Surveyed Provinces

- **Cattle**: these are kept by 21% of surveyed urban households and 72% of surveyed rural households (see Plates 5.52 to 5.54). Ardahan followed by Kars, leads animal husbandry with 91% and 87% of rural households respectively engaged in animal husbandry. Households surveyed in Ardahan also have the highest average herd size of nine cows, higher than the approximate average (of four) for Turkey[1]. Kars, Erzurum, Gumushane and Erzincan also have larger herds than the survey average of six cows. The southern provinces of Adana, Kahramanmaras and Osmaniye have herd sizes of three or less. These figures support the finding that animal husbandry decreases in importance from north to south and is the main source of income in the less market-oriented northern provinces.

- **Poultry:** this is the second most common type of livestock kept by more than half the surveyed households in Osmaniye, Kars and Kayseri and at least 15% of urban settlements in Kayseri, Kahramanmaras and Erzurum. Only 3% and 2% of poultry kept in urban and rural surveyed settlements respectively is sold to markets. The vast majority of poultry products (primarily eggs and some meat) are consumed within the household.

- **Sheep:** these are particularly widespread in Kars and parts of Kayseri and are an important form of livelihood for at least 30% of surveyed households in Gumushane and Erzincan (see Plates 5.55 to 5.57). Flock size is more than double the village survey average of 32 sheep per household in Kayseri (70 sheep per household) and in Ardahan (60 sheep per household). The findings suggest that sheep are kept partly for subsistence and partly as a commercial activity in all of these provinces, and to a lesser extent, in Erzurum and Kahramanmaras.

- **Goats:** these are primarily kept for their meat and cheese in the more mountainous regions such as Osmaniye, northern Kahramanmaras, and Gumushane. Goats are of limited significance for urbanised settlements. The average rural herd size of 13 in rural areas is exceeded only in Kayseri, Erzurum, Kahramanmaras and Osmaniye provinces, although only in the latter three provinces are goats owned by surveyed households sold in local markets.

Plate 5.52 Family Cow in Erzurum

Plate 5.53 Cattle Loading in Erzurum

1 The Agricultural Census collects information on livestock at the settlement and not the household level. Data extrapolated from the 1991 Agricultural Census (the most recent) suggests that Turkish households have on average approximately four sheep and 16 goats.

Plate 5.54 Cattle in Northern Anatolia

Plate 5.55 Sheep Grazing in Sivas

Plate 5.56 Sheep in Sivas

Plate 5.57 Livestock in Yenigun, Osmaniye

- **Seasonal Grazing:** livestock grazing is carried out by 87% and 81% of households in Kars and Gumushane respectively, the two least densely populated. Conversely seasonal grazing is carried out by only 36% of households in Adana where there is limited communal land and more development pressure on land (see Figure 37). In excess of 90% of surveyed households carrying out seasonal grazing, graze their livestock between April and October, although 6% of households state that they graze livestock throughout the year (3% of which are located in Kahramanmaras the province with the highest proportion of communal land in surveyed settlements see Section 5.13.2). 80% of livestock owned by surveyed settlements are grazed on communal land, whilst approximately 15-20% of households graze their livestock on their own land plots. In northern provinces, some settlements have been abandoned due to over grazing in the area.

- **Horses:** these are kept by 12% of respondents in the surveyed settlements including 35% and 32% of households in Kars and Ardahan respectively.

- **Beekeeping [1]:** this takes place in a large number of settlements in Kars (83%), Kayseri (76%), Sivas (62%) and Osmaniye. Bee keeping ranges in importance from less than 10% to 100% of households within a settlement. In Sivas, it is particularly important involving between 27% and 100% of households in half of all beekeeping settlements surveyed. For the majority of households, honey and wax is either used for household consumption or is one of a number of income sources. A minority of bee keeping households depend on honeycomb and strained honey as a main source of income. These households are generally located in Sivas, Kayseri, Kahramanmaras and Osmaniye, where bee keeping is particularly widespread, and to a lesser extent in Adana, Ardahan and Erzincan (see Plates 5.58 to 5.60 and Figure 38). In one settlement in Osmaniye, bee keeping is a main source of income for 25 households (See Box 5.15 and 5.16).

1 This section draws upon information collected from the telephone interviews held with Muhtars from 210 'additional settlements'.

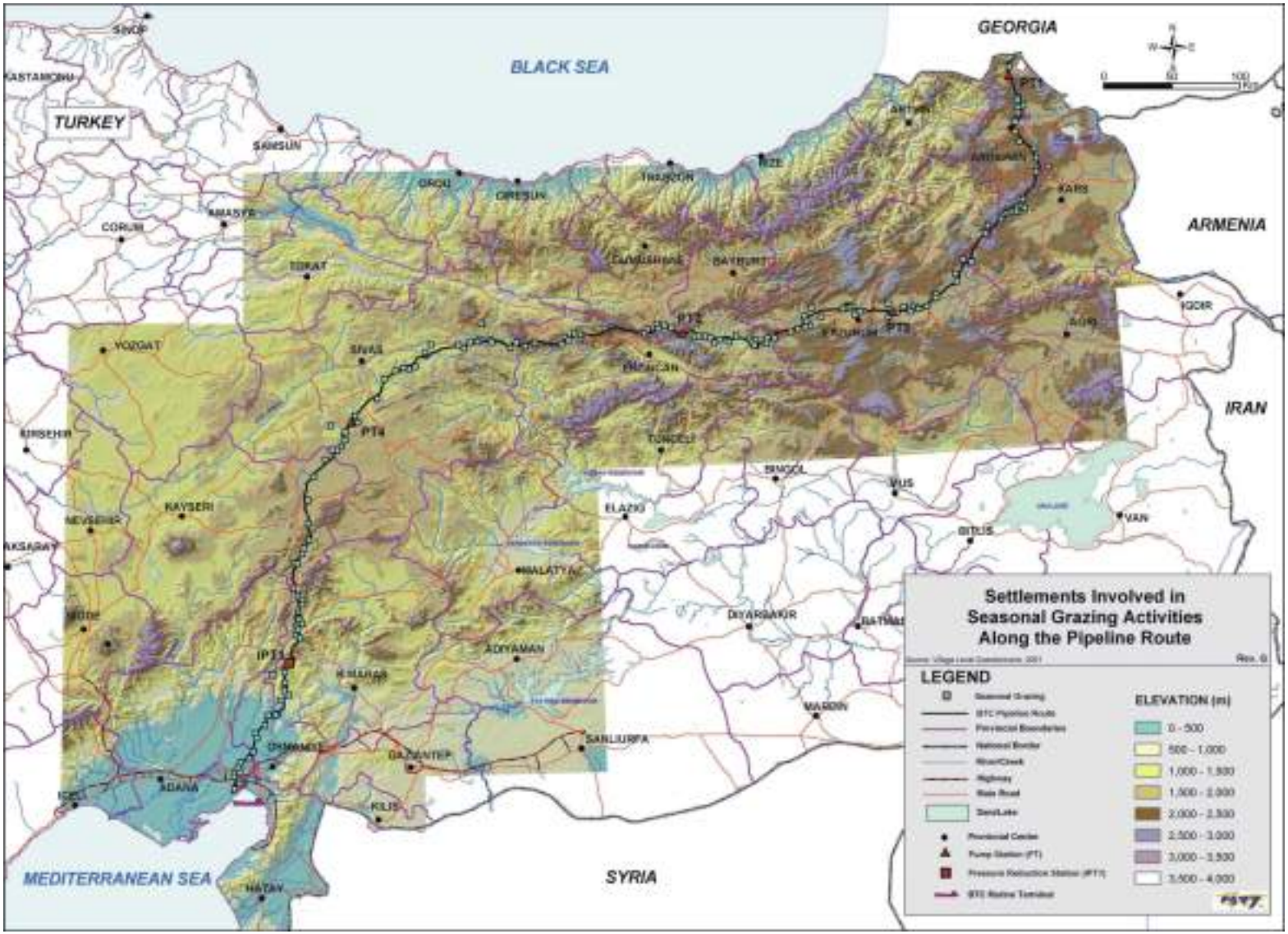


Figure 5.37 Settlements Involved in Seasonal Grazing Activities Along the BTC Pipeline Route

Box 5.15 Beekeeping in Turkey and Along the Pipeline Route

There are approximately 3.5million bee colonies in Turkey with honey production ranging from 10 kg/colony to 25 kg/colony. Bee keeping activities (eg disease management, feeding, honeycomb placement) take place in the Cukurova plain region (south of the Taurus Mountains) between January and April and again between September and December. Honey is collected in these low altitude areas in May. In central and northern pipeline provinces beyond the Taurus Mountains these activities coincide with later vegetation growth and nectar production and begin later in March and continue to June/ July. Honey collection therefore takes place later in the year between July and September usually coinciding with wheat harvesting.

There are two types of bee keeping in Turkey: *stationary* and *mobile*.

- *Stationary beekeepers* keep their colonies in the same place throughout the year and generally five to ten metres from their homes under a lean-to roof, hayloft etc to allow daily care. Stationary colonies are usually smaller than mobile colonies with the size of a colony starting at between 2-5 and increasing to 40-50 in number. Approximately 1% of stationary beekeepers have settled outside of the settlement and keep colonies in an apiary (artificial hive).

- *Mobile beekeepers* move their bees to coincide with flora blossoming patterns. They keep bees in huts made of wood to allow easy transportation and themselves stay in tents or portable wooden huts. Average colony numbers are higher, between 20 and 150, and keepers tend to keep their colonies at least 2km to 5km away from settlements, most commonly on pasture land.

Bees can fly up to 8km (although generally 4km) from the hive to forage for nectar. As there are few suitable nectar-producing trees, such as linden and chestnut, along the pipeline route, bees generally collect nectar from herbaceous or cultured plants, particularly wheat. They also collect nectar from clover.
(Source: Bee Study by Ahmet Inci, Senior Agricultural Engineer)

Box 5.16 Community Concerns on Beekeeping Activities

The Sariz region is famous for its diverse flora and therefore the honey produced in the region is regarded as very valuable. There is also some conflict with bee keepers from other regions using the flora of this region. According to the villagers *'the bees fly over a distance of 4km and would be impacted by the construction of the pipeline, which is a proposed 1km from the village'*.
(Source: Consultation in Kayseri)

According to the Muhtar of Altinboga, *'bee keeping is an important source of income for our village with approximately 1,500 beehives in the village'*.
*(***Source: Consultation in Kahramanmaras)**

Figure 5.38 Distribution of Beekeeping Activities Along the BTC Pipeline Route

Plate 5.58 Bee Keeping in Posof, Ardahan

Plate 5.59 Bee Hives in Adana (left) and Sivas (right)

Plate 5. 60 Bee Keepers In Kayseri

- **Fisheries**[1]: the Muhtars of 30 settlements stated that fishing activities are carried out by their inhabitants. Six of these are located in Kahramanmaras and five in Sivas. On the whole only a few households are involved in fishing in each settlement, primarily for household consumption or as one of a number of income generating activities (see Figure 5.39). Large numbers of households 182, 150 and 99 are involved in fishing in Catkent (Erzincan), Safak (Sivas) and Altinboga (Kahramanmaras) respectively. However, fishing in each of these settlements is primarily for household consumption. There was no evidence that large-scale commercial fish farming is carried out by households. Only four of 30 settlements (generally settlements with a range of between 6-30 households dependent on fishing for household consumption) have so far been identified as being within 2km downstream of a potential BTC Pipeline crossing (see Section 6).

- **Subsistence Versus Market Production**: in summary, it is evident that cattle breeding is predominantly for household consumption (rather than for market sale) with the exception of Ardahan and Erzurum where a majority of cattle is sold in markets. In urban areas, poultry are mainly used for household consumption. In comparison, sheep breeding (notably in Kayseri, Sivas and Kahramanmaras) are mainly market-oriented activities. Fishing and bee keeping are on the whole carried out for household consumption although the latter is increasing in importance as a source of income.

5.13.7 Land ownership and use summary

Table 5.28 provides a summary of the land ownership and use patterns for each of the surveyed BTC Pipeline provinces.

1 This section includes information from the telephone interviews held with Muhtars from 210 'additional settlements'.

Table 5.28 Summary of Resource Ownership, Distribution & Use by Province

Province	% HHs that Own or Cultivate Land (*urban/ rural)**	Main Land Ownership	Second Most Common Land Ownership	% HHs without land titles ***	Irrigation (% of settlements)	Average Land Holding ****	Distribution of Land	Primary Land use
Ardahan	54 *(25/96)*	Owner cultivated	Communal (villagers)	52/49	27	56 *(5)*	Relatively even, with high fragmentation	Grain
Kars	85	Owner cultivated	Share-cropping within family	79/81	67	101 *(7)*	Mild inequality, with high fragmentation	Grain
Erzurum	54 *(21/70)*	Owner cultivated	Share-cropping	3/6	69	86 *(5)*	Mild inequality	Grain (Sugar beet**)
Erzincan	69 *(87/32)*	Owner cultivated	Communal	14/11	100	83 *(5)*	Relatively even	Grain
Gumushane	85	Owner cultivated	Communal	33/31	100	35 *(4)*	Relatively even	Grain
Sivas	72 *(38/85)*	Owner cultivated	Communal	46/48	40	94 *(6)*	Relatively even	Grain
Kayseri	75 *(75/94)*	Owner cultivated	Communal	35/38	71	87 *(5)*	High inequality and land polarisation	Grain
Kahraman-maras	49 *(34/67)*	Owner cultivated	Communal	19/24	64	44 *(4)*	High inequality and land polarisation	Grain
Osmaniye	82	Owner cultivated	State	14/11	75	43 *(4)*	Relatively even	Grain
Adana	69	Owner cultivated	State	20/11	71	46 *(3)*	High inequality and land polarisation	Grain
Pipeline Corridor (average)	**65 *(33/82)***	**Owner cultivated**	**Communal**	**32/31**	**64**	**68 *(5)***	**Greater inequality towards the south**	**Grain**

* Not all provinces have urban areas within the 4km survey corridor
** Urban areas
*** For the first and second main plot owned by the households (HH)
**** Average land holding in hectares and average number of plots (in brackets)
Source: [Ref 31]

Figure 5.39 Distribution of Fishing Activities Along the BTC Pipeline Route

5.14 LIVELIHOODS, EMPLOYMENT AND SKILLS

5.14.1 Overview

An understanding of livelihoods, employment and skills within the survey area fulfils the following key objectives: 1) it allows one to assess the extent to which people are dependent on various forms of livelihood and thus their ability to cope should access to these livelihoods be diminished; 2) it provides an indication of availability of local residents for project employment; and 3) it provides an indication of the suitability of local residents for semi-skilled and skilled employment.

The findings are reported under the following headings.

- **Levels of Income:** reviews levels of income/ wealth (financial and capital assets) and changes to living conditions.
- **Sources of Livelihoods:** describes the importance of both cash and non-cash earning activities (eg wage income, food production and social benefits).
- **Levels of Employment:** firstly identifies employment status and levels of unemployment and secondly reviews willingness to accept temporary pipeline employment associated with the pipeline (a potential proxy for underemployment).
- **Sources of Employment:** identifies the main employment sectors in which the population spend their working day, including both subsistence and income-based activities.
- **Skills:** identifies the extent to which respondents have previous construction experience and/ or skills appropriate for large scale construction projects.

Box 5.18 provides a brief overview of income, employment and skills and is followed by a more detailed review of findings along the pipeline corridor, culminating in a summary table presenting findings by province (see Table 5.28).

5.14.2 Levels of income and wealth

Both income and asset levels (eg ownership of luxury goods and property) were recorded for the surveyed households in order to ascertain levels of overall wealth, and to determine vulnerability to impacts if one livelihood source was removed.

Turkey: national Gross Domestic Product (GDP) per capita in 2000 was approximately 2,955 USD, far higher than that for Georgia (546 USD) and for Azerbaijan (605 USD) [Ref **33**].

Pipeline Provinces: in 2000 the ten pipeline provinces produced approximately 7.7% of Turkeys GDP. Adana (the most industrialised province) accounted for a large proportion of this with 3.1% of Turkeys GDP. There is a general rise in GDP from north to south. For example Ardahan was ranked 80 of the 81 provinces in Turkey and had the lowest GDP per capita of the pipeline provinces (1,063 USD). Conversely Adana (ranked 6) had the highest (3,302 USD). Kayseri and Kahramanmaras (ranking 17 and 24 respectively) also had higher GDP per capita than other pipeline provinces (see Table 5.28).

Box 5.17 Overview of : Livelihood, Employment and Skills

Levels of Income: the pipeline provinces have low levels of Gross Domestic Product (GDP) per capita. With the exception of Adana, all provinces have levels below the average for Turkey. The northern five provinces are ranked between 64 and 80 of 81 provinces (with the exception of Erzurum which is ranked 35) in Turkey in terms of GDP per capita (81 being the lowest). In terms of income, settlements surveyed in Adana and Erzurum have the highest income levels (Osmaniye has the lowest) and Adana and Kayseri the highest ranking in terms of assets (eg luxury goods such as cars and washing machines) Gumushane and Kars have the lowest asset ranking.

Sources of Livelihood: the two main sources of livelihood (both wage and subsistence) along the whole pipeline corridor are agriculture and livestock production. Subsistence agriculture dominates, although sales to markets have greater importance in Erzurum, Erzincan, Osmaniye, Kahramanmaras and Adana. Wages are an important income source for 23% of *urban* households but only 9% of *rural* households. Pension income is also important and is the second main source for provinces with urban areas within the corridor (eg Erzurum and Sivas) correlating with greater reliability on formal employment.

Levels of Employment (Status): in *rural* areas, the household head (usually male) is generally employed in agriculture and works to earn money to support his family. In district centres (*urban* areas), he may be self-employed, have a salaried job or work in agriculture. With few exceptions, married women do not undertake salaried work and are either unpaid family workers or housewives. 89% of children (aged 6-15 years) are students, although 3% are unpaid family workers and 6% housewives. Differences in employment are more noticeable between *rural* and *urban* areas than in varying locations along the BTC Pipeline Route. Unemployment is approximately 7% for the surveyed settlements although underemployment is higher: 70% of those surveyed in rural areas and 45% in urban areas would accept a temporary job. Thus unemployment levels may not fully reflect the true extent of unemployment along the pipeline corridor and in the vicinity of the marine terminal.

Sources of Employment (Sector): *rural* employment is dominated by the agriculture and natural resource sector. One quarter of *urban* households are also employed in agriculture. Industry is relatively weak throughout the pipeline corridor and is primarily limited to light industry.

Skills Levels: there are a range of skills available along the BTC Pipeline Route, particularly in *urban* areas. Approximately 3% of surveyed households have members that have worked on previous pipeline projects (such as the East Anatolian Natural Gas Pipeline, the Iraqi Oil pipeline and the NATO Pipeline).

Table 5.29 Gross Domestic Product by Province, 2000 (current prices)[1]

Province	GDP (Million USD)	% of Turkey's GDP	GDP Rank (in Turkey)	GDP per Capita (USD)	GDP per Capita Rank (in Turkey)
Ardahan	143.5	0.1	80	1,063	77
Kars	374.1	0.2	68	1,139	73
Erzurum	1,370.6	0.7	35	1,459	62
Erzincan	484.9	0.2	64	1,537	60
Gumushane	279.2	0.1	73	1,498	61
Sivas	1,326.2	0.7	37	1,759	53
Kayseri	2,425.9	1.2	17	2,318	35
K.Maras	1,947.9	1.0	24	1,939	46
Osmaniye	721.6	0.4	53	1,567	58
Adana	6,088.3	3.1	6	3,302	19
TURKEY	199,333.5	100.0	-	2,955	-
Source: [Ref 43]					

Average Household Income: average annual income for the surveyed households exceeds both the national gross minimum wage of 2,664 million TL (USD 1,665), and the net minimum wage of 1,963 million TL (USD 1,227) (eg after subtraction of income tax, contribution to the education fund etc).[2] Incomes are on average higher in urban areas within the pipeline corridor (particularly in Sivas, Erzincan and Erzurum) where there is greater economic diversification into non-agricultural activities (see Table 5.30*)*. The surveyed settlements in Erzurum have the highest average income levels in the pipeline corridor. These correlate with the higher levels of industrialisation in Erzurum [(3)] than in other northern provinces. Surveyed settlements in Osmaniye have the lowest average household income of 1,436 million TL per year (USD 897). Although partially situated on the fertile Cukurova plain, Osmaniye is still very much dependent on agriculture and has experienced very little diversification in terms of industry.

Income Distribution: inequalities in income distribution are highest in rural areas, particularly in the provinces of Erzincan, Gumushane and Kahramanmaras. The latter comprises two distinct regions divided by the Taurus Mountains: 1) the northern region comprising more rural settlements in high altitude valleys (earning little more than subsistence livelihoods); and 2) the southern region on the fertile Cukurova plain, where irrigation allows agricultural diversification and its location ensures close links with Adana (hence incomes are higher).

Income Variation: monthly incomes within the pipeline corridor are generally highest between June and September and lowest between November and March, directly correlating with agricultural calendar peaks and troughs indicating high dependency on agricultural activities in the BTC Pipeline provinces.

1 GDP currency conversions are based on January 2002 figures with a rate of 1 million TL = USD 1.60.

2 For the period of 01/01/02 to 30/06/02. Reference: official gazette published by Asagari Ucret Tespit Komisyonu. Minimum wage is revised every 6-12 months under Labour Law 1475.

3 According to the SIS, Erzurum has firms operating in five of nine industrial sectors.

Table 5.30 Average Annual Household Income and Wealth for Rural and Urban Areas

Province	Average Annual Income: rural / urban (Million USD)*	Income Ranking (rural / urban)	Income Relative Deviation[1] (rural/ urban)	Average Annual Income (Million USD) and Ranking	Asset Index (AI) (ranking) **	Composite Income Index (CAII) (ranking) **
Ardahan	1,936 / 1,495	1 / 6	1.45 / 1.04	1,678 (5)	0.36 (3)	958 (3)
Kars	1,237	7 / NA	1.07 / NA	1,237 (9)	0.24 (9)	475 (9)
Erzurum	1,926 / 1,847	2 / 3	1.00 / 1.25	1,899 (1)	0.30 (8)	900 (4)
Erzincan	1,617 / 2,019	5 / 2	0.88 / 0.91	1,752 (3)	0.35 (4)	972 (2)
Gumushane	1,722	4 / NA	0.77/ NA	1,722 (4)	0.23 (10)	633 (8)
Sivas	1,018 / 2,134	9 / 1	1.48 / 1.36	1,346 (8)	0.30 (7)	642 (7)
Kayseri	1,192 / 1,592	8 / 5	0.97 / 1.23	1,373 (4)	0.36 (2)	790 (6)
Kahramanmaras	1,474 / 1,667	6 / 4	0.60 / 1.45	1,576 (6)	0.31 (5)	794 (5)
Osmaniye	897	10 / NA	1.42 / NA	897 (10)	0.30 (6)	438 (10)
Adana	1,827	3 / NA	1.16 / NA	1,827 (2)	0.39 (1)	1,139 (1)
Overall Average				**1,531**	**0.31**	**774**

NA: no urban areas were within the 4km pipeline corridor and therefore surveyed in Adana, Kars, Osmaniye and Gumushane.
Currency conversions are based on January 2002 with 1 million TL = 1.6 USD
** Ranking of settlements: 1 denotes the highest average income and/or asset levels and 10 the lowest levels of income and/or assets for the surveyed province. AI and CAII are defined in more detail below
Source: [Ref 31]

Levels of Assets[2]: households in Adana and Kayseri (ranked first and second respectively) have relatively higher levels of assets, when compared to Erzurum, Kars and Gumushane (ranked eight, ninth, and tenth respectively) that have significantly lower assets. The findings suggest, with the exception of Adana and Kayseri, that few households own luxury assets. For example:

- 60% of surveyed households in Adana have an automatic washing machine compared with 11% in Kars;
- 22% of surveyed households in Erzincan and Adana have cars compared with only 7% of households in Kars;
- 5% of surveyed households have computers in Adana compared with no households in Gumushane;
- 40% of households in Adana have mobile phones yet only 5% in Gumushane have mobile phones; and
- 58% of households in Gumushane and 63% of households have land floors compared with 1% in Adana.

Levels of Wealth: a Composite Asset and Income Index (CAII) and Asset Index was calculated to determine levels of overall wealth (see Box 5.18). Kars, Gumushane, Sivas and Osmaniye have low CAII values (ranked between 7 and 10), whereas Erzurum, Erzincan, Adana and Ardahan can be regarded as the most affluent provinces in the survey area (ranked 1-4), explained by higher levels of economic diversification with the exception of Ardahan. The latter has benefited from the opening of the border crossing (increasing trade) and in-migration of a number of private companies (eg to the Ardahan Industrial Zone). Kahramanmaras and Kayseri are ranked fifth and sixth and have moderate levels of wealth.

1 Relative deviation is the weighted ratio of the average mean value to the standard deviation of the sample (a measure of variability). Lower values indicate greater inequality in income distribution.

2 Including luxury goods such as televisions, washing machines, cars, computers and property including types of flooring.

Plate 5.61 Settlements in North Eastern Anatolia

Plate 5.62 House in Alvar, Erzurum

Plate 5.63 Satellite Dishes in Goksun District Centre, Kahramanmaras

Plate 5.64 Summer Houses in Adana

Box 5.18 Determining Levels of Wealth

In order to measure levels of wealth as opposed to just income within the pipeline corridor, two indices, an Asset Index (AI) and a Composite Asset-Income Index (CAII) have been developed. The following formulas have been used to calculate AI and CAII:

$$AI = \left[\frac{Number\ of\ items\ \ that\ \ households\ \ have - Number\ of\ households\ \ having\ \ a\ \ land\ \ floor}{Number\ of\ items \times Number\ of\ households} \right]$$

$$CAII = \left[\frac{Number\ of\ items\ that\ households\ have - Number\ of\ households\ having\ a\ land\ \ floor}{Number\ of\ items \times Number\ of\ households} \right] \times Annual\ Income$$

In the first index (AI), the total number of items (eg luxury goods such as washing machines, television) that households have in a settlement is considered to have a positive contribution in measuring the level of wealth, whilst the number of households with a land (earth) floor is assumed to be a negative indicator for the level of wealth. This number is then divided by both the total number of household items (15) and the number of households in each settlement in order to normalize the nominator. In the case of CAII, the AI index is used as a weighting factor and AI is multiplied by annual income. Therefore, in terms of the CAII, consideration is given to both the effects of assets and income simultaneously. In both cases, the higher the index number the higher the level of wealth.

Source: Devised for the survey

Living Conditions: the majority of surveyed Muhtars stated that living conditions had deteriorated over the past five years in their settlements particularly those in Osmaniye, Kars, Erzincan and Adana. At the household level, many respondents in Erzurum (87%), Ardahan and Kayseri complained of reduced living standards. There was a noticeable variation of opinion within provinces and slightly more respondents in urban areas (where there is greater dependency on cash income) perceived a recent decline in living standards. The most commonly cited causes were: the current national economic crisis (raised by 38% of Muhtars); unemployment (20%); low agricultural prices (15%); high input costs in agriculture (10%); and other agricultural changes[1] (10%).

Access to Finance: access to finance at the settlement level was measured according to the number of national bank branches within a settlement. All district centres have at least one

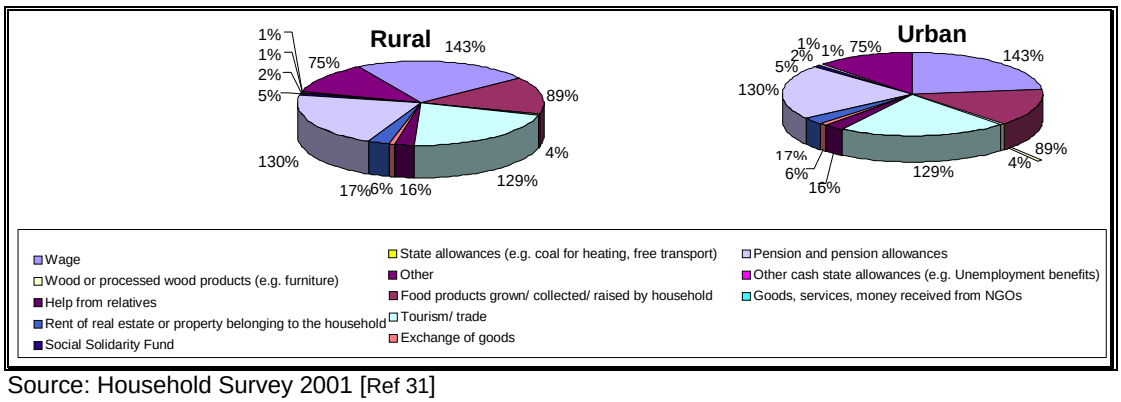
1 eg structural adjustment reforms such as a reduction in agricultural subsidies.

national bank branch office (see Plate 5.65), however only one surveyed rural settlement stated they have a national bank branch, Alvar (in Erzurum)[1].

Plate 5.65 Bank in Goksun, Kahramanmaras

5.14.3 Sources of livelihood

Over the past 20 years, Turkey has experienced a substantial decline in agricultural production, increases in industrial production and exports, and a gradual shift towards the service sector, all of which signal a transition from an agrarian to an industrialised economy [Ref 45]. Nevertheless, Turkey remains a highly agricultural based economy with 35% of the population dependent on agriculture and 50% of the surveyed settlements engaged in agriculture as their main sector of employment. This is documented in the surveyed findings below (see Figure 5.40).



Source: Household Survey 2001 [Ref 31]

Figure 5.40 Main Sources of Income for Rural and Urban Households

- **Food Production:** this is defined as food products grown, collected or raised by the households for market or household consumption and is the main source of livelihood for 57% of surveyed households and is particularly important in Gumushane, Osmaniye and Kars for 70%, 82% and 85% of households respectively. When compared with

1 It is unclear whether or not this national bank branch is still operational.

urban settlements, households in *rural* settlements such as Ardahan and Kayseri, exhibit a greater dependency on food products as their main source of livelihood (93% and 91% respectively).

- **Wage Income:** this is defined as a regular permanent, non-agricultural source and is only a main source of income for approximately 23% of *urban* households and 9% of *rural* households. It is particularly important in:

  - *Erzurum* (33%): in part attributable to the high proportion of surveyed settlements that are within 5km of urban settlements such as Pasinler, hence home to a number of commuters earning a wage income;
  - *Kahramanmaras* (25%): in part due to the inclusion of Goksun district centre within the settlements surveyed and the increasing importance of the textile industry in the province;
  - *Ardahan* (25%): in part due to the inclusion of Ardahan and Posof district centres within the settlements surveyed and its border location;
  - *Adana* (21%): due to relatively high levels of industrialisation.

- **Pension and Pension Allowances:** these are a main income source for 21% of urban households and for 12% of rural households. Dependency is slightly higher than the national average of approximately 10% and particularly important in urban areas where formal employment and hence pensions are more widespread.

- **Social Support**: very few households in the pipeline corridor rely on cash state allowances (eg Social Assistance and Solidarity Encouragement), allowances in kind, or goods provided by non-governmental organisations. This appears to be attributed to a range of factors including the limited availability of these funds.

- **Other:** construction, trade and transport are also listed as main sources of income for 6%, 9% and 3% of surveyed households respectively. For example, 25% of households in Ardahan stated that tourism/ trade was important correlating with its proximity to the border.

5.14.4 Levels of employment (employment status)

National: the labour market is characterised by: 1) a small share of wage-earners in the labour force; 2) low productivity of labour in agriculture; 3) low productivity of labour in the informal sector in urban areas; 4) low levels of female participation in employment; and 5) a decrease in levels of participation[1] in employment between 1970 to 1995 from 65% to 50% (SIS, 1995). On average, 48% of the national population in the year 2000 (aged 15 years and above) described themselves as employed although not necessarily in the formal sector[2]. The workforce is male dominated: 75% of men work compared with only 30% of women [Ref 37]. In terms of employment status, in 1998, 34% of working adults were categorised as regular employees, 9% casual employees, 6% employers, 24% self employed and 27% unpaid family workers (62% of which were women). Turkey's unemployment rate in 2001 was 8.5% (see Box 5.19). This figure hides the reality of high levels of *underemployment*.

Box 5.19 'Jobless Rate Surges After Crisis'

'**Unemployment** rate in Turkey was at 8.5 per cent in 2001, according to provisional figures released by the State Institute of Statistics (DIE) yesterday. The number of unemployed rose by 450,000 last year to 1,902,000, according to a household workforce survey carried out by the DIE. Some 368,000 of the newly jobless people were in urban areas and 81,000 in rural areas. The unemployment ratio among educated youth was determined at 28.5 per cent. In 2001, Turkey experienced the worst economic crisis in its history since World War II and scores of white collar workers were laid off amid, in particular, a contraction in the banking industry. Turkey's total workforce was seen at 22,269,000 of which 20,367,000 were employed. Some 14,904,000 of the total workforce were males and 5,463,000 were females. The services sector provided the largest employment. Accordingly 41 per cent of Turkey's workforce is employed in the services sector, 35.4 per cent in agriculture, 18.3% in industry and 5.3% in the construction sector.'

(Source: Turkish Daily News, 29 March 2002)

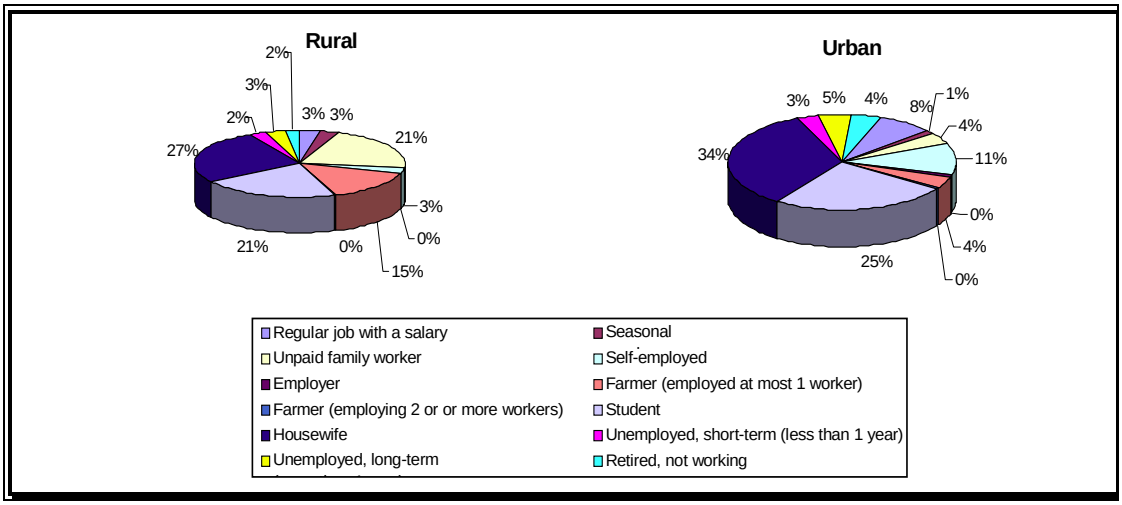
Provincial Variation: there is limited variation in employment status along the pipeline corridor. Greater differences exist between urban and rural areas and also in the employment status of different members of the household. Approximately 6% of the surveyed workforce are unemployed, split relatively evenly between short-term unemployment (less than one year) and long-term unemployment. The southern provinces exhibit higher levels of unemployment rising to 10% in both Osmaniye and Kahramanmaras, and 7% in Adana correlating with high density levels (eg 112/km^2 in Adana) and increased competition for employment. In Adana, long-term unemployment is particularly high most likely due to high in-migration but potentially because

1 Ratio of total labour force to total population between 12-64 years. Source [Ref 3]

2 The formal sector employs workers in permanent positionsand provides a regular wage income.

land concentration renders a larger number of households landless and less reliant on agriculture as a source of employment and food.

Rural/ Urban Variation: according to the 1997 State Institute of Statistics Census [Ref 30], employment levels in urban areas tend to be lower than in rural areas explained by increased competition for jobs (due to in-migration) and the more limited opportunity to work in agricultural either as seasonal labourers[1] or as unpaid family workers in urban areas (see Figure 5.41). This is corroborated by the survey results, which found unemployment rates of approximately 8% in urban areas and 5% in rural areas correlating with the finding that generally more respondents in urban centres cited unemployment as a priority problem for their settlement[2].



Source: Household Survey 2001 [Ref 31]

Figure 5.41 Employment Status (for Rural and Urban Respondents) in the Surveyed Provinces

Gender Variation: in a typical household in the pipeline corridor, the male household head is identified as the main generator of income for the household. In rural areas he is likely to be a farmer, whilst in urban areas he may be self-employed, be an employer, have a salaried job or work in agriculture. With very few exceptions, married women do not undertake paid work. They are either unpaid family workers generally involved in agricultural activities in either urban (38%) or rural areas (34%), or housewives. There is a trend in Turkey for women to become economically inactive as the economy shifts from agriculture potentially explaining the higher percentages of housewives in southern provinces.

Age Variation: approximately 45% of family members in the surveyed households are offspring still living at home including 44% aged 15 or over (referred to here as young adults) legally allowed to work. Young adults are generally students (45%), housewives (17%) or unpaid family workers (16%). 89% of offspring aged between 6 and 15 (referred to as school-aged children) were identified as students, 3% unpaid family workers and 6% housewives[3]. Nevertheless, field observations indicated that a high proportion of school-age children are working as unpaid family workers, particularly during the harvesting seasons. According, to the SIS, child labour is becoming a serious problem in Turkey, noticeably in urbanised areas such as Adana. However, possibly because of the dominance of rural areas within the pipeline

1 Seasonal workers account for 24% of the working population in Turkey [Ref 30].

2 Including 64% of respondents in Göksun, 53% of respondents in Ardahan, 67% of respondents in Pasinler, 54% of respondents in Imranli, 48% of respondents in Sariz and 42% of respondents in Andirin.

3 The legal age of marriage in Turkey is 18.

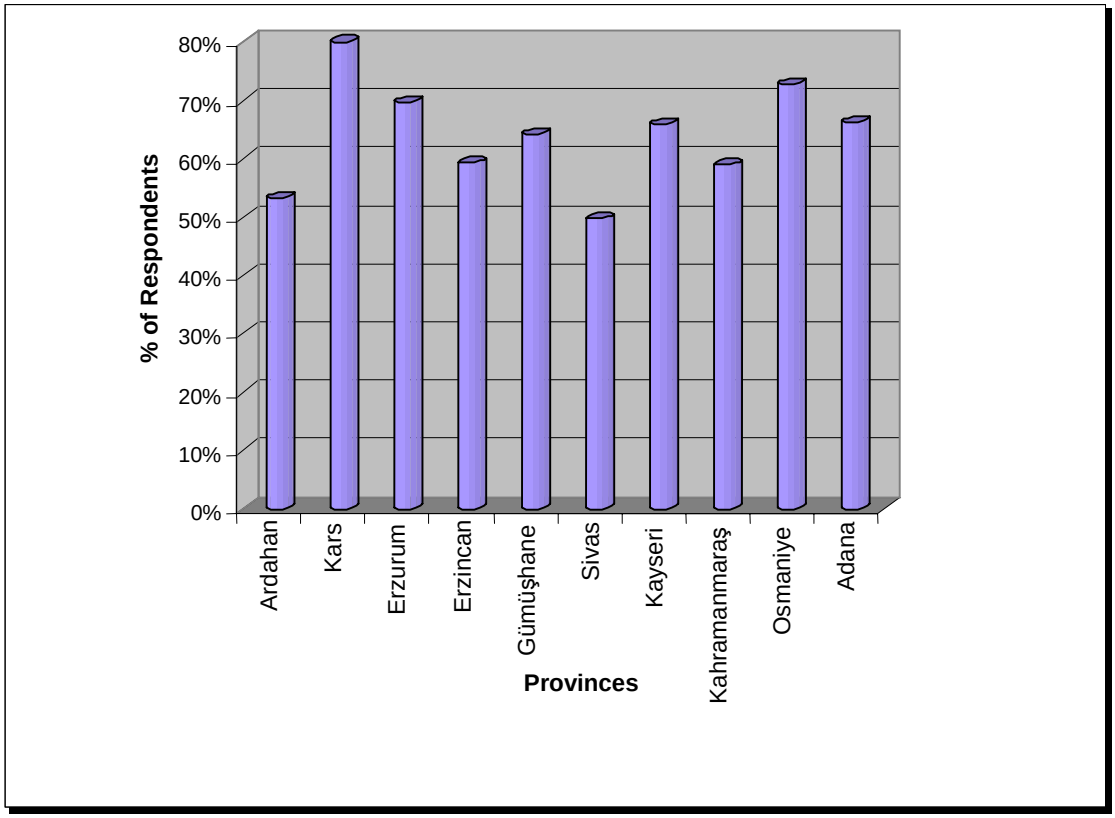
corridor, the survey findings did not corroborate this, although the percentage of students was lower in the central and northern provinces concomitant with an increase in unpaid family workers. Over 40% of respondents identifying themselves as unemployed are in their twenties and a further 23% are in their thirties. This is perhaps because young people working as unpaid family workers are more likely to view this work as temporary rather than permanent employment.

Cultural Variation: variations in occupational status between different ethnic groups was evident. Kurdish speaking respondents are less likely to have permanent salaried positions, 7% less than for other groups. Similarly, this group is found to have lower levels of self-employment (8% compared with the survey average of 13%) although there were more Kurdish farmers within the survey population (33% compared with the survey average of 26%).

Underemployment: unemployment figures do not accurately represent levels of *underemployment*[1]. Underemployment is generally higher in rural areas because fewer inhabitants are employed in the formal sector and more are dependent on agriculture, the seasonal nature of which also leads to underemployment particularly during winter months. When asked to identify the main problems faced by their household, unemployment and inadequate income were most commonly cited after infrastructure problems. 56% of respondents named unemployment as one of the three main problems and 38% respondents identified unemployment as the main problem faced by their household.

Acceptance of Temporary Employment: levels of underemployment are also indicated by high numbers of people willing to accept a temporary construction job. Acceptance rates are higher in rural areas (60% compared with 40% in urban areas) and in the northern provinces. This is potentially because fewer inhabitants from rural areas are already in formal wage earning employment and because underemployment particularly in winter months leaves a larger number available for temporary work (see Figure 5.42). A number of respondents indicated that they would be less likely to accept a temporary job during busy agricultural months, for example, during August in Adana and during June in Erzurum. In a few settlements surveyed, the willingness to accept a temporary job offer was well below the average for example in Sivas, (approximately 50%) compared with 80% in Kars where there has been no previous pipeline experience. This is most likely linked to previous negative experiences with other pipeline projects and reluctance to be involved in the proposed BTC Pipeline Project.

1 The National Labour Force Survey (SIS Website) defines 'underemployed' people as those who: 1) work less than 40 hours because of economic reasons (ie no work is available, inability to find a full time job) ; 2) could potentially work more hours in their present job or in another job; or 3) want to change jobs or are seeking additional work because of insufficient income or because they are not working in their usual occupation. [Ref 33]



Source: Household Survey 2001 [Ref 31]

Figure 5.42 Acceptance Rate of a Temporary Job Offer by Surveyed Provinces

5.14.5 Main sectors of employment

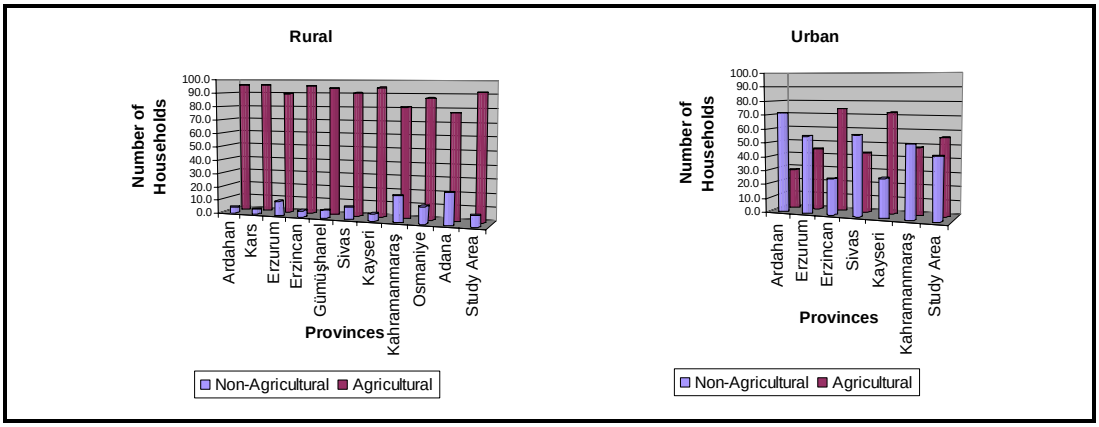
The main sectors of employment identifying how respondents spend their time (in both subsistent and cash earning activities), does not always directly correlate with main sources of income (see Section 5.14.2). However, agriculture is the main source of both income and employment for respondents, although surveyed households are also dependent on non-agricultural income sources such as pensions and wage incomes.

Agriculture/ Natural Resources: rural employment is dominated by the agricultural / natural resource sector, particularly in Ardahan, Kars and Erzincan (see Figure 5.43). Agriculture remains important in urban areas with almost one in four household members engaged in agriculture. This is generally attributed to household members residing in district centres but remaining closely linked to settlements through involvement in activities such as harvesting and other seasonal agricultural activities. Overall, 45% of surveyed households are engaged in agriculture either for cash income or subsistence.

Agriculture/ Natural Resources Sub-sectors: as expected, arable agriculture and animal husbandry are the dominant sub-sectors with 99% of the survey respondents engaged in these activities. Several exceptions occur in rural areas such as in Sivas, where 1% of households[1] are employed in bee keeping; Kayseri, where 3% are employed in fishing activities either for household consumption or as one of a range of income sources and Kahramanmaras, where 3% of households are employed in forestry. Approximately 15% of household members reported

1 These figures only include respondent data from the in-field surveyed settlements and not those later surveyed via telephone interviews, which suggest that bee keeping is more important.

some form of secondary employment. The most important is animal husbandry (68% of households) and agriculture (27%). This suggests that farmers are engaged in mixed agriculture.



Source: Household Survey 2001 [Ref 31]
N.B Only six surveyed provinces included urban area (eg district centres) within the 4km corridor

Figure 5.43 Distribution of Employment in Non-Agricultural and Agricultural by Surveyed Provinces

Crafts and Traditional Skill: local crafts and traditional skills are becoming less important as a source of employment. For example, elderly women in Adana are concerned that younger generations are not interested in the traditional skill of manual carpet weaving. Some women however are becoming more involved in the production of handicrafts using less traditional methods. For example in one settlement in Erzurum, young women attend an embroidery class run by a teacher appointed by the Public Education Centre (Halk Egitim Merkezi). Handicrafts products made in the settlement are sold at local fairs (see Plate 5.66)

Plate 5.66 Sewing Course in Erzurum

Manufacturing/ Processing: the pipeline corridor runs through areas with a relatively weak industrial sector. Most industrial establishments are focussed on light industry, (eg food and beverage production, tobacco, textiles and apparel and non-metallic minerals). In urban areas of Sivas and Kayseri, manufacturing is relatively important, with Kayseri having considerable importance as the focus of industry in Inner Anatolia. Industrial facilities (eg food processing establishments, dairies, sugar beet refining) are present in about 50% of the settlements surveyed in Ardahan and Erzurum. The former can partly be explained by the recent development of the Ardahan Industrial Zone. Between 20-30% of settlements surveyed in

Kahramanmaras, Gumushane, Osmaniye and Adana stated that there are industrial facilities in their settlements. Kahramanmaras is known as the 'hub' of the textile industry correlating with the high use of irrigation, cotton production and availability of labour in the southern portion.

Other: trade dominates urban non-agricultural employment and is a main sector of employment for 9% of households. It is evidently important in Ardahan as a direct result of its border location. Construction is also important for 6% of surveyed households particularly in rural areas and in Sivas, Kahramanmaras and Gumushane (correlating with higher levels of seasonal workers)[1]. Transportation is a main employment sector for only 3% of households surveyed (including 8% of households surveyed in Erzurum). Education/ healthcare and social services are a main sector of employment for approximately 2% of surveyed households, including 11% of households in Kahramanmaras. Mining, tourism, utilities and government/ administrative services are relatively negligible and a main primary employment sector for less than 1% of households. For example, tourism is only important in eight of the surveyed settlements (in Adana, Kahramanmaras, Erzurum and Ardahan). However, in Kahramanmaras province population levels double during the summer months due to the in-migration of holiday-makers from Kadirli, Osmaniye and Adana [Ref 29].

Hunting is neither a source of income nor a main economic activity. It is mainly undertaken to protect livestock from wolves or wild boar, or for sport. Very few households hunt as a form of subsistence and where this is the case, it is a minor contribution to overall livelihoods (Box 5.20).

Development Potential: an overwhelming majority (over 80%) of settlements in Ardahan, Kars, Erzurum, Gumushane, Sivas, Kayseri and Kahramanmaras stated that there are possibilities for economic development within their settlement. In northern provinces where animal husbandry is prevalent, respondents suggested that there was potential for accompanying industries (eg dairy, leather). Conversely, respondents from Adana felt that there were no possibilities for further economic development, potentially because the province has already experienced a recent proliferation of developments.

Box 5.20 Hunting in Turkey

Hunting in Turkey is regulated within the framework of the "Law on Hunting on Land No. 3167", specifically Article 16 and the provisions of the "Decisions of the Central Hunting Commission" (also known as MAK).

The extent of hunting activities is determined by the Directorate General of Forestry. Grey partridge, common quail, stock doves, wood pigeons, land pigeons, wild boars, wolves, jackals and foxes constitute the majority of wild animals hunted in the ten provinces through which the pipeline passes. Domestic and foreign hunters are permitted to hunt wild goats, wild boars, wolves, jackals and foxes for the prices specified in the MAK provisions, exclusively in the province of Adana. In this context hunting is regarded exclusively as a tourist activity.

The hunting season is determined on an annual basis within the context of the Law of MAK. The hunting season for the period 2001-2002 was August 15, 2001 to February 24, 2002.

Source: Ministry of Forestry, Wildlife Department

1 It is the second main employment sector for 9% of respondents in Kahramanmaraş and 13% of respondents in Sivas.

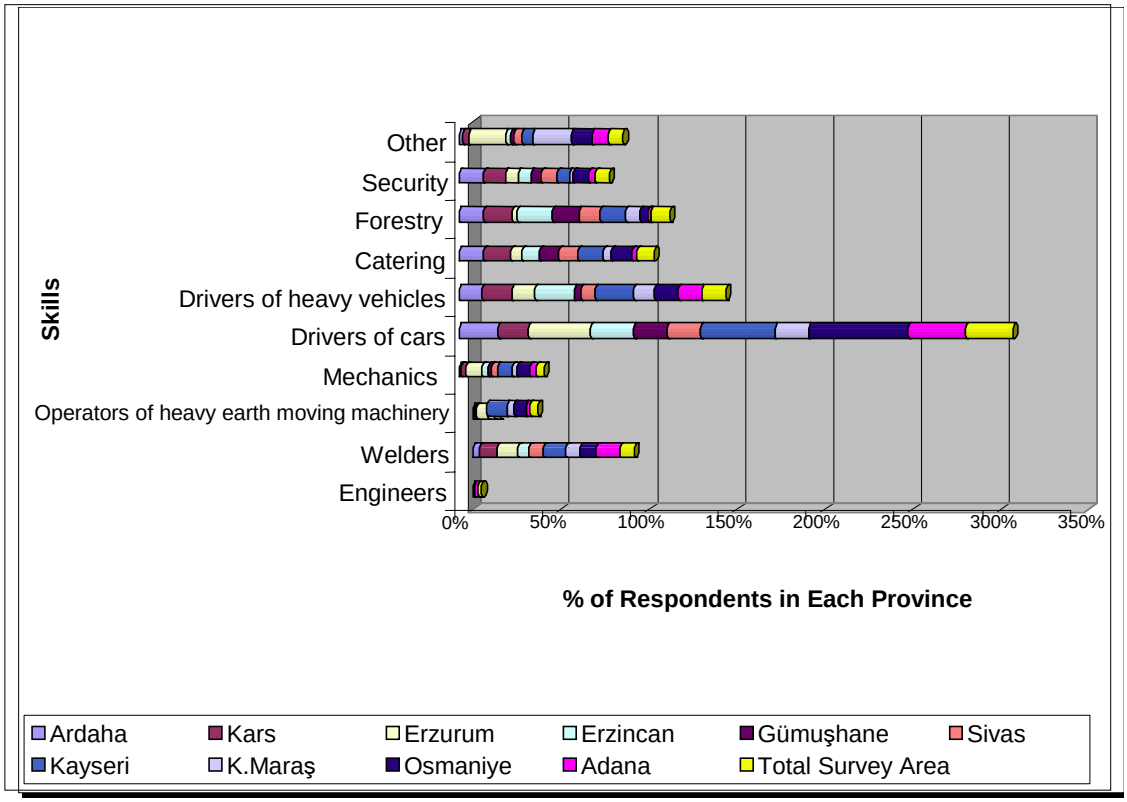
5.14.6 Availability of construction skills and pipeline experience

There is potential for recruitment of semi-skilled and unskilled workers during construction. In order to ascertain the availability of construction skills and experience, respondents were asked to list their available skills, previous construction experience and availability for temporary employment. The findings indicate that there is an existing pool of labour with construction experience and a high number of people are able to drive cars and heavy vehicles in all provinces (see Figures 5.44 and 5.45).

Available Skills: other skills along the pipeline route include the following:

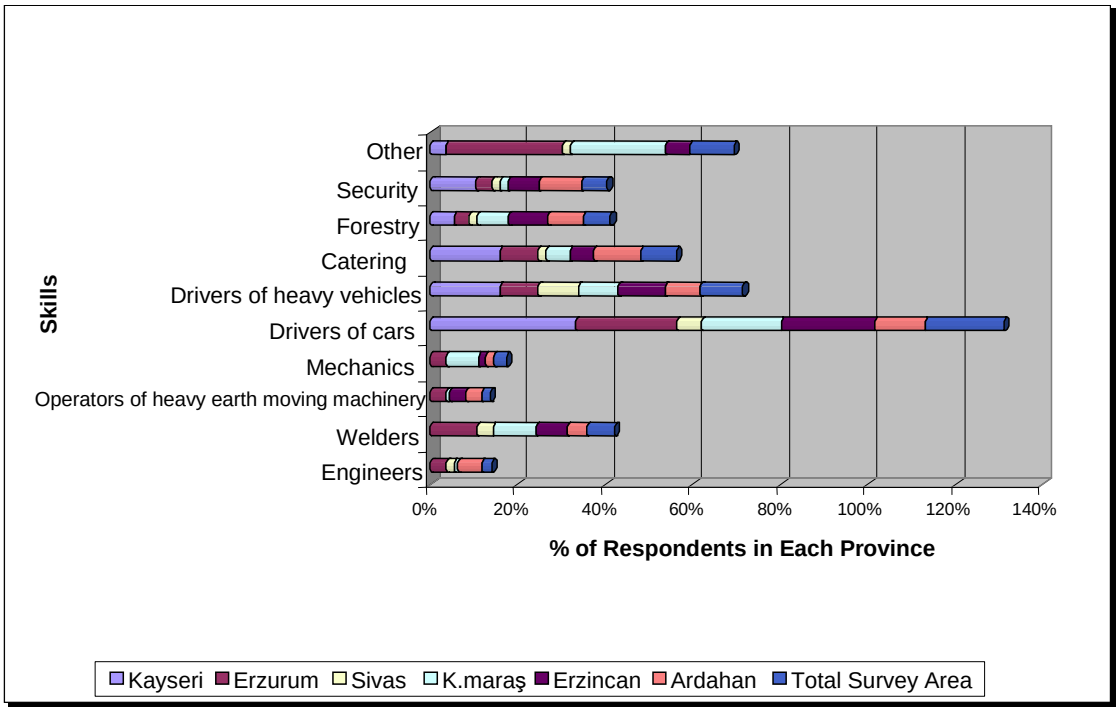
- *Engineers:* Erzurum and Adana have the highest percentages of respondents with engineering skills (12% and 13% of respondents respectively).
- *Welders:* Osmaniye and Kayseri have the highest percentages of respondents with welding experience (7% of respondents).
- *Mechanics:* 7% of respondents in both Erzurum and Osmaniye have experience as mechanics.
- *Catering experience:* this is most wide-spread in Kayseri and Kars (15% of respondents in each province).
- *Forestry:* 16% of respondents in the two provinces of Kars and Erzincan have forestry skills.
- *Security:* 12% of respondents in both Kars and Ardahan have security skills.

Previous Pipeline Experience: this is highest in Erzurum, Erzincan, Gumushane and Sivas, all with experience of both the NATO pipeline and the East Anatolian Natural Gas Pipeline, and Adana province where inhabitants have experience of the Kirkuk-Yumurtalik Crude Oil Pipeline. Approximately 3%, or the equivalent of 41 respondents surveyed, were previously employed on a pipeline project (see Figure 5.46). This includes just over 5% of household members surveyed in Erzurum and Adana. In Erzurum, those surveyed have previously worked as truck or tractor drivers, in pipe stringing, security and pipe laying. Respondents in Adana have worked as truck drivers, unskilled workers and welders. In Kahramanmaras, 3% of respondents stated previous experience as operators, truck drivers, pipe floorers, and unskilled workers. A limited number of Kars and Erzincan residents have worked as truck drivers, unskilled workers, pipe floorers and moulders on previous projects.



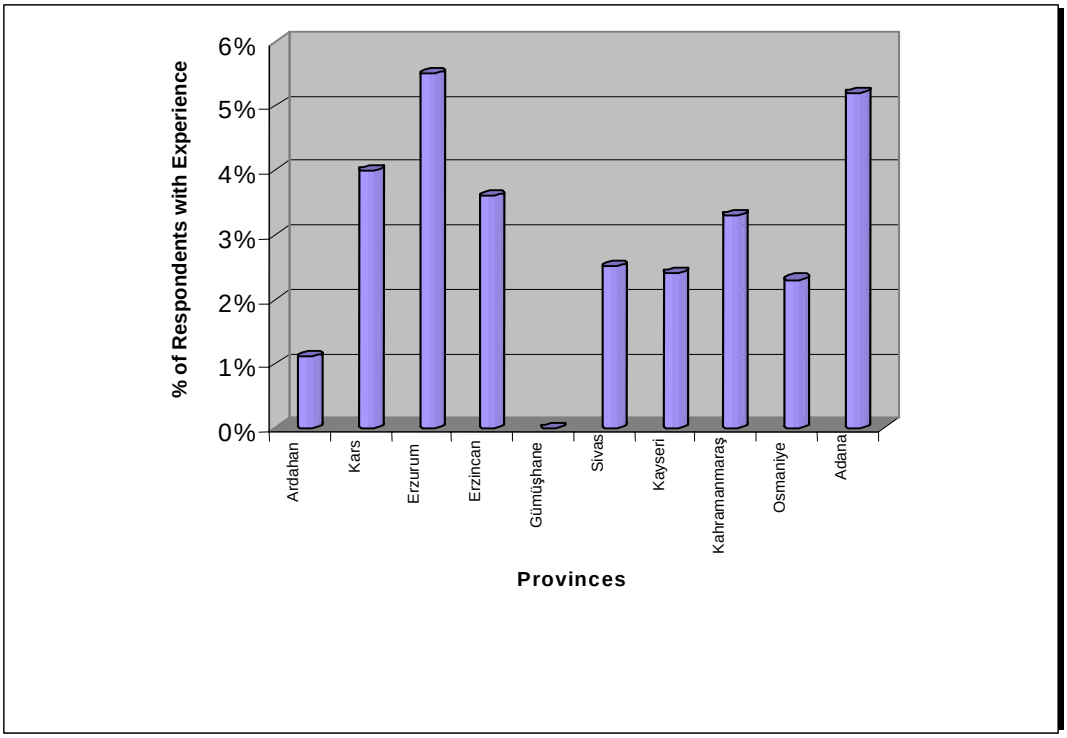
Source: Household Survey 2001 [Ref 31]

Figure 5.44 Available Skills in Rural Areas Surveyed in Each Province



Source: Settlement Survey 2001 [Ref 31]
(NB: Urban areas were not surveyed in four provinces)

Figure 5.45 Available Skills in Urban Areas Surveyed in Each Province



Source: Household Survey 2001 [Ref 31]

Figure 5.46 Percentage of Respondents with Previous Pipeline Work Experience

5.14.7 Summary of livelihoods and employment

Variations in income and employment levels and sources of income and employment by province along the BTC Pipeline Route are summarised in Table 5.31 below.

Table 5.31 Summary of Livelihoods, Employment and Skills along the Pipeline

Province	Wage income %	Primary source of income **	Secondary source of income	Unemployment	Main employment sector	Previous pipeline experience Urban/rural
Ardahan	6	Food (43%)	Tourism/ trade (26%)	6	Agriculture (38%)	0% / 2.6%
Kars	3	Food (85%)	Other (16%)	3	Animal husbandry (58%)	n.a. / 4.0%
Erzurum	8	Food (56%)	Wage income (33%)	4	Agriculture (59%)	1.8% / 7.3%
Erzincan	3	Food (55%)	Pensions (19%)	8	Agriculture (56%)	3.6% / 3.6%
Gumushane	0.4	Food (70%)	Other (26%)	1	Agriculture (50%)	n.a. / 0%
Sivas	3	Food (56%)	Pensions (25%)	5	Agriculture (60%)	3.6% / 2.1%
Kayseri	3	Food (66%)	Other (28%)	6	Agriculture (58%)	0% / 4.3%
K. Maras	7	Food (44%)	Pensions (28%)	10	Agriculture (40%)	3.6% / 3.0%
Osmaniye	2	Food (82%)	Pensions /other (16%)	10	Agriculture (83%)	n.a. / 2.3%
Adana	6	Food (65%)	Wage income (21%)	7	Agriculture (48%)	n.a. / 5.2%
Pipeline Corridor average ****	**5**	**Food (58%)**	**Pensions (21%)**	**7**	**Agriculture (50%)**	**1.3%/3.4%**
TURKEY average	**46**	**-**	**-**	**8.5%**	**-**	**-**

5.15 INFRASTRUCTURE, UTILITIES AND SERVICES

5.15.1 Overview

Although the new pipeline development and its supporting infrastructure will be largely self-sufficient in terms of telecommunications, energy, water supplies, sewage treatment and waste disposal, the Project will use local roads, access some energy and water supplies from existing local supplies, and potentially disrupt local irrigation systems. This section therefore details utilities, road quality, the nature and extent of irrigation systems and services within the pipeline corridor. To summarise, an overall analysis of infrastructure and services within the survey area meets the following key objectives:

- *provide* a benchmark for future change (as a result of possible in-migration and/or use of these facilities by the Project);
- *provide* an indication of the extent of physical capital within the survey area (this has implications for overall levels of livelihood within the different settlements and thus, the ability of settlements to cope with potential changes brought about by the Project);
- *provide* an indication of the availability and quality of infrastructure and services in the pipeline corridor and extent to which these can be utilised by the Project (without affecting levels of livelihood of the settlements concerned).

This Section starts with an overview of recent trends in terms of infrastructure and service provision and an overview of survey highlights (see Box 5.21). This is followed by a more in depth exploration of infrastructure and service availability and quality culminating in a review of information sources in the survey area and disputes within settlements.

Recent Trends: there have been significant changes to Turkish settlements in the last couple of decades. Firstly, and potentially most importantly, the electricity network has been expanded, connecting a large number of settlements and enabling the vast majority of households to use televisions. Secondly, accessibility has increased through the introduction and improvement of all-season roads. Thirdly, widespread investment in telecommunications networks, particularly telephones, has drastically improved levels of communication. Fourthly, there have been improvements in levels of education and significant rises in literacy levels particularly amongst women. Finally, increased rural-urban migration has linked almost all households to major towns and/or cities. Thus present day villagers enjoy relative socio-economic homogeneity. For example 93% of surveyed households have television sets (colour or black and white), 85% have telephones, and all settlements have access to primary schools (although these are not necessarily located within the settlement).

Box 5.21 Overview of Infrastructure and Service Availability and Quality

Utility Infrastructure: the findings suggest that energy and water facilities are comparatively more available and of a better quality (regularity and acceptability of supply) than sanitary facilities (sewerage, toilet, waste collection and disposal facilities) in the surveyed settlements. In general, surveyed settlements in Gumushane, Osmaniye, Ardahan and Kars have lower provision of infrastructure (particularly regular electricity, water, sewerage and waste disposal). This correlates firstly with the rural, remote and isolated nature of the vast majority of surveyed settlements in these provinces, secondly with their low ranking in relation to public investment expenditure and finally with their generally low wealth ranking in the study (8^{th}, 10^{th}, 3^{rd} and 9^{th} respectively). Conversely, Erzurum, Kahramanmaras, Erzincan, and Adana have relatively better provision of infrastructure correlating with higher levels of urbanisation, development (particularly for the latter), higher levels of public expenditure investment [Ref 29] and levels of wealth as determined in the study.

Services: provision of health services is relatively poor throughout the surveyed settlements, with the exception of 'urban areas'. Eighty four per cent of settlements have primary schools, explaining the high literacy rates evident throughout the survey respondents. Additional services (with the exception of coffee shops and transportation) such as banks, post offices are rarely available in rural areas.

Provision for Different Groups: the findings suggest that there is no difference in infrastructure and service provision in settlements where Kurdish or Circasian is spoken. All settlements have electricity and 10% of settlements have running water at home (including 40% of Kurdish speaking settlements). The one settlement surveyed that has no telecommunications is Kurdish speaking. 40% of non-Kurdish speaking settlements have health care centres compared with 65% in Kurdish speaking settlements and 66% in Circasian speaking settlements.

5.15.2 Services, utilities and physical infrastructure

Infrastructure Provision: the key factor in the provision of infrastructure services is the availability of a municipal organisation in the settlement. This is because the municipality is responsible for the provision of infrastructure and distributes state funds provided via the Bank of Provinces. However, only settlements with at least 2,000 inhabitants can set up a municipality. In the case of smaller settlements, it is the various bodies of the central state that are charged with the provision of infrastructure services (see Box 5.22).

Box 5.22 Roles and Responsibilities in Infrastructure Provision

There are various authorities responsible for providing infrastructure services at the local level (province, district and village). These include:

Provincial Administration: the provincial governorships and district level sub-governorships are responsible for providing basic services to the public both using their own budgets or using other institutions' regional branches. The regional directorate of the *Ministry of Agriculture and Rural Affairs* is the state ministry responsible for district and village level affairs and amongst other tasks, is responsible for the provision of infrastructure services such as roads, water, electricity, and sewerage systems.

Professional Public Organisations: these are responsible for the planning, management and operation of specific infrastructure services at the village and district level and include: the General Directorate of State Hydraulic Works (DSI) - state water agency; and TEAS, the state electricity production, transmission and distribution company.

Municipalities: these are required to meet the common regional and civic needs of the region and its population. The primary roles and responsibilities of the municipality are to provide: health and social assistance; public works; education; and agricultural support.

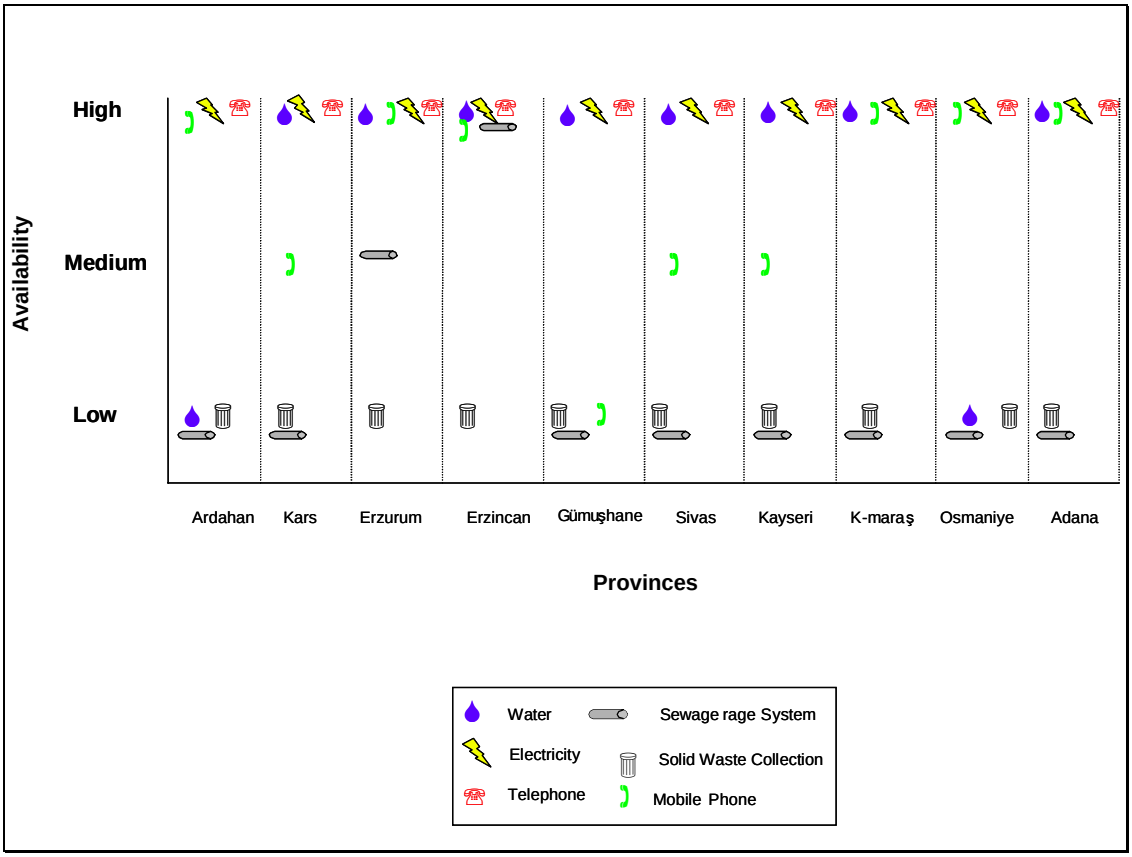
Provincial Local Administrative Organisations: these also have responsibilities related to public works such as construction, maintenance and repair of provincial roads, provision of drinking water for settlements, bridge and port construction, transportation, public services such as natural gas and drinking water, land expropriation for local public services etc.

The Village Administration: for settlements with at least 150 people these have obligatory duties including the protection of health, strengthening of social relations, maintenance of order and security, waste removal, public works and cultural affairs.

(Source: Prime Ministers Website www.basbakanlik.gov.tr [Ref 46]**)**

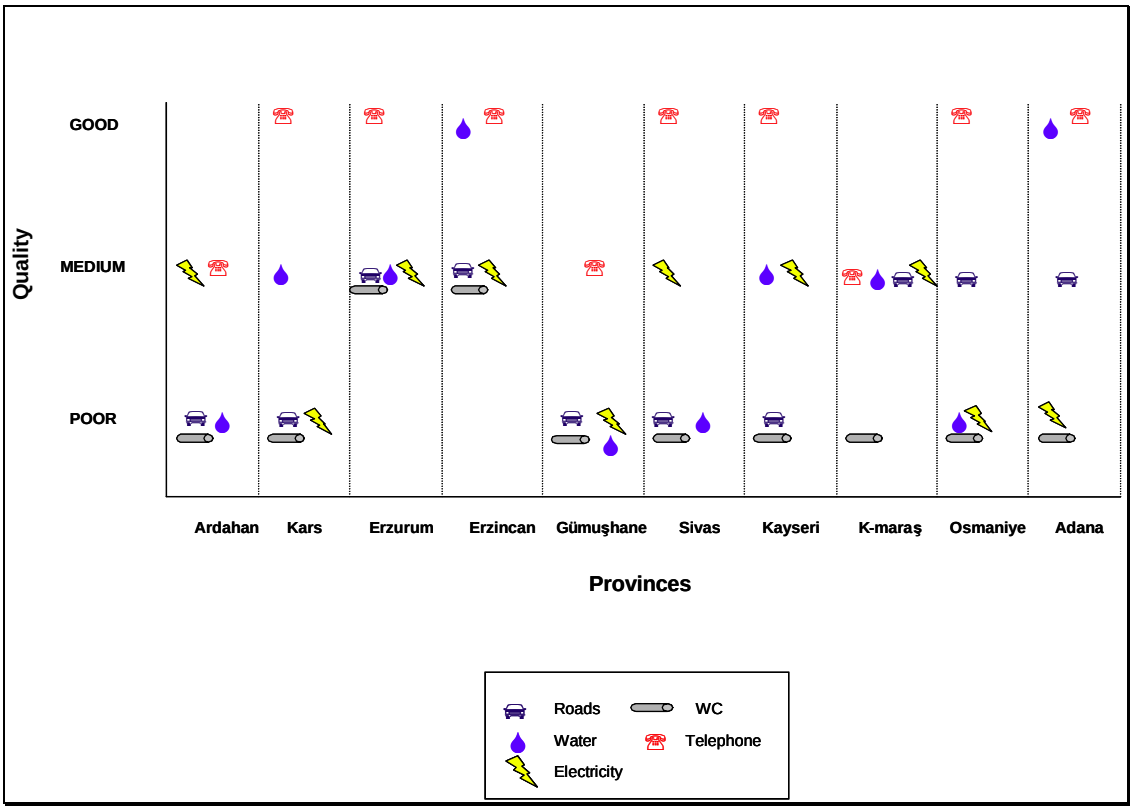
Infrastructure as a Main Settlement Problem: despite recent efforts to improve infrastructure, in response to the question '*what are the main problems faced by your household*', the poor availability/ condition of infrastructure and public services was most commonly raised. 67% of households in both Kars and Gumushane complained about infrastructure and social services followed by 66% of households in Osmaniye and 65% of households in Sivas. Conversely only 22% of respondents in Erzurum complained about the level and quality of infrastructure and service provision (tending instead to focus on unemployment). Specifically, inadequate water resources, poor road conditions, inadequate or non-existent public services such as health services and schools were highlighted. For example, 42% of households stated that the quality and quantity of drinking water was a problem (ranging from 70% of households in Osmaniye to 28% of households in Kars). 25% of households (ranging from 43% of households in Kars to 6% of households in Adana) stated that road conditions and transportation was a problem. Health and sanitation was the third most commonly cited problem (by 16% of surveyed households) and finally, educational and sewerage infrastructure were raised as a problem by at least 5% of surveyed households.

The following conclusions can be drawn on the basis of information from Muhtar on infrastructure availability and household information on infrastructure quality (see Figures 5.47 and 5.48).



Source: Settlement Survey 2001 [Ref 31]

Figure 5.47 Availability of Infrastructure in the Surveyed Provinces



Source: Household Survey 2001 [Ref 31]

Figure 5.48 Quality of Infrastructure in the Surveyed Provinces

Electricity: all settlements surveyed along the BTC Pipeline Route are connected to the national electricity grid. Electricity is primarily used for lighting rather than heating. However, the regularity of the electricity service exhibits variation between settlements. On average only 50% of households receive a regular electricity supply (see Plate 5.67), with slightly more in Erzurum, Erzincan, Sivas and Kahramanmaras (50-75% of households), but dropping to below 50% of surveyed households in the remaining provinces.

Alternative Energy Sources: approximately 48% of surveyed households use dried animal dung (*tezek*), 44% use purchased wood, 40% use coal and 15% use wood cut from nearby forests for heating. Bottled gas and petroleum products are not used for heating but cooking and heating water. *Tezek* is commonly used because it is free and widely available, notably in the approximately 45% of surveyed households with cattle, including 85% and 95% of households in Gumushane and Kars respectively. Wood, the second most common source of heating is more commonly used (despite variations) in southern provinces (see Plates 5.68 and 5.69).

Piped Water: approximately 90% of all surveyed settlements along the pipeline corridor have piped water, although this drops to 50% of surveyed settlements in Osmaniye, one of the least developed surveyed provinces despite its southern location. Of those settlements with piped water, 51% have access to regular water and 39% have only irregular supply. Supply is judged by Muhtars to be particularly poor in Sivas (60% of settlements) and Adana (71%).

Sources of Water: in the absence of regular piped water (eg 10% of surveyed settlements) or where supply is irregular, a mixture of surface and groundwater sources are used depending on availability (see Plate 5.70). The most common alternative used by surveyed households, is the

village fountain[1], notably for more isolated mountainous settlements in Ardahan, Kars and Gumushane. The second most important source of drinking water (eg for 46% of households in Erzurum) are wells located on family land or common wells open to the entire village (eg 15% of settlements in Gumushane). In Adana, water tanks from nearby settlements are the most popular alternative source of water. Natural sources (such as springs and rivers) are comparatively less important but named as a source for 17% and 18% of surveyed households in Gumushane and Osmaniye respectively. In one settlement in Ardahan, water is collected by donkey from a nearby river.

Plate 5.67 Power lines and roads in North East Anatolia

Plate 5.68 Gas Supply Store Erzurum

Plate 5.69 Alternative Fuel: in North Eastern Anatolia

1 A communal supply of water that may be piped, or abstracted from ground or surface water.

Plate 5.70 Outdoor Cooking Facilities in Yenigun, Osmaniye

Plate 5.71 Wood for Fuel, Osmaniye

Plate 5.72 Water Fountains in Erzurum (left) and Kahramanmaras (right)

Plate 5.73 Water Fountain in North Eastern Anatolia

Plate 5.74 Water Tank in Osmaniye (Yenigun)

Irrigation: although two thirds of settlements have irrigation facilities (see Box 5.23), 62% of households do not have access to water to irrigate their own land. Access to irrigation is described in greater detail in Section 5.13.5.

Box 5.23 Overview of Irrigation Systems in Turkey

Irrigation is typically provided through open canal, surface systems, although modern sprinkler and drip irrigation systems have come into increasing use over recent years. The irrigation systems employed in Turkey are outlined below.

Surface Irrigation:

- **Trapezoidal Irrigation** – earth channels that carry between 5lt/second and 500lt/second. Typically, a cooperative of at least 15 farmers operates such channels, although the Ministry of Rural Services is responsible for their construction. They are common in Sivas, Kahramanmaras, Adana, Kayseri and Osmaniye.
- **Perpendicular Irrigation** – cemented channels located at ground surface level that carry between 5lt/second and 500lt/second. They are well suited to rocky areas. Typically, a cooperative of at least 15 farmers operates such channels, although the Ministry of Rural Services is responsible for their construction. They are common in Sivas, Kahramanmaras, Adana, Kayseri and Osmaniye.
- **Aerial Irrigation** – the General Directorate of State Hydraulic Works (DSI) constructs and manages these larger irrigation schemes.

Pressurised Irrigation:

- **Sprinkler Irrigation & Drip Irrigation** – the Ministry of Rural Services is responsible for the construction of these systems and, although they are expensive to construct and install, both are common in Adana and Osmaniye. A village cooperative is typically required to operate and maintains such systems.

Plate 5.75 Earth Irrigation Channel (trapezoidal), Erzurum

Plate 5.76 Irrigation Channel (perpendicular) In Erzurum

Plate 5.77 Cemented Perpendicular Irrigation Channels, Adana

Sewage Disposal: in excess of two thirds (67%) of surveyed settlements do not have access to a public sewerage system. Erzurum and Erzincan are better provided for in terms of availability and quality, with 84% and 82% of settlements respectively with access to a formal community sewerage system. This is potentially because more urban areas were surveyed in these provinces and, particularly in the case of Erzurum, the province ranks highly in terms of Public Investment Expenditure [Ref 30][1]. None of the settlements surveyed in Kars, Gumushane or Osmaniye have a formal sewerage system, in part because they are more rural and remote. In the absence of a proper sewerage system, households have found various ways to dispose of sewage. The most common solution is via cesspits, which are emptied either privately or by the municipalities. Another common 'solution' particularly for Kars, Gumushane and Sivas is the disposal of sewage in nearby fields, rivers and creeks.

Toilets: sanitation levels are also hindered by the condition of toilets (see Plates 5.78 and 5.79). Approximately 50% of surveyed households living in the pipeline corridor do not have flush toilets within the house. This rate rises to 88% of households surveyed in the provinces of Kars, 80% in Gumushane, and 80% in Osmaniye. Once again households in Erzurum and Erzincan fare relatively well (correlating with the larger proportion of 'urban' areas surveyed), and more than 60% of households have access to flush toilets. Overall, however, the absence of a properly functioning public sewerage system with concomitant low levels of sanitation was raised as a major problem by 16% of households, a high proportion of which live in Kars.

Waste disposal: the availability of solid waste disposal services is very much dependent on the availability of municipal services. Only one fifth of the surveyed settlements in the pipeline corridor have a public waste/garbage collection system and provision is highest in Kahramanmaras where almost half of all surveyed settlements have access to a formal system None of the surveyed settlements in Kars, Gumushane and Osmaniye provinces have waste collection and disposal services. This correlates with the inaccessibility of some of these settlements, particularly in winter. Approximately 41% of surveyed households stated that they dump solid waste in nearby fields, rivers or creeks. Waste is also disposed of through burning (14% of all surveyed households) and dumping at a site adjacent to or within the settlement (12%).

1 Erzurum accounted for 1% if the total budget for Turkey.

Plate 5.78 Indoor Toilet in Erzurum

Plate 5.79 Outside Toilets in North Eastern Anatolia

Telephones: all surveyed settlements along the pipeline corridor have access to the national network and more than 85% of all surveyed households have a telephone. Osmaniye and Gumushane are the two provinces with the highest number of households without telephones (23% and 21% of households respectively, potentially because they are both partially located in remote, mountainous regions). Satisfaction with the telephone infrastructure is high. Over 80% of surveyed households reported satisfaction, with the exception of households in Adana, Gumushane and Kahramanmaras, where only 60-80% of households are satisfied with telecommunications.

Mobile Telephones: according to settlement Muhtars, nearly 80% of all (surveyed) settlements along the pipeline route are covered by mobile telephone networks including 100% coverage of all surveyed settlements in Erzurum, Osmaniye and Adana. This compares with Gumushane where no surveyed settlements are covered by a mobile network. This is potentially due the remote location of the surveyed Gumushane settlements. The rate of mobile phone ownership is relatively high, particularly in Erzurum and Osmaniye where 77% and 50% of households surveyed respectively own mobile phones (see Plate 5.80).

Plate 5.80 Prevalence of Mobile Phones, North Eastern Anatolia

Box 5.24 Community Feedback on Infrastructure

Drinking water supply and roads are significant problems in the village. The water system constructed by the State in 1998 allegedly does not function. There are also difficulties in transporting water supplies to the village. There is no sewerage system and the village has an irregular electricity supply. The roads are blocked during winter and villagers cannot travel to other settlement areas for approximately three to four months.
(Source: Community Meeting in Kars)

One resident reported that *"there is an inadequate supply of water for household consumption in our village and water is only available for two hours a day. We also have problems with our telephone network"*. Another claimed the following: *"our natural water canals are extremely contaminated and are not used for irrigation purposes. The water makes people in our village sick"*.
(Source: Community Meeting in Erzurum)

"Transportation is difficult during winter, with roads closed between January and March due to snow and mud."
(Source: Community Meeting in Gumushane)

Some residents had serious complaints about inadequate water supplies to their village. Water supplies are often cut off for several hours a day. One resident reported *"there is no water available in our village and no common fountains, wells or other drinking water available. Our water is transported from Andirin and nearby wells."*
(Source: Consultation in Kahramanmaras)

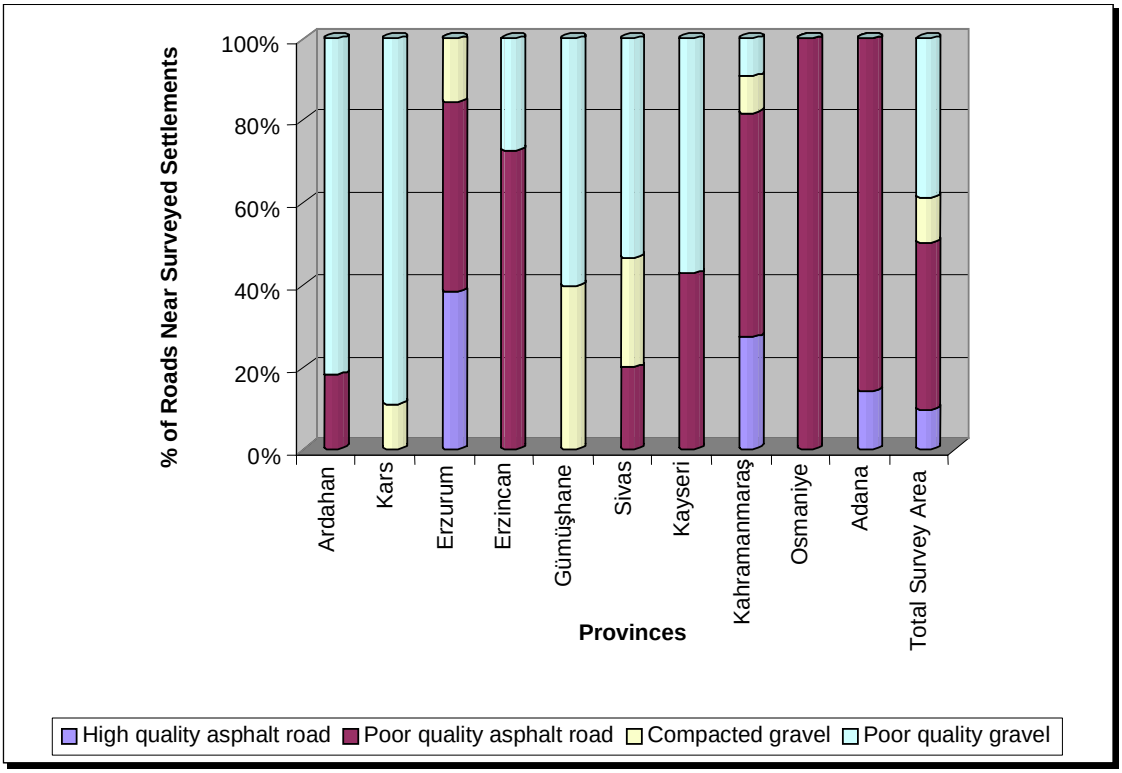
A lack of a sewerage system, repeated electricity cuts and inadequate and unhealthy drinking water are concerns for villagers of Asagibozkuyu, who receive their water transported in tankers.
(Source: Consultation in Osmaniye)

5.15.3 Transport infrastructure and services

Roads Building: 36% of all settlements along the BTC Pipeline Route have had new roads, within or linking adjacent settlements, constructed during the last five years. However, there are marked variations between provinces. At one extreme, in Gumushane no new roads have been constructed in the vicinity of surveyed settlements over the past five years. Conversely, more than 60% of settlements surveyed in Erzurum have had new roads. This disparity results from the roll-out of a programme of road-building by the Department of State.

Road Quality: in general, the quality of roads in the pipeline corridor is low (see Figure 5.49). The surveyed Muhtars indicated that only 10% of roads within and linking their settlements are high quality asphalt, 41% are poor quality asphalt road, 11% compacted gravel and 39% poor quality gravel. In Ardahan, Erzincan, Kayseri and Osmaniye all the roads are either poor quality asphalt or poor quality gravel. Only in Erzurum (correlating to the higher number of newly built roads) are more than 50% of roads of high quality asphalt or compacted gravel. Furthermore, accessibility to surveyed settlements, particularly those in northern provinces, is limited during winter months (particularly in Kars and Ardahan) because roads are blocked by snow. The situation is exacerbated by poor transportation in many settlements (see Plate 5.81).

Transport: very few households have cars, notably in northern provinces (eg 7% of households in Kars). Instead households are reliant on other forms of public transportation, for example minibuses (see Plates 5.82 to 5.86).



Source: Settlement Survey 2001 [Ref 31]

Figure 5.49 Road Types in the Surveyed Provinces

Plate 5.81 Accessibility of Roads in Winter in Erzurum

Plate 5.82 Horse and Cart in Alvar, Erzurum

Plate 5.83 Transportation via Donkey, North Eastern Anatolia

Plate 5.84 Railway Line in Erzurum

Plate 5.85 Transportation in Kars

Plate 5.86 Local Transport in Erzurum (Kandilli)

5.15.4 Health levels and services

Health levels in Turkey: contagious diseases including whooping cough, Hepatitis B, tetanus, and diphtheria are present throughout Turkey including those provinces through which the pipeline passes. According to the Ministry of Health's (MOH), Department of Contagious Diseases, there are no significant provincial differences in disease levels [1] (see Box 5.25).

Box 5.25 Contagious Diseases in Turkey

There are a number of contagious diseases present throughout Turkey for those provinces through which the pipeline passes (whooping cough, Hepatitis B, tetanus and diphtheria). Of the major contagious diseases in Turkey, Rubella had the highest reported cases (16,244) in 2000. According to the Ministry of Health, reported cases tend not to reflect the reality or extent of diseases in Turkey but give a useful indication as to the presence of diseases and illnesses.

The highest number of reported cases of Hepatitis B is in the provinces of Erzurum (87 cases in 2000), Sivas (70 cases) and Adana (82 cases), whereas reported cases of rubella were highest in Kayseri (317 cases in 2000), Erzurum (187 cases) and Adana (178 cases). The number of reported cases of whooping cough, tetanus and diphtheria are very low for the BTC Pipeline provinces.

Gastric Diseases
Diseases caused by poor quality drinking water or food, present in Turkey, include typhoid/paratyphoid, dysentery and Hepatitis A. In Turkey in 2000, the number of reported cases of the following diseases was: typhoid 26,622; dysentery 24,796; and Hepatitis A 10,654. Of the BTC Pipeline provinces, the number of reported cases of typhoid was highest in Kahramanmaras (1,492). Dysentery was the most commonly reported gastric disease, particularly prevalent in Adana (3,559) and Kahramanmaras (1,1,48). Hepatitis A was most commonly reported in Kahramanmaras.

Malaria
Reported cases of malaria are only available at the national level. 20,963 cases were reported in 1999 [Ref 47]. According to the World Health Organisation, the majority of malaria cases in Turkey occur during summer months and most commonly occur in south-eastern parts of the country and the Cukurova Plain.

HIV/AIDS: official statistics suggest that Turkey has a relatively low incidence of HIV and AIDS. Only 1,141 cases were reported between 1985 (when the first case was diagnosed) and July 2000. Two thirds of these individuals are HIV carriers. The majority of the cases recorded are male individuals in the 25 to 35 age group, although the number of infected women is steadily increasing. It is acknowledged that data are scarce and, in some areas, unreliable, therefore it is possible that true incidence figures may be considerably higher. Problems associated with prejudice and discrimination also contribute to reluctance for formal diagnosis, particularly within the female population.

Health Problems in Surveyed Settlements: Muhtars identified physical disability, malnutrition, and mental disability as the most widespread 'illnesses' in 63%, 55%, and 52% of the surveyed settlements respectively. Physical disability is a notable problem for more than 80% of settlements in Kars (89%), Erzurum (92%), Kahramanmaras (91%) and Adana (100%). Malnutrition is a particular problem in northern settlements, and was identified by Muhtars as a problem in 91% of settlements in Ardahan, 85% of settlements in Erzurum and 79% of settlements in Kars, correlating with the low availability of health services in these provinces. 25% of Muhtars in all surveyed settlements and just over half of Muhtars in Erzurum cite

1 Source: Head of the Department of Contagious Diseases. [Ref 42]

infectious diseases as a problem correlating with the presence of contagious diseases in all regions of Turkey.

Sources of Health Problems in Surveyed Settlements: the four main causes of poor health according to the surveyed Muhtars are: 1) poverty (65% of settlements surveyed); 2) inadequate health services (60%); 3) insufficient sanitary conditions (60%); and 4) old age (57%). Poor sanitary conditions were more commonly raised in the high altitude northern provinces (eg Ardahan, Kars) indicating that provision is more difficult in isolated settlements. Poverty, potentially relating to both poor diets and the inability to obtain treatment, was raised as a particularly important cause of health problems notably in Ardahan (91% of surveyed settlements) and Gumushane (80%). The latter is the 8th poorest in terms of wealth and has the lowest number of active clinics. Old age was cited by more than 80% of Muhtars notably in northern provinces (Ardahan, Kars, Gumushane) correlating with the higher percentages of inhabitants over 60 due to out-migration of younger inhabitants (see Section 5.12.5).

Health Services in Turkey: the Ministry of Health is the main provider of health care in Turkey although there is an increasing number of semi-public and private organisations delivering health care. The distribution of village clinics (also known as village health centres) illustrates some provincial disparities along the BTC Pipeline Route. The provinces of Ardahan, Gumushane, Kars and Osmaniye have the lowest number of active (ie operational) village clinics. However, due to relatively low population densities in these provinces, the average population per clinic in Ardahan is lower than that in southern provinces, for example Adana.

Table 5.32 Distribution of Clinics (2000)

Provinces	Rural Clinics	Urban Clinics	Total Active Village Clinics / (Not-Active)	Average Population per Village Clinic
Ardahan	15	10	25 / (0)	4649
Kars	26	12	38 / (3)	8166
Erzurum	43	43	86 / (9)	6450
Erzincan	17	25	42 / (5)	10,233
Gumushane	14	14	28 / (1)	5,253
Sivas	38	47	85 / (5)	7,837
Kayseri	16	73	89 / (13)	11,040
Kahramanmaras	27	67	94 / (11)	11,187
Osmaniye	17	21	38 / (8)	12,086
Adana	40	85	125 / (14)	13,849
TURKEY	**1,856**	**3,854**	**5,700 / (576)**	**11,461**

Source: Ministry of Health Website (2000) [Ref 47]

Health Staff: the majority of doctors, midwives and nurses are employed by the Ministry of Health and are therefore relatively evenly distributed throughout the provinces. Conversely, dentists are usually privately employed. Dentists are in much shorter supply in the public health system and therefore the ratio of patients to each dentist is far higher (see Table 5.33). The pipeline provinces, with the exception of Kayseri and Kahramamaras, have far fewer doctors and dentists, and to a lesser extent other health staff, than the average for Turkey.

Table 5.33 Health Indicators (1996)

Provinces	Population per Doctor	Population per Dentists	Population per 'Other' Health staff
Ardahan	2,131	21,614	481
Kars	1,517	22,452	368
Erzurum	1,023	19,692	445
Erzincan	1,658	16,947	453
Gumusane	1,370	16,921	510
Sivas	1,058	15,619	457
Kayseri	993	7,762	418
Kahramanmaras	920	7,691	396
Osmaniye	2,589	7,132	533
Adana	2,201	13,395	498
TURKEY	**907**	**5 158**	**397**
Source: State Institute of Stastics sources (1996)			

Health Services in Surveyed Settlements: nearly 39% of all settlements surveyed in the pipeline corridor have health centres although the availability of doctors and midwives in surveyed settlements is low, 24% and 29% respectively. In some settlements, 'health personnel' are available to take care of minor problems or injuries, but these individuals are not always trained. The inadequacy of health services was identified as a problem for 60% of all surveyed settlements and a particular problem for 91%, 89% and 77% of all surveyed Muhtars in Ardahan, Kars and Erzurum respectively. Settlements where Kurdish is spoken, have slightly better health facilities. For example, 55% (13) of surveyed Kurdish speaking settlements have a health centre compared with 44% across all 88 surveyed settlements.

Box 5.26 Community Feedback on Health Services

"There is no health centre in the village and there are health problems like contagious diseases."
(Source: Consultation in Erzincan)

"There are health problems of goitre, kidney dysfunctions and other illnesses associated with the condition of the water in the district".
(Source: Consultation in Erzurum)

There is a dispute within the village over a local water resource that is reportedly used exclusively by a few families; the dispute has resulted in legal action. The only other water resource in the settlement is believed to cause cancer and cannot meet local demand.
(Source: Community Meeting in Kayseri)

There are serious problems in the village associated with in-breeding (marriage between relatives). The village appears to be quite '*isolated'* and with a '*closed community atmosphere'* according to community meeting facilitators. There are also problems with pregnancies with disabled babies born from marriages between relatives.
(Source: Community Meeting in Kahramanmaras)

"Malaria is a serious health issue in the village, especially during summer months."
(Source: Community Meeting in Osmaniye)

The community meeting facilitator asked the sub-governor, mayor and security officers if they had any concerns regarding health and STDs. They noted that *"there are no [reported] cases associated with the previous pipeline project and we expect there will be no problem in this project."*
(Source: Construction Camp Community Meeting in Erzurum)

5.15.5 Educational levels and services

Attendance Rates: eight years of education is compulsory for children in Turkey (this increased in 1998 from five years). Consequently, most children aged between 6-14 (7-15) now attend school. However, in four surveyed settlements in Erzurum and one settlement in each of Ardahan, Erzincan, Sivas and Adana, 20%-30% of children between 6-15 were reported as not attending school. In Erzurum, this is attributed to a combination of the cost of education [(1)], the large distance between school and home and the custom of not allowing girls to attend school partly because of the problem of travelling to nearby settlements unaccompanied (see Plates 5.87 and 5.88).

Education Levels: 27% of all surveyed respondents (of six years and above) have not attended primary school. This number is particularly high in Sivas (38% of respondents) correlating with slightly lower availability of primary schools. 47% of respondents have completed only primary education, whereas 24% have completed both primary and high/secondary school. Only 2% of respondents have completed university education (including 4% of respondents from Ardahan).

1 Although primary and secondary education is free, households still need to pay for books, clothing etc. Also children are not available to assist with family work such as agriculture.

Table 5.34 Levels of Education (percentage of population of six years of age and older)

	Primary school not started/ completed	Primary school	Secondary school *	High school *	University
Ardahan	18	46	16	17	4
Kars	23	56	12	9	1
Erzurum	27	50	9	13	2
Erzincan	27	48	13	11	2
Gumushane	27	66	5	2	0
Sivas	38	48	6	6	2
Kayseri	28	39	14	16	3
Kahramanmaras	27	39	15	16	3
Osmaniye	25	54	12	9	1
Adana	26	44	15	15	1
Whole corridor	**27**	**47**	**12**	**12**	**2**

* Until recently, compulsory primary school education was only five years, followed by secondary education of three years and high school education of three years. Now the length of compulsory education has increased to eight years, and is followed by high school (which is not compulsory).
NB: Data above reflects both compulsory education of 5 and 8 years.
Source: [Ref 31]

Literacy Levels: high literacy levels are evident. According to the surveyed Muhtars, on average 85% of inhabitants of school age and above are literate. Sivas, Gumushane and Osmaniye exhibit the lowest literacy levels (75%, 82% and 84% respectively). Literacy amongst Kurdish and Circasian speaking groups is 80% and 84% respectively. Kurdish speaking groups have very similar education patterns to Turkish (only) speakers. The findings suggest that they have marginally more primary school graduates than other groups, but slightly lower levels of university education. Circasians were found to be better educated than other groups – with twice as many graduates of secondary education and 10% (of respondents) university graduates.

Female Education: the survey found relatively high levels of literacy amongst women – although in some settlements older women (some of whom had spent all their lives in agriculture) were not literate. The main issue raised over female education was the repercussions on 'social tradition and family honour' of allowing unaccompanied females to travel outside of the village to obtain education.

Education Services: the State Planning Organisation and Ministry of Education control elementary and secondary education. 84% of all surveyed settlements along the pipeline corridor have primary schools, including all the settlements surveyed in Ardahan, Kars, Kahramanmaras and Osmaniye provinces. In Erzurum and Adana, only 46% and 43% of settlements respectively have primary schools. As a consequence of the lack of schools and teachers, some schools operate a 'double shift', whereby half of the pupils attend school in the morning and half in the afternoon Ref 29].

Only larger settlements and district centres have secondary education facilities. The ratio of children to schools and teachers tends to be higher in southern provinces (and urban areas) where in-migration has caused overcrowding but also because fewer women are available to work as teachers[1].

1 There is a tendency in southern provinces for the number of housewives to increase as agriculture decreases in importance. Increasing affluence in provinces such as Adana is not correlated with an increase in women working in the formal sector (eg in education).

Plate 5.87 School Children in Erzurum

Plate 5.88 School in Erzurum

5.15.6 Other social services

Table 5.35 summarises the availability of key services in the provinces (see Plates 5.89 to 5.92).

Table 5.35 Percentage of Surveyed Settlements with Services in the Pipeline Corridor

	Coffee Shop	Library	Local government	Stores	Market	Post Office	Bank	Gendarmerie station	Transport	Farmers' association	Sports facilities
Ardahan	64	36	36	36	18	36	36	36	91	36	18
Erzurum	46	39	39	23	23	39	31	31	100	46	77
Kars	77	11	0	0	11	11	0	22	56	22	11
Erzincan	82	46	9	72	82	9	9	18	100	36	36
Gumushane	20	0	0	0	0	0	0	20	0	0	0
Sivas	20	7	7	7	60	7	7	21	93	21	13
Kayseri	0	0	0	0	67	0	0	0	33	0	0
Kahramanmaras	64	27	64	55	46	18	18	18	91	46	55
Osmaniye	50	0	0	0	100	0	0	0	100	25	0
Adana	100	0	43	0	100	29	0	0	100	86	57
Total	52	17	20	19	51	15	10	17	76	40	27

Source: Settlement Survey [Ref 31]
NB The findings could be an underestimation as they derive from the Muhtars of the surveyed settlements.

The importance of coffee shops in the daily lives of villagers (particularly men) is indicated by the widespread availability of coffee shops, surpassed only by transportation (eg a minibus service). Of note, is that Gumushane is the least well-off in terms of availability of services and only one fifth of its surveyed settlements have coffee shops and not one has any of the additional services. This correlates with its rank of eighth of the ten pipeline provinces in terms of overall wealth, and the remote location of the surveyed settlements. Settlements in the southern provinces are associated with better provision of sports facilities, farmers' associations and stores. District centres such as Pasinler and Posof are important centres for the majority of social services. Other services, for example fire stations, are provided only in municipalities (ie settlements with more than 2,000 residents).

Plate 5.89 Local Store in Erzurum

Plate 5.90 Fire Station in Kahramanmaras

Plate 5.91 Post Office in Erzurum

Plate 5.92 Supermarket in Erzurum

5.15.7 Information sources

Television is the most important information source on national issues for just under 95% of households surveyed. This is indicative of how widespread televisions have become, even in rural areas, and their ability to influence public opinion. 93% of surveyed households have either black and white or colour televisions. Conversely, for local issues, informal verbal communication between settlement inhabitants is the most important source of information for approximately 70% of households surveyed. Settlement meetings are the second most important information source for local issues (cited by approximately 10% of households).

Box 5.27 Community Feedback on Provision of Information

The village requested that they be informed of every stage of the Project and receive more information through booklets and brochures. *"More publicity about the Project will contribute to the adoption of the Project by local people"*.
(Source: Consultation in Sivas)

"Why are frequent consultations with local people carried out? Is it because of serious negative impacts." **(Source: Construction Camp Community Meeting in Erzurum)**

5.15.8 Main settlement problems

Problems faced by inhabitants have been discussed in more detail in the relevant sections throughout this section. In summary, poor infrastructure, unemployment and poverty are the main problems faced by survey respondents. For example, 50% of households surveyed stated that infrastructure and social services were problematic (including in excess of 65% of households in Kars, Gumushane, Sivas and Kayseri) and 38% of households stated that unemployment was a major problem including 62%, 50% and 43% of households in Erzurum, Kahramanmaras and Adana respectively. Unemployment is most evident in urban areas where in-migration, the lack of an agricultural safety net and where the impacts of the current national economic crisis have been most severely felt. An average of 7% of households, rising to 11% in Kayseri, and 14% of households in Osmaniye stated that they suffered from poverty.

5.15.9 Disputes within settlements

An understanding of recent settlement disputes[1] and their resolution is important for: 1) determining whether settlements are divided internally (with potential implications for mitigation); 2) which resources are already in dispute and where there is potential for the Project to exacerbate these tensions; and 3) ascertaining the channels through which disputes are usually resolved (in case additional disputes are raised). Points one and two are discussed in Section 6. Generic causes of disputes and their resolution are briefly discussed below.

Disputes were rarely mentioned as one of the top three problems faced by households. 93% of the Muhtars surveyed stated that their settlement had no unresolved disputes. Relative settlement homogeneity contributes to the low levels of tensions reported by the Muhtars. Generally, disputes are associated with economic and resource allocation problems, and inter-family rivalry (eg over land boundaries, water rights, the honour of women) (see Box 5.28). Contrary to the situation 50 years ago, only under rare circumstances (three cases reported by the Muhtars) have these disputes resulted in blood feuds (typically more violent, physical disputes).

1 Settlement disputes are commonly perceived as a verbal disagreement or argument within villagers and are typically associated with village or family affairs, for example disputes over use of settlement resources such as water.

Box 5.28 Sources of Disputes

- **Natural resources (water)**: *'there are some conflicts and fights between households on the grounds of the village water supply'.*
  (Source: Consultation Meeting in Kars)

- **Natural Resources (land):** consultation has revealed instances where disputes exist between neighbouring settlements over the ownership and usage of land parcels. In one case, a parcel of unregistered land regarded as 'no mans land' is located between two neighbouring settlements in Kahramanmaras. Legal action over which settlement has the right to use the land as pasture land or for cultivation has been a recent point of controversy between the two settlements.
  (Source: Consultation Meeting in Kahramanmaras)

- **Wealth:** the survey highlighted a few cases where disparities in wealth levels have resulted in conflict. In one instance, political power resulting in economic gain of certain groups (eg preferential water use for some groups impacting upon agricultural productivity) had resulted in tensions. Another surveyed settlement has a small agro-business community where there is considerable accumulation of wealth. The owners of the dairies are of Karakalpak origin (a Turkic tribe with Central Asian origin) and the workers Kurdish. The ethnic division of labour was reportedly leading to resentment particularly because the Karakalpak residents were relatively better off whereas the Kurdish households were relatively poor. In this particular case, an economic dispute over disparities between levels of wealth has been exacerbated by ethnic discourses
  (**Source: Consultation Feedback from Kars)**

- **Political:** less than 2% of Muhtars cited political instability as a source of conflict (eg rivalries for the position of Muhtar). A good relationship between the village elders, the Muhtar, the principal of the school (if there is one) and the *imam* (the religious officer / head of the mosque if there is one) is indicative of the low levels of dispute in the village. The Muhtar is in a position of prestige and has two very important roles: 1) as the official link to the state and state resources (the Muhtar plays an important role in resource allocation); and 2) distribution of a small, but in some cases significant budget. Conflict between two individuals of influence (eg the Muhtar and school head) was also identified. In one village in Erzurum, this has led to a serious legitimacy crisis for the village head where residents of the village are increasingly supporting the schoolteacher. **'***The village is divided due to the village headmen elections. There are also internal conflicts in the village and problems associated with the spending of income obtained from the village pasture'*
  (Source: Consultation in Erzurum)

- **Ethnic/Religious:** only four of all 1,328 respondents raised ethnic or religious problems as sources of dispute within their settlement.

5.15.10 Dispute resolution

With the exception of the Alevi settlements, there is no traditional council or leader responsible for settlement conflict resolution. Amongst the Alevi, there is a traditional religious community leader (dede) who takes on this role. The most common form of dispute resolution is through intermediation by the Muhtar or elders (13% of disputes), followed by involvement of the entire village community (8%). Other solutions, for example, include resorting to legal measures, although this is not common (due to expense and bureaucracy) and the Jandarma are only involved in violent cases, or where there is the potential of disturbance to public order. Only in one case raised during consultation (a dispute over the distribution of water) did the inhabitants take sides and take each other to court.

5.16 ATTITUDES AND PERCEPTIONS TOWARDS THE PIPELINE

This section documents attitudes towards previous pipeline experience and perceptions towards the proposed BTC Pipeline Project.

Previous Pipeline Experience: of the 88 settlements surveyed, 35 have previous pipeline experience. These are located in Erzurum, Erzincan, Gumushane, Sivas and Adana (See Box 5.29) Six Muhtars stated that their settlement had experienced no impact (either positive or negative) from their previous pipeline experience. Conversely, 28 settlement Muhtars stated that their settlement had experienced at least one negative impact. These included: lack of employment (seven settlements); damage to irrigation channels (seven settlements); damage to land and littering of construction materials (12 settlements); failure to keep promises and flatten land (10 settlements); failure to compensate due to lack of land titles (three settlements); and insufficient compensation (seven settlements). 16 Muhtars stated that their settlement had experienced at least one type of benefit (See Box 5.29).

Box 5.29 Benefits from Previous Pipeline Experience

Settlements in Erzurum, Erzincan, Gumushane, Sivas and Adana have experience of the NATO Pipeline and the East Anatolian Natural Gas Pipeline and settlements in Adana have experience of the Kirkuk-Yumurtalik Crude Oil Pipeline. Of the 35 settlements with pipeline experience, 16 Muhtars stated that their settlement had experienced at least one type of benefit. These included: use of unskilled/semi-skilled labour (14 settlements); land expropriation (ten settlements); use of transport services (three settlements); and greater connectivity to the market due to improved roads (three settlements) of the 35 settlements.

Box 5.30 East Anatolian Natural Gas Pipeline: Community Feedback

Settlements in eastern provinces such as Erzurum and Erzincan who live in close proximity to the East Anatolian Natural Gas Pipeline Project have low confidence in the BTC Project as a result of previous experience.

"There were many problems with the natural gas pipeline. Lands were not reinstated, there was overflow through the lands and pastures were covered in mud, which affected harvests. Problems also occurred with feeding animals on the damaged pastures".
(Source: Consultation in Erzurum)

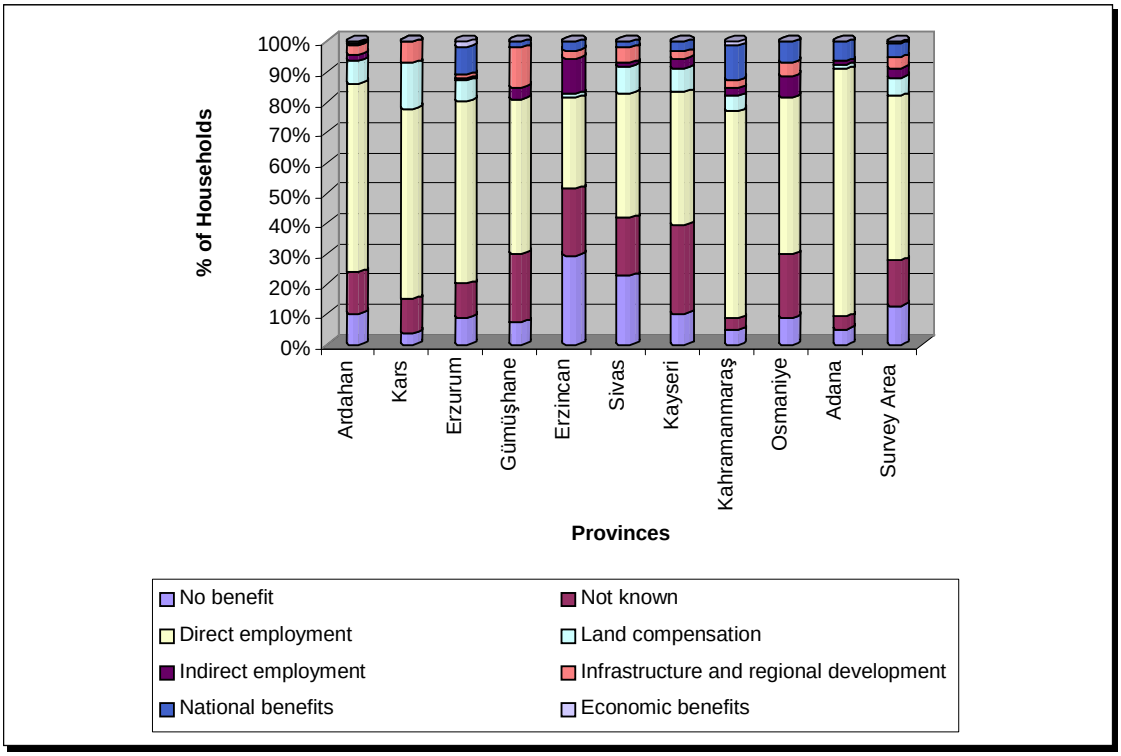
"If it becomes necessary, I will lie down in front of the bulldozers. Half my field was completely destroyed and I am not going to let the other half be destroyed."
(Source: Consultation in Erzincan)

Awareness of the Proposed BTC Pipeline: this is generally low in both rural and urban areas. Approximately 70% of households were unaware of the BTC Pipeline Project prior to the survey team arriving at the settlements – suggesting that the Muhtar had not informed inhabitants of the Project after the first visit by the organisation team. In Erzurum, more than one third of urban households were aware of the proposed BTC Pipeline Project – most likely because having experienced pipeline projects before, information on the new pipeline spread

quickly. Awareness levels were higher in rural settlements in Adana (75% of households), Osmaniye (50%) and Erzurum (50%) and relatively low in Ardahan, Kars (both without previous pipeline experience) and Sivas.

General Attitude Towards the Pipeline Project[1]: the feedback from surveyed settlements was positive or neutral towards the Project. Many of those surveyed agreed that the BTC Project was important and would bring important economic and strategic benefits to Turkey[2]. There are also hopes and expectations that the Project will bring benefits to the local area**.** Approximately 90% of all surveyed households support the Project. Fewer households in rural areas (85%) are supportive of the pipeline, potentially because they have been more closely affected by previous experiences. There are no significant differences between provinces with the exception of rural Erzincan, where only 47% of households support the pipeline, potentially correlating to previous experiences. These high levels of support, which were also reflected during the consultation meetings, must be understood in the context of high expectations for employment and other project benefits.

Expected Benefits: the main perceived benefit from the Project is direct employment (54% of households). Expectations of employment were highest in Adana (81%) and lowest in Erzincan (30%). Local sourcing was also raised during consultation as a potential benefit. 13% of households expect no benefits from the BTC Pipeline Project (see Figure 5.50).



Source: Household Survey 2001 [Ref 31]

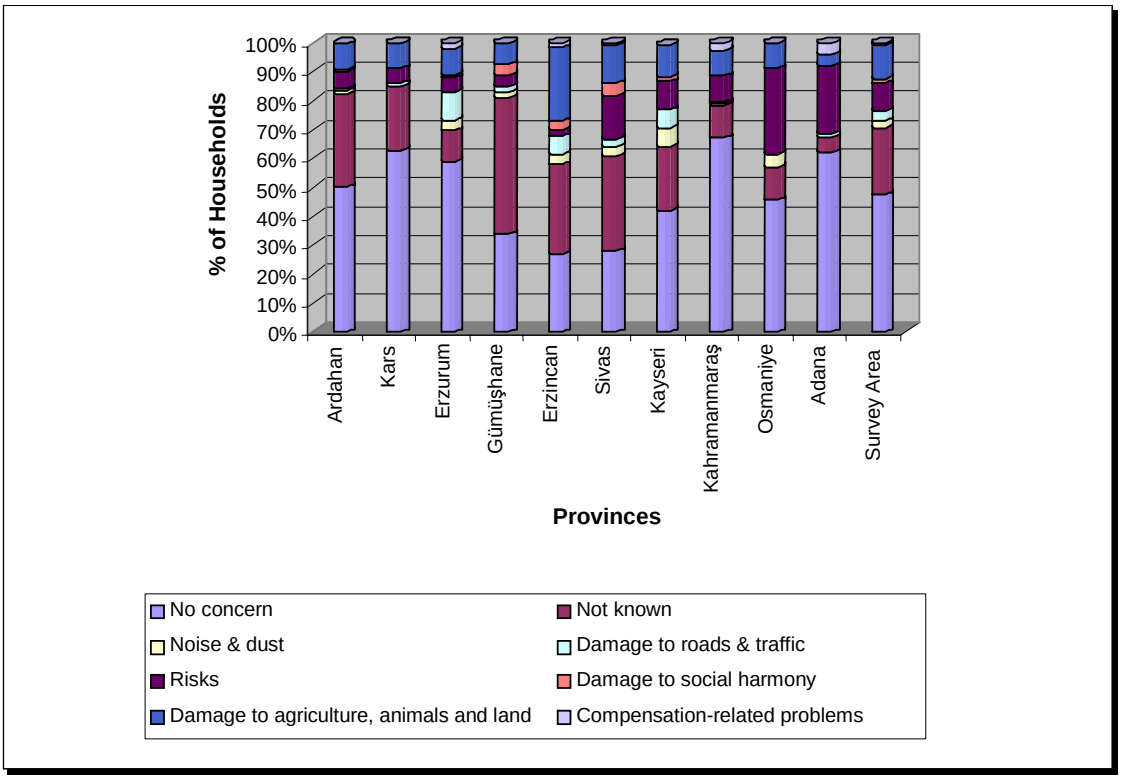
Figure 5.50 Expected Positive Impacts in the Surveyed Provinces

Expected Negative Impacts: approximately 48% of surveyed households have no concerns associated with the proposed project and 23% of households particularly those without previous pipeline experience did not feel in a position to comment. The main concerns raised during consultation are listed below (see Figure 5.51).

1 This section only reports findings from the community survey. Further concerns were raised by communities in the consultation meetings (see Section 3 and Appendix A1) and other stakeholders.

2 See Section 1 for a summary of the economic and strategic benefits that will be brought to Turkey through realisation of the BTC Project.

- *Land and Resource Damage:* less than 1% of households raised specific concerns that there may be damage to agricultural production, livestock husbandry and land. Erzincan and Sivas had the highest number of households (25% and 14% respectively) concerned that damage to agriculture/ land may occur, potentially fuelled by previous pipeline experience.
- *Land Compensation:* only 2% and 4% of households in Kahramanmaras and Adana were particularly concerned about compensation for land.
- *Social Harmony:* a small number of households in Sivas, Gumushane and Erzincan are particularly concerned about impacts on *social har*mony.
- *Roads and Traffic:* 10%, 6%, 6% and 5% of households in Erzurum, Erzincan, Kayseri, and Osmaniye respectively are particularly concerned about potential damage to roads and increase in traffic particularly during harvest periods.
- *Pollution:* 6% and 5% of households in Kayseri and Osmaniye respectively are particularly concerned about noise and dust.



Source: Household Survey 2001 [**Ref 31**]

Figure 5.51 Expected Negative Impacts in the Surveyed Provinces

Attitudes towards the BTC Project (in addition to those captured in the household survey) and reported above were also explored in the community meetings and other stakeholder meetings (see Section 3.2.5 and Appendix A1). These meetings raised additional 'perceived' benefits and concerns, which have further informed the impact assessment and development of mitigation measures (see Section 6).

Bibliography

Ref 1 www.geography.about.com/library.

Ref 2 www.fs.fed.us/colorimage/images/app1.htm.

Ref 3 ENVY. 2001. Baseline Report (including Contaminated Land) Rev.1 (Doc.# PLE-REP-LHS-GEN-002).

Ref 4 Soil Survey Staff. 1960. Soil Classification: A Comprehensive System — 7th Approximation. US Department of Agriculture. Wa DC. 265pp.

Ref 5 US Department of Agriculture. 1983. Keys to Soil Taxonomy. Technical Monograph No. 6. Wa. DC.

Ref 6 Wischmeier, W.H. and D.D. Smith. 1978. Predicting rainfall erosion losses: a guide to conservation planning. US Department of Agriculture. Agriculture Handbook No. 537. Washington DC.

Ref 7 Fowler, A and WB Krantz. 1994. A Generalized Secondary Frost Heave Model. Vol 54, Nbr 6 Soc for Ind and Applied Mathematics Journal on Applied Mathematics.

Ref 8 ENVY. 2001. Soil Quality Survey Report Rev. C (Doc.# ENV-REP-ENS-GEN-006).

Ref 9 British Standards Institute 1999 BS5930 'Code of Practice for Site Investigation', BSI, London.

Ref 10 Water Quality Sampling, Section 2: Guidance on Sampling Techniques, April 1997.

Ref 11 ENVY. 2002. Water Quality Survey Report Rev. 0 (Doc.# ENV-REP-ENS-GEN-003).

Ref 12 Environment Foundation of Turkey. 1998. Turkiye'nin Cevre Sorunlari 1999. Publication N°. 131, Turkey. ISBN: 975-7250-47-7.

Ref 13 ENVY. 2002. Phase II Habitat Survey Report Rev.0 (Doc.# ENV-REP-ENS-GEN-002).

Ref 14 Akman, Y. and Ketenoglu, O. 1992. Vegetation Ecology and Research. *Science Faculty Revolving Fund Management Publications: Ankara University* No. 93 (In Turkish).

Ref 15 Cepel, N. 1995. Orman Ekolojisi (Forest Ecology). *Istanbul University Faculty of Forestry Publications* No 433. 4th Edition. (In Turkish).

Ref 16 Guinochet, M.. 1973. *Phytosociologie.* Masson et cie.

Ref 17 Gemici, Y.. 1994. *Eastern Anatolian Watershed Rehabilitation Project: GEF sub-project – In situ Conservation of Genetic Diversity (No. 11295-TU).* Turkish Ministry of Forestry: Directorate of Aegean Forestry Research Institute. 226pp.

Ref 18 ENVY. 2001. Bird Survey Report Rev. 0 (Doc.# ENV-REP-ENS-GEN-001).

Ref 19 ENVY. 2002. Sea Turtle Survey Report Rev. 1 (Doc.# ENV-REP-ENS-TRG-001).

Ref 20 ENVY. 2001. Marine Ecology Survey Report Rev. 0 (Doc.# ENV-REP-ENM-TRG-001).

Ref 21 ENVY. 2002. Mammal Species Dossier Rev.B (Doc.# ENV-TNO-ENM-GEN-008).

Ref 22 ENVY. 2002. Fish Study Report Rev. B (LET-BOT-ENV-000083).

Ref 23 International Union for Conservation of Nature (IUCN) (1994) 'The World Conservation Union's Classification – Habitat/Species Management Area'.

Ref 24 Davis, P.H. 1971. Distribution patterns in Anatolia with particular reference to endemism. In: Proceedings of Symposium on Plant Life of South West Asia. Edinburgh Univ. Press. pp. 15-27.

Ref 25 Hilton-Taylor, C. (Compiler). 2000. 2000 IUCN Red List of Threatened Species. IUCN, Gland, Switzerland and Cambridge, UK. xviii + 61pp.

Ref 26 Ekim, T., Keyence, M., Viral, M., Duran, H., Aztec, Z. and Adiguzel, N.. 2000. Turkiye Bitkileri Kirmizi Kitabi [Red Data Book of Turkish Plants]. Turkiye Tabiatini Koruma Dernegi and Van Yuzuncu Yil Universiti [Turkish Association for the Conservation of Nature & Van Centennial University], Ankara. Ix + 246pp.

Ref 27 BirdLife International. 2000. Threatened Birds of the World. Lynx Edicions & Birdlife International, Barcelona and Cambridge, UK. xii + 852pp.

Ref 28 ENVY. 2002. Notes on Brown Bear Rev. 0 (Doc.# ENV-REP-ENM-GEN-005).

Ref 29 ENVY. 2001. A Summary of Archaeological Studies Conducted up to Date Rev. A (Doc.# ENV-TNO-ENS-GEN-001).

Ref 30 State Institute of Stastics, 1997 Census.

Ref 31 BTC Project Turkey Section - Settlement and Household Survey 2001.

Ref 32 Cowan, J.P. 1994. Handbook of Environmental Acoustics. Van Nostrand Reinhold, New York.

Ref 33 World Bank Country Reports, 2000.

Ref 34 ENVY. 2002. Air Quality Survey Report Rev. 0 (Doc.# ENV-REP-ENS-GEN-004).

Ref 35 ENVY. 2002. Noise Survey Report Rev.0 (Doc.# ENV-REP-ENS-GEN-005).

Ref 36 ENVY. September 2002. Noise Survey Report Rev. 0 (Missing Baseline) (Project No. 01-56-01).

Ref 37 State Institute of Statistics, 2000 Household Labour Force Survey, 2000.

Ref 38 http://www.incc.gov.uk/species/default.htm.

Ref 39 http://www.panda.org/resources/programmemes/global200.

Ref 40 Turkish Regulation for the Control of Soil Pollution, Official Gazette dated December 12, 2001.

Ref 41 John Charman, Mark Lee. August 2002. BTC Crude Oil Pipeline Project Turkey. Geotechnical Audit – Landslides Aerial Photograph Inspection.

Ref 42 ILF, 15 June 2002. Volume Geo 06, Liquefaction Investigation Report. ILF REP EPL PLG 019 Rev. 0.

Ref 43 State Institute of Statistics -1990 Census, Statistical Yearbook of Turkey, 1993.

Ref 44 State Institute of Statistics Website, www.die.gov.tr.

Ref 45 Turkish Ministry of Foreign Affairs Website, www.mfa.gov.tr.

Ref 46 Turkish Prime Ministers Website www.basbakanlik.gov.tr.

Ref 47 Turkish Ministry of Health Website www.moh.gov.tr.

Ref 48 Turkish Ministry of Health , Head of the Department of Contagious Diseases.

6 BTC PIPELINE – CONSTRUCTION IMPACTS AND MITIGATION

6.1 INTRODUCTION

6.1.1 Basis for the assessment

This section of the Report identifies environmental and social impacts associated with construction of the BTC Pipeline. It assesses the significance of the identified impacts in light of mitigation measures incorporated into design and management of the Pipeline. Where appropriate, specific control measures are described in greater detail.

This section is organised on an environmental and social aspect basis. For each aspect, the section:

- identifies and describes the generic potential impacts that might arise as a result of pipeline construction;
- describes, where appropriate, the general mitigation measures that have been incorporated into the Project to address potential impacts for that aspect. Any residual impacts are identified.

The majority of the mitigation measures for environmental and social impacts need to be applied along the whole pipeline. Indeed, the core strength of many mitigation measures lies in the consistency of approach that will be applied along the pipeline corridor, independent of the influence of particular environmental resources/receptors, settlements or individuals. Other mitigation measures, such as those required where the route passes through (or close to) a protected ecological resource or to sensitive activities, (eg beekeeping), are site-specific. Further measures, such as safety of residents, require greater attention when the route is passing close to inhabited areas. Site-specific potential impacts, particularly sensitive environmental and social aspects identified in scoping and consultation and additional mitigation measures, are introduced in Section 6.16 and documented in detail in the environmental and social impact tables in Supplement 1 (Volume 2).

A key conclusion of the scoping exercise was that many of the potential impacts from pipeline projects are readily amenable to mitigation. Thus, for the majority of potential impacts described in this section, the proposed mitigation measures will result in residual impacts that are minor (also termed ‘acceptable’ or ‘insignificant’).

The impacts are identified and evaluated against site-specific characteristics in order to determine whether the proposed mitigation measures are sufficient and therefore the level of residual impact.

6.1.2 Scoping

The identification of potential impacts started at the scoping stage for the EIA. Initial activities involved the systematic identification of the activities envisaged for all project phases and the environmental and socio-economic resources and receptors along the route, and how the two (project and environment) might interact. Initially identification was based on a combination of professional judgement and past experience of pipeline projects. Scoping was facilitated by site visits and surveys and initial consultation, particularly with regulatory

authorities. Since scoping paralleled the Basic Engineering (BE) Design phase, it influenced routing and corridor narrowing decisions and the evaluation of alternatives (as described in Section 2).

A key purpose of scoping is to identify the key issues for the EIA and to determine how best to address them in terms of more detailed study, assessment methodologies and developing mitigation during Detailed Engineering (DE) Design.

The main issues to emerge from scoping during the BE Design phase are summarised in Box 6.1. However it is important to recognise that scoping is an ongoing activity. As the corridor was narrowed from 500m to 100m, as re-routes were made for design and environmental and socio-economic reasons and as stakeholder consultation proceeded through its planned phases, the scope of the EIA has responded accordingly.

Consultation is central to the EIA process. Its function is to understand as far as possible, how the Project will impact all stakeholders, and to obtain their ideas and opinions on the management of impacts. Section 3.2 summarises the consultation process that has been conducted at the national, regional and local level and how the results of the process have been used to shape the design of both the Project itself and the mitigation measures identified. Further details of the process to date can be found in the Public Consultation and Disclosure Plan (PCDP), (see Appendix A1). Key concerns emerging from consultation include land and resource damage, issues regarding land compensation, social disturbance, damage to roads and increased congestion, and noise and dust pollution. The main perceived benefits relate to economic and strategic benefits to Turkey, as well as employment and purchasing of goods and services at the local and district level.

Box 6.1 Summary of Main Environmental Issues Identified in Scoping

Construction

During scoping, it was considered that the following sites (and/or areas) merited further detailed investigation in terms of ecological baseline characteristics, potential impacts and mitigation:

- Posof River Valley;
- Sarikamis Forest;
- Erzurum Plain;
- Aras River;
- Karasu River;
- Acisu River;
- Zamanti River.

Furthermore, several issues (and/or activities) of significant concern were identified which also required further detailed investigation:

- changes to, and disturbance of, soils;
- temporary air, noise and water emissions;
- crossing of watercourses;
- erosion control;
- social and community impacts;
- traffic and transportation management;
- cultural heritage and archaeology.

It was considered that most of the other potential environmental impacts associated with the construction activities could be avoided or at least minimised. In most cases, standard good construction practice and adherence to international standards would be sufficient to minimise any adverse impacts.

Commissioning

During commissioning, the major potential impact identified was that associated with the hydrostatic testing of the pipeline. The possible sources and disposal of test water were viewed as constituting one of the major issues to be investigated in the EIA process.

Operation

It was concluded during scoping that the following operational issues would require further detailed investigations:

- emissions;
- land-take and landscape;
- pollution control and waste management;
- oil spill prevention and response.

Decommissioning

Decommissioning or abandonment of the BTC Project is governed by the Host Government Agreement (HGA). The HGA stipulates that an 'Abandonment Plan' shall be prepared to address the removal of all surface installations, the drainage and proper disposal of any remaining Petroleum in the Facilities and the re-vegetation of the pipeline corridor consistent with the terrain features and other prevailing conditions in the subject area.

The Abandonment Plan will have to be approved by the Government. Once it is approved or all disputes resolved, the BTC Co would be required to complete the abandonment of the Facilities in accordance with the Abandonment Plan.

Other Issues

- proximity to the existing East Anatolian Natural Gas Pipeline (NGP);
- cumulative impacts.

6.1.3 Potential impacts

On the basis of the scoping exercise described above, a series of key potential social and environmental impacts were identified for assessment within the EIA process. These potential impacts are discussed in this section and are outlined in Box 6.2 below.

Box 6.2 Summary of Potential Environmental and Social Impacts

Potential Environmental Impacts

- changes to, and disturbance of, soils;
- changes to, and disturbance of land and associated impacts upon existing landuse and users;
- temporary landtake;
- visual changes to landscape;
- permanent landtake at above ground facilities (AGIs), such as the pump stations, pressure reduction station and block valves;
- temporary discharges to water and physical impacts on watercourses;
- temporary emissions to air;
- temporary noise emissions;
- changes to, and disturbance of, other existing features, including infrastructure, archaeology and cultural heritage resources.

Potential Social Impacts

- disturbance from construction workers;
- safety risks for neighbouring settlements;
- land expropriation within and outside of the RoW;
- decreased fish yield in streams downstream of river crossings;
- disturbance to beekeeping and animal grazing activities;
- employment, sourcing of local goods and services, and skills training;
- disruption (planned and unplanned) to local infrastructure and services.

6.1.4 Mitigation

The mitigation measures summarised in this section, and more fully described in the Management Plans (see Appendix C), have been fully adopted by the Project. All mitigation measures have been worded so that they are clear commitments. They have been incorporated into specifications, which have been included in the Environmental and Social Specifications for Construction Contractors. This allows the Contractors to both plan their activities accordingly and to fully allow for the cost of environmental and social requirements in pricing their bids and reaching contractual agreement with BOTAŞ.

The following sections set out potential impacts and mitigation measures for each environmental and social aspect associated with construction of the Turkish section of the BTC Pipeline. Sections from 6.2 to 6.15 provide a summary of generic potential impacts that will be experienced and mitigation measures that must be applied along the length of the pipeline route during construction. These sections reflect the requirements of the management plans and so should be read in conjunction with the relevant plan as indicated.

6.2 SOILS

Soil can be thought of as a living entity, usually comprising a layered habitat with the thickness varying from place to place. Different layers favour different types and densities of organisms. The act of constructing a pipeline and subsequent reinstatement greatly simplifies these structures, with a knock-on effect on the organisms they contain. Clearly, it is impossible to duplicate the complexity created by natural processes, but reinstatement has the objective of helping nature preserve as much of its integrity as possible, and provide a basis for natural processes to carry on and complete the job, ie to recover. Whilst reinstatement is important, recovery is critical. The recovery time is that required for a layered soil habitat to begin to re-establish itself along with associated soil organisms involved in aeration, stabilisation and breakdown of material to render nutrients available for plant uptake and so on. Reinstatement starts and facilitates the recovery process; the better the reinstatement, the more rapid the recovery. Natural flora and fauna will become re-established, agricultural productivity will return to its former level, and the disturbed land will take on the appearance of its surroundings.

Conversely, where soils are fragile, sensitive to disturbance and difficult to reinstate, recovery processes will inevitably take longer. Where this happens, impacts to ecology, agricultural land use, landscape and visual appearance may endure for years and be clearly perceptible.

In this context, it is worth stressing that while the construction phase, through the Project footprint or landtake, has direct, and mainly temporary, impacts on a number of receptors and resources (landscape, landuse, water courses etc), the extent to which these impacts endure in the long-term is largely dependent on the extent to which any impacts to soil take place and the time it takes to recover.

Potential impacts on the soil resource will start during construction and how long they endure will depend on the success of reinstatement. The most significant will be potential changes in the soil structure and degradation of the soil quality as a result of erosion and compaction. The extent to which these occur, will be dependent on the properties of the soils. Clearly different soils will need different handling, and the emphasis of mitigation will vary from one soil to another, as well as according to other factors such as weather/time of year, slope etc. Table 20.1 in the Reinstatement Plan (RP) (see Appendix C2) briefly summarises the various soil types along the route as described in Section 5, highlighting those factors that can impact a particular soil and the management measures that will be required.

Impacts resulting from contamination of soils due to spillage of fuels, chemicals or crude oil are also possible. The measures that will be used to minimise the extent to which soils are adversely affected during soil stripping and other construction activities, and which will be included in method statements and working practices as appropriate, are fully described in the RP (Appendix C2) and summarised in Table 6.1.

Table 6.1 Summary of Major Generic Impacts and Mitigation Measures for Soils during Pipeline Construction

POTENTIAL IMPACT	MITIGATION MEASURES
Changes in soil hydrology	Appropriate and effective drainage and construction procedures will be used, (refer to Section 20 of the RP for methods to benefit soil infiltration).
Localised changes in topsoil and subsoil structure	Topsoil, subsoils and any parent material removed will be separately stripped, handled, stored and replaced, (refer to Sections 12 and 13 of the RP). Access areas will be restricted (refer to Section 22 of the RP). Topsoil storage periods will be kept to a minimum.
Localised compression of subsoils	Appropriate machinery and / or protective boarding will be used during soil stripping (eg machinery with tracks will be used where the soil conditions indicate that compaction is likely; should any compaction occur, the subsoil will be ripped prior to the replacement of topsoil). Soil stockpiles will be restricted to a maximum of 2m in height to prevent compaction under the weight of the soil. Additional measures will be employed for dealing with any compaction along the working width or in other areas that might affect agricultural reinstatement (for example subsoil stripping). Access areas will be restricted (refer to Section 22 of RP).
Localised contamination to soils	Wherever possible, fuel handling will take place in secure bunded areas. Adequate supplies of absorbent material will be available at all fuel storage and handling areas and the workforce will be trained in their use and safe disposal. Similar conditions will apply to lubricant oils, chemicals and liquid wastes. Should a spill occur, contaminated soils would be cleaned up or removed for appropriate disposal in accordance with the Regulation on Control of Soil Pollution and other Turkish legislation and World Bank requirements. Leaking or empty oil drums will be removed from the site immediately with measures in place to prevent contamination. All wastes will be handled, stored and disposed of in accordance with the requirements of the WMP.
Disturbance to potentially harmful materials in previous landfill sites	Appropriate machinery and / or protective boarding will be used during soil stripping to ensure minimum compaction. Access will be restricted (refer to Section 22 of the RP).
Loss of soil stability along river banks, steep slopes etc	Appropriate machinery and / or protective boarding will be used during soil stripping (refer to the RP, Sections 16 and 17 for erosion control methods; Section 19 for river bank reinstatement; Section 20 for Bio-restoration and Section 21 for reinstatement methods specific to slopes etc).
Silt laden run off from stockpiles	Measures to reduce mobilisation of silt, such as covering stockpiles and constructing silt fences will be undertaken where necessary, particularly on slopes, adjacent to sensitive habitats and land uses and in the vicinity of water courses (refer to section 21 of the RP for spoil reinstatement).
Fragile, sensitive soils may be sensitive to disturbance and difficult to reinstate, ultimately affecting ecology, agricultural land use, landscape and visual appearance.	Avoidance wherever practicable for use as storage facilities etc in the event they should occur, spills of fuel and lubricant oils will be contained by ensuring that all fuel storage areas are located in secure bunded areas. Bunded areas will be designed to accommodate 110% of the volume and will stand on an impermeable surface. Should a spill occur, contaminated soils would either be cleaned up or removed for appropriate disposal in accordance with the Regulation on Control of Soil Pollution and other Turkish legislation and World Bank requirements. Leaking or empty oil drums will be removed from the site immediately. Particular attention will be given to the control of offsite activities associated with AGI construction. Access to the site will be via specified access routes only. Offsite activities (eg activities associated with water supply, power supply etc) will utilise predetermined access routes that avoid any areas of environmental sensitivity and will avoid impacts on existing farming and other activities. Offsite works will be limited to the minimum period and area required and will be immediately and fully reinstated upon the completion of the work. Access areas will be restricted (refer to Section 22 of the RP). Special care is necessary to ensure preservation of topsoil and successful establishment of a natural vegetative cover in areas of volcanic tuff, or other thin topsoils, Contractor Method Statements will clearly state methods that will be adopted to avoid such adverse impacts, (refer to Section 21.6 of the RP).

6.3 LANDSCAPE AND VISUAL IMPACTS

Potential landscape and visual impacts resulting from the construction of the pipeline are broadly those that will result from physical changes to the landscape through which the pipeline will pass, and those which affect visual amenity of the residents and others in the project area. Impacts to landscape and visual amenity can also have potential indirect impacts, eg to revenue from tourism. Table 6.2 provides a summary of potential landscape and visual impacts, with corresponding mitigation measures, which may be experienced during pipeline construction. Although measures are discussed in this section in brief, these are more fully described, along with replanting requirements, in the RP (Appendix C2).

Landscape and visual impacts associated with construction on the AGI sites will be very similar to those experienced during operation of the AGIs, these operational impacts are discussed in detail in Section 7. In general, visual impacts during construction at these sites are potentially greater than during operation due to the following factors:

- the need to undertake some offsite works, eg power and water supply activities;
- the nature of the activities, eg earthworks;
- the absence of operational mitigation measures such as boundary planting.

However, any additional landscape and visual impacts during construction will be temporary and will be limited to the period of the construction works. The Zone of Visual Influence (ZVI) assessments, (see Section 7), indicate that residential viewers in surrounding villages will experience only medium to long distance views of the AGI facilities during operation. As the ZVI assessment does not consider any off-site construction activities, such activities may be visible from a greater area and a larger number of residential properties, although any activities will be of limited duration. Consequently, it is not predicted that any landscape and visual impacts during construction will be significantly greater than those predicted during operation of the AGIs as discussed in Section 7.

The speed with which these impacts diminish in the long term will be a function of the success of the reinstatement (especially of soils), and in turn the recovery of vegetation and the overall ‘natural’ appearance of the land, which is dependent on the nature of the area through which the pipeline will pass.

Table 6.2 Summary of Major Generic Impacts and Mitigation Measures for Landscape and Visual Resources during Pipeline Construction

POTENTIAL IMPACT	MITIGATION MEASURES
Interruption of agricultural use of the working width	Off-site construction activities will be limited to the shortest practicable duration.
Disturbance to landscape features habitats such as watercourses or loss of landscape features such as mature trees	Wherever it is practicable, individual mature trees will be avoided during the detailed consideration of the final alignment for the route at a very local level. The working width will be limited to the minimum required for construction purposes in response to identified local sensitivities as specified on alignment sheets. Where the removal of existing landscape features (such as tress, shrubs etc) is necessary, the species selected for replanting works will be appropriate and characteristic of that particular landscape area. Replanting works will also be carried out in a way that ensures that root growth patterns will not compromise the integrity of the pipeline.
Aesthetic value to residents	On completion of works all temporary structures, surplus materials and wastes will be completely removed. Lay-down areas and all on-site construction activities at the AGIs will be contained within the area of permanent land take area and will be demarcated by the use of secure fencing around the site boundary. Removal of mature trees prior to or during construction will be minimised to that necessary for safe working. Contractor will keep highways free from mud and dust and to ensure no vehicle / other items of equipment leaving the construction base or working width, deposit soil, debris or rock on public highways or public right of ways. In areas of volcanic tuff, or other thin topsoils, Contractor Method Statements will clearly state the methods that will be adopted to avoid such adverse impacts, refer to Section 21.6 of the RP (Appendix C2).
Physical landscape changes due to spoil heaps, signs of construction etc	The AGIs have all been located within the rural environment to minimise potential impacts to residential properties. Off-site construction activities will be limited to the shortest practicable duration. Off-site construction areas will be fully restored to their pre-construction state in accordance with the RP. As described elsewhere in this section, physical terrain, soils and vegetation will be reinstated as closely to their original condition as it is practically possible, the success of this will be critical in determining the extent to which landscape impacts endure post-reinstatement.

6.4 SURFACE WATER RESOURCES

The Pollution Prevention Plan (PPP) lists all the necessary measures and precautions that will be adopted to prevent the pollution of surface waters along the pipeline RoW and in the vicinity of construction sites, (see Appendix C4). As a key general requirement, a protocol will be signed with the General Directorate of State Hydraulic Works (DSI) for all watercourse crossings.

The watercourse crossings have been designed to avoid affecting the stability and long-term performance of riverbanks and flood defences. The pipeline will be installed below the watercourse bed, at a level such that the gradients on the channel beds are not impaired or future re-grading does not become more difficult.

Construction details for each water crossing will be prepared by the Construction Contractor to the satisfaction of BOTAŞ and will be approved by DSI and formalised through method statements, which will be prepared for each major watercourse crossing. A general working method statement will be prepared for medium and minor watercourse crossings. These plans and procedures will deal with spills in water and on land (which might otherwise move into the groundwater). For spills in water, the plans and procedures will include: immediate reporting techniques, deployment of a boom downstream of the spill source spanning the entire watercourse, angling of the boom to direct pollutant to one of the banks, use of floating absorbent and/or skimmers to remove the pollutant, and removal of contaminated material from the site to a suitable licensed disposal location.

For spills on land, the plans and procedures will cover: techniques for isolating and containing the source, use of absorbent material to mop up the spill (for small spills on land), excavation of trenches downhill of the spill to intercept any contaminated groundwater with absorbent material in trench (for larger spills on land), and appropriate disposal (ie to a licensed facility) of contaminated material. In all instances, incidents and near misses will be reported and corrective action taken to prevent a future occurrence (for a near miss) or reoccurrence (for an actual spill).

Appropriate spill response equipment will be available on a vehicle moving with each main spread (this will carry equipment for deployment in surface waters), at each construction camp and at all fuel or chemical storage facilities.

The major rivers that the pipeline will cross were assessed as potential sources for hydrotest water abstraction. The following conclusions were drawn from this assessment:

- eight rivers were chosen as potential hydrotest water sources, due to their relatively high flow rates and low ecological sensitivities (see Appendix C4);
- there should be more than one location for water abstraction at each Lot along the pipeline route;
- water should be passed between the test sections and ‘topped up’ as required so as to minimise the volume of water that needs to be abstracted and consequently reduce the volume of discharge following test completion.

The Construction Contractor will be required to produce a comprehensive *Plan for the Implementation of Hydrostatic Testing*, which will include information regarding the quantity and quality of water required, the proposed use of any chemical additives, an evaluation of available water resources in the relevant regions and proposed abstraction points, and a discharge proposal in accordance with the HGA (see Section 4.8.4).

Additional measures aimed at the protection of surface and groundwater that will be adopted throughout the Project are outlined in Sections 4 and 5 of the Pollution Prevention Plan (PPP) (see Appendix C4). The rivers chosen as potential sources for hydrotest water abstraction are shown in Table 4.2 in the PPP. Table 6.3 summarises the potential impacts and mitigation measures to be employed during construction and reference should be made to both the EMMP and the PPP.

The Contractor will prepare a detailed time schedule for all crossings, which will be subject to project approval. It should be noted that the timing of a number of river crossings will be determined by considerations of the seasonal sensitivity of ecological resources. These considerations are further addressed in Section 6.6 below and in Attachment One of the EMMP.

Table 6.3 Summary of Major Generic Impacts and Mitigation Measures for Surface Water Resources during Pipeline Construction

POTENTIAL IMPACT	MITIGATION MEASURES
Contamination from oil / fuel	Direct access of vehicles and mechanical plant to watercourses will be minimised. If it is necessary for any vehicle/plant to enter a watercourse it will be inspected in advance and, if required, remedial action will be taken to prevent contamination from oil/fuel leakages. Mobile plant will be regularly inspected and maintained in accordance with manufacturers' guidance, all drivers will be instructed in the use and safe disposal of clean up equipment and carry absorbent materials in their vehicles. Fuelling/washing/maintenance of plant/machinery will not take place in/within 30m of a drain/watercourse unless approved in advance by BOTAŞ. All vehicle wash facilities will be securely constructed, using re-circulatory system with no overflow. The effluent will be contained for treatment and disposal. Site roads and approaches to watercourse crossings will be kept free from deposits in order to prevent silt, oil or other materials entering any drain/watercourse. Temporary access roads will be free from deposits to prevent silt, oil or other materials from entering drains or watercourses (Section 4.2 of Traffic Management Plan (TMP), (see Appendix C5). Measures will be implemented to ensure the transport of mud/dust from the site to public highways and roads is limited. Such measures shall be developed in consultation with the BOTAŞ representative (refer to Section 4.7 of the TMP). Additional mitigation and responses measures are detailed in the PPP (Appendix C4) and, for larger incidents, the OSRP (see Appendix C6)
Siltation	No silt/turbid discharge water from trench dewatering operations will be allowed to enter any drain/water body/wetland, unless the drain or water body was dry and well vegetated. Discharge of water from dewatering and hydrotesting operations will be in accordance with relevant Turkish water quality legislation and World Bank discharge guidelines. All dewatering intake hoses will be elevated from the bottom of the trench to avoid drawing bottom silt through pumping operations. If discharge point is <30m from any watercourses/resources, discharge will be directed through a filter bag and/or into areas contained by erosion control barriers. Pumped discharges will be made using a pump of suitable size for the situation and at a rate that does not cause riverbed disturbance. Cut-off ditches and well-point dewatering or cut-off walls for groundwater will be used to prevent surface water entering excavations. Sediment filters and traps will be installed by the Contractor to intercept run-off and remove sediment before it enters watercourses. Sediment settling ponds will be installed where other measures to control erosion and sediment in runoff are insufficient or of unknown effectiveness.
Watercourse crossings	Construction activities will be planned to occur over a limited period of time and with minimum equipment required for safe and efficient working. Watercourse crossings will be constructed perpendicular to the axis of the river channel wherever engineering and routing conditions allow. Ambient downstream flow rates will be maintained and measures will be taken to minimise raised sediment loadings in the river. River channels, beds and banks will be restored to their original state, and banks and adjacent upland areas will be stabilised immediately after final grading. If blasting is required within a watercourse, the explosives will be padded with blasting mats.
Equipment crossings	Flume/culvert pipes will conform to watercourse crossing dimensions and alignments. The size and number of flumes will be sufficient for the maximum anticipated flows. River channels may be temporarily altered to allow placement of flume pipe(s)/culvert(s) and to facilitate equipment crossings, but if this is necessary they will be fully reinstated afterwards. Where fill for equipment crossings comprises log rip rap or other erodable material, sandbags will be placed within the watercourse, and both upstream and downstream of the crossing point, to stabilise and seal the flume pipes. Clearing crews may occasionally find it necessary to construct temporary crossings with timber or log mats. However, these will not be used for equipment crossings. Long-term equipment crossings will be installed by subsequent crews to specifications subject to formal project approval. Temporary bridging structures will be installed prior to crossing any watercourse. One of the following methods will be used: timber mats with or without flume pipe(s); clean rock fill and flume(s); or a portable bridge. Bridges will be maintained to prevent soil from entering the watercourse.

POTENTIAL IMPACT	MITIGATION MEASURES
Fish species	Construction works will be carefully scheduled to avoid seasonal sensitivities (refer to Attachment 1 of the EMMP). Where there are downstream fisheries farmed or used by local communities and/or a river of importance for migrating or breeding fish is crossed, special attention will be paid to sediment control measures and their effectiveness will be carefully monitored so that instant remedial action can be taken if it is required.
Flooding and drainage	The full holding capacity of the flood plain will be restored upon completion of construction. A temporary drainage system will be installed where necessary during construction, in addition to the normal reinstatement of existing drainage systems. Once reinstatement has been completed, the pipeline will be designed to have no significant effect on, or inhibit the movement of, surface / groundwater.
Hazardous material leakage	Hazardous chemicals, fuels or lubricating oils will not be stored, and refuelling and concrete coating activities (excluding field joints) will not be carried out within 30m of a watercourse. The placing of wet concrete and cement in / close to any watercourse will be controlled to minimise the risk of discharge. During mechanical completion, the pipeline will be hydrostatically pressure tested to ensure there are no leaks. In the very unlikely event that leaks occur, an appropriate clean up response will be put into place, refer to PPP (Appendix C4).
Discharges from construction camps (sewage; domestic waste water; water generated by subsidiary operations, such as vehicle/equipment washing, etc; and rainwater that may be contaminated by pollutants such as rust, silt or oil).	Comprehensive scheme for water re-use, treatment and disposal will be developed in the Construction Contractor's waste minimisation/ treatment study. In order to minimise liquid effluents, water will be re-used whenever practicable. All residual wastewater will be treated prior to final disposal, except where disposal is to a licensed third party. The standard of treatment will be location specific and dependent on the nature of the receiving body (water, terrain etc). The Construction Contractor will propose treatment techniques and standards for each disposal location according to guidelines in the PPP. These will be subject to formal project approval before any work takes place. Treatment standard and temporary nature of the discharges will ensure no significant deterioration occurs to the quality of the receiving body. The relevant Turkish standards and World Bank environmental performance guidelines are summarised in Section 3 of the Report. All wastewater discharges will be monitored during construction in accordance with the requirements of the EMMP to ensure these standards are met. Wastewater treatment plants will be established at the main construction camps and/or maintenance facilities. These will be designed to be capable of accepting a range of wastewaters, with each type of water passing through a sequence of unit operations such as oil removal, chemical treatment, biological treatment and suspended solids removal. Short-term camps will have simpler portable facilities, such as packaged sewage treatment facilities and tanks to receive waste from chemical toilets prior to onward transport to a treatment centre (eg at a main construction camp). All wastes arising from wastewater treatment, except for the treated water itself, will be dealt with according to the Waste Management Plan (WMP), see Appendix C3.
Surface water abstraction, (including hydrotest water abstraction)	As abstraction of surface water for the Project could lead to potential conflict with other users, the Construction Contractor will follow the steps set out in Figure 4.1 of the PPP. An analysis of potential sources for hydro test water abstraction has been carried out and the results are provided in the PPP. Corrosion inhibition chemicals, oxygen scavengers or biocides will only be used in the hydro test water with the prior permission of BOTAŞ and the Turkish regulatory authorities. At this stage, only generic chemical constituents of hydro test water are known. Any abstraction will be at a rate that ensures the maintenance of adequate downstream flow rates to protect aquatic life, provide for all water body uses, and downstream abstraction of water by existing users. The rate of discharge will be controlled to a level that avoids the risk of flooding or erosion.

6.5 GROUNDWATER RESOURCES

Groundwater is an environmental factor that can have an impact on a construction project as well as be impacted by it. For example in areas where groundwater lies close to the soil surface, excavations require dewatering so that work can continue.

Potential impacts on groundwater resources (including springs and wells) that could arise as a result of pipeline construction and the associated mitigation measures are detailed in Table 6.4. Reference should be made to both the EMMP and the PPP (see Appendices C1 and C4, respectively). BOTAŞ will develop and implement a Groundwater Protection Strategy for the BTC Pipeline (see EMMP) and to supplement the full implementation of identified mitigation measures.

Groundwater resources will not be utilised for the purpose of supplying hydrotest water to the pipeline. Similarly, groundwater resources will only be accessed (eg for domestic and potable water at construction camps) following abstraction and sustainability testing and with appropriate permits from the relevant authorities (see attached Erzurum Aquifer case study).

The possibility of contamination has the greatest potential for causing adverse effects on groundwater quality. In the event of a potential contamination event (eg from on-site spillage), those groundwaters most vulnerable to impact are 'unconfined aquifers' ie where the resource has no intervening impermeable strata to separate it from the effects of contamination seeping through the subsurface stratigraphy. Although confined aquifers could conceivably be impacted, this is likely to occur primarily through works taking place within their recharge zones.

It should be noted that many of the mitigation measures described in Section 6.4 for the protection of surface water resources, will provide equal protection to groundwater resources.

Table 6.4 Summary of Major Generic Impacts and Mitigation Measures for Groundwater Resources during Pipeline Construction

POTENTIAL IMPACT	MITIGATION MEASURES
Increased runoff and reduced infiltration, thereby affecting localised groundwater recharge.	A temporary drainage system will be installed where necessary during construction, in addition to the normal reinstatement of existing drainage systems. Once reinstatement has been completed, the pipeline will be designed to have no significant effect on, or inhibit the movement of, surface / groundwater.
Draw down of groundwater.	Dewatering of the pipeline trench will be carried out in areas where there is a high water table. The discharge of this water will be in accordance with relevant Turkish water quality legislation and World Bank guidelines. Where construction camps will be supplied by groundwater or spring water sources, a sustainability study will be carried out. For groundwater this will include a water features survey and pump testing.
Possibility of contamination from site drainage or accidental spillage of fuel, lubricants and chemicals.	All discharges, including effluents from wastewater treatment plants, will meet both World Bank and Turkish water discharge standards (refer to the PPP, see Appendix C4). Fuels and other oils will not be stored in areas of Class 1 unconfined aquifers. If it is necessary to store fuels etc in such locations they will be stored in bunded areas on impermeable bases and the inventories will be kept to a practical minimum. Construction camps and other temporary facilities will not be located in areas of Class 1 unconfined aquifers and soakaways will not be used as a means for disposal of treated wastes in such locations. No temporary facilities (construction camps, general and pipe storage areas, fuel storage areas) will be located within 50m of springs or wells. Fuelling, washing or maintenance of plant or machinery will not occur in, over or adjacent to a drain or watercourse or in areas where high level ground water or unconfined aquifer conditions prevail.

ERZURUM AQUIFER

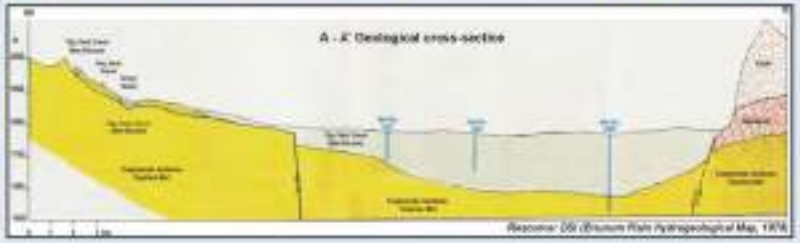
The plain comprises three major parts, namely, the Erzurum, Kumbet and Cinis plains. Aquifer characteristics can be described as follows:

Erzurum Plain: Both confined and unconfined aquifers exist in this plain. In this area, the pipeline passes through an unconfined aquifer.

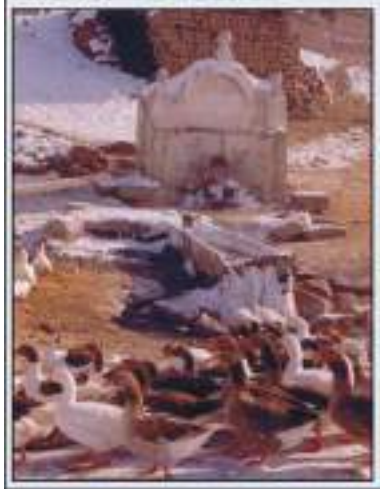
Kumbet Plain: Aquifer units in the plain are composed of Quaternary-aged sand and gravel deposits, and Pliocene-aged sand and gravel deposits at lower layers. These two different-aged units show the same characteristics. The aquifer is unconfined and pinches out at its boundary.

Cinis Plain: The aquifer units of the plain are composed of Quaternary-aged sand and gravel deposits. The aquifer is of the unconfined type with a thickness between 20 - 40m.

KARASU RIVER, ERZURUM PLAIN



WATER FOUNTAIN IN ERZURUM



The water quality of the Erzurum Aquifer ranges from C_2S_1 to C_3S_1 according to the Turkish Regulation on Water Pollution Control (DSI, Hydrogeological Investigation Report, 1978); thus, the groundwater from this region can be used for both irrigation purposes and for drinking (after appropriate treatment).

WATER FOUNTAIN IN NORTH EASTERN ANATOLIA

Pipeline routing surveys conducted through the **Erzurum Aquifer Plain** have paid particular attention to ensuring that operational wells are avoided. No groundwater abstractions will be located within 50 m (i.e. as defined by Turkish Water Pollution Control Regulations) of springs and wells and any planned abstractions will be subject to sustainability tests to avoid derogation of adjacent supplies.

The **Erzurum Aquifer** was considered to be an area of high sensitivity during the pipeline risk assessment study, therefore, mitigation measures were adopted to minimise potential risks to the groundwater resources. This included the installation of block valves, heavier walled pipe, greater depth of burial and concrete coating in some areas.

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6.6 BIOLOGICAL ENVIRONMENT

The potential impacts to sites and habitats of nature conservation importance, as a result of the construction of the pipeline, are summarised in Table 6.5. Reference should be made to both the EMMP and the RP (see Appendices C1 and C2, respectively).

The extent to which some of these impacts endure into the long-term (ie beyond 5-10 years) will be critically dependent upon the successful reinstatement of soils, their structure, chemistry and drainage characteristics and possibly other physical factors, such as micro-topography. These will provide the basis for successful recovery of ecological populations, whether allowed to occur naturally or aided by seeding and planting.

A specific mitigation measure that will be applied within all Ecologically Sensitive Areas (ESAs) is to conduct pre-construction surveys, which will be undertaken by appropriate specialists to identify and locate threatened species in the construction corridor and at any surrounding areas potentially affected by construction activities. Based on the findings of these surveys appropriate additional mitigation measures will be determined.

The seasonal considerations associated with construction through ESAs and at river crossings will inform the preparation of construction programmes for each of the spreads (within other construction schedule constraints) in line with the Seasonal Sensitivities Table presented as Attachment 1 in the EMMP (see Appendix C1).

Pump Station 3 (PT3) will be located on the edge of an ESA and PT2 will be situated outside of the initially surveyed 500m corridor, in an area for which there is no site-specific ecological information. In addition, 10 of the 52 Block Valve Stations (BVS) will be located within ESAs. These AGI sites will also be subject to site-specific vegetation and faunal surveys described previously. Furthermore, the area of sensitive habitat affected by construction activities at the BVS sites will be reduced to the minimum necessary for safe working.

No further facilities (whether temporary or permanent) will be permitted within currently defined ESAs (or any additional ESAs that might be identified during preconstruction surveys) without the formal project approval. In determining proposals for such facilities, the Construction Contractor will be required to submit, for formal project approval, an ecological evaluation, including specific management measures and an appraisal of alternative locations outside the ESA.

Additional detail, particularly for sensitive areas and for biorestoration of habitats affected along the construction corridor and areas affected during AGI construction are provided in the RP. Mitigation measures specific to vulnerable/protected species are provided in the environmental impact tables (Supplement 1, Volume 2) and the Seasonal Sensitivity Tables (Attachment 1 to the EMMP).

In the forest areas, the preparation and application of site specific plans will be accomplished with the cooperation of the General Directorate of Afforestation and Erosion Control and when necessary with the General Directorate of Forestry. The Construction Contractor will determine site specific measures for the rejuvenation areas. The general framework for such measures has already been given in the Reinstatement Plan (Appendix C2). These measures will be reviewed by BOTAŞ and the regional directorates of Forestry. In general the route in the rejuvenation areas will be kept narrow at 22m, which is less than the construction corridor (28m).

Fire is a significant potential risk in forest areas. An outline Fire Prevention Strategy is provided in Box 6.3 and will be developed further in collaboration with the Ministry of Forestry. In addition, in the longer term, the Ministry may utilise pipeline crossings of forest areas as fire breaks. This issue will be discussed further between the Project and the Ministry of Forestry.

Box 6.3 Forest Fire Protection Strategy

A strategy for prevention, response and management of forest fires will be developed in consultation with the Ministry of Forestry.

In the first instance this will involve the following activities:

- assess risks, ie ignition potential at forested sites along the route;
- assess hazards, including fuel loading (volume of flammable forest materials) and topographic factors;
- assess historical fire causes.

From this exercise a definition of fire prevention problems and their locations will become apparent.

Typically fires are associated with a number of primary activities such as:

- camp and cooking fires;
- smoking (including the disposal of cigarette stubs form moving vehicles);
- trash burning;
- field and vegetation burning;
- vehicle faults, eg brakes and exhausts;
- welding.

The project requires a high quality of vehicle maintenance and welding will be subject to strict HSE procedures such that these potential sources can be regarded as being of low significance. All trash will be subject to the Waste Management Plan (Appendix C3) under which certain wastes will be managed through controlled incineration at licensed mobile incinerators. There will be no burning of trash. Likewise there will be no burning of vegetation. All cut vegetation will be used as a mulch in reinstatement or will be disposed of according to the Waste Management Plan. Stockpiles of cut vegetation in forest areas and elsewhere will be managed in the context as being a potential hazard in the event of a fire. Use of open camp fires in forested areas will be prohibited. Smoking is a significant source of risk and prohibition is not a practical option.

Key aspects of management will include the following:

- education of the workforce: this will be a critical activity especially in regards to smoking;
- site inspections and audits at specific locations;
- development of procedures (pre-fire, during fire and post-fire measures) for specific event types and sites in conjunction with the Ministry of Forestry;
- general enforcement of regulations and project procedures.

Clearly there will always be a residual risk of fire and response equipment procedures and equipment will be needed. Response provisions will be developed in detail and will address the following aspects:

- reporting to the Fire Operations Center of the Department Directorate of Forest Fire Prevention in Ankara, the forestry administration, office of the muhtar, gendarme or civilian administration;
- safety of the workforce and third parties in the event of a fire;
- response equipment stockpiles, including Personal Protection Equipment.

Post-fire measures will include cause investigation in association with the Fire Operations Center of the Department Directorate of Forest Fire Prevention in Ankara and the development of corrective actions, including afforestation, as required.

Table 6.5 Summary of Major Generic Impacts and Mitigation Measures for Biological Environment during Pipeline Construction

POTENTIAL IMPACT	MITIGATION MEASURES
Temporary loss of habitat and component species within the construction corridor	The working width has been reduced in areas of nature conservation value. For example, the RoW will be narrowed to 8m for a total length of 300m through Posof Wildlife Protection Area (see attached case study). The working width and all areas of non-permanent land take associated with AGI construction will be reinstated taking into account nature conservation issues. Special measures will be taken to ensure that the possibility of adverse effects on threatened / protected species / features of ecological interest is minimised (see attached case study for Ardahan Forest Important Bird Area). The measures will be formalised into working method statements, including the Special Area Reinstatement Method Statements, 60 days prior to construction commencing. Potential impacts associated with activities that might disturb sensitive species, including blasting, will be avoided wherever practicable, or minimised, through the careful management of construction activities/personnel and appropriate scheduling of works. Seasonal sensitivities for species as described in the environmental impact tables (Supplement 1, Volume 2) and the EMMP (Attachment 1, Appendix C1) will be adhered to during schedule of construction works in affected areas. Experienced ecological advisors will appointed as described in the EMMP and will be present on each spread during construction activities and in particular at ESAs. They will observe for the occurrence of protected species and will advise on appropriate clearance, ecological protection and reinstatement methods on a site-specific basis. Key access routes will be determined prior to commencement of construction activities and discussed as part of the environmental management process (refer to the TMP, Appendix C5). Existing, upgradeable roads and Rights of Way will be used where practicable to avoid the need to construct new roads. Access roads, other infrastructure, pump stations, valve stations, pressure reducing stations and the pipeline have been selected to limit passage through wetland. Access routes will be selected to avoid ecologically sensitive areas and to minimise erosion and will be designed to limit physical land usage. Unless of benefit to local communities, temporary roads will be removed when no longer needed and will be reinstated.
Temporary fragmentation of habitats	Experienced ecological advisors will be present on each spread during construction activities and in particular at ESAs. For example, significant habitat fragmentation has been avoided in Posof Wildlife Protection Area through re-routeing of the pipeline.
Temporary severance of ecological corridors	All construction personnel will be briefed on environmental sensitivities in the surrounding area. The working width will be reduced in areas of forest. Reinstatement to maintain habitat continuity as far as is practicable.
Drying out of wet areas	A temporary drainage system will be installed where necessary during construction, in addition to the normal reinstatement of existing drainage systems. Once reinstatement has been completed, the pipeline will be designed to have no significant effect on, or inhibit the movement of, surface / groundwater.
Damage to adjacent habitat and species due to the incursion of machinery / personnel into nearby sites not directly required for construction purposes	The working width will be reduced wherever practicable in areas of forest. The working width and all areas of non-permanent land take associated with AGI construction will be reinstated taking into account nature conservation issues. Potential impacts associated with activities that might disturb sensitive species, including blasting, will be avoided wherever practicable, or minimised, through the careful management of construction activities and personnel and appropriate scheduling of works. At the commencement of works, the working width will be clearly delineated where it passes through environmentally sensitive areas. Additionally, prior to the commencement of works at the proposed AGI sites, the construction area will be fenced to ensure construction activities are contained within this area. Hunting, fishing and the carrying of firearms by construction personnel will be strictly prohibited.

POTENTIAL IMPACT	MITIGATION MEASURES
Potential impact to flora / fauna due to loggers / hunters	New access (permanent or temporary) will be minimised, making maximum use of existing access, with short new sections to connect to BVSs and AGIs. In addition, a range of mitigation measures will be implemented during the construction phase, including the erection of barriers or maintenance of security checkpoints on temporary construction access routes and the provision of awareness training to site staff and workers on the identification of, and response to, illegal activities.
Disturbance to adjacent habitats and species during construction activities	Special measures will be taken to ensure that the possibility of adverse effects on threatened/protected species or features of ecological interest is minimised. These will be formalised in working method statements and will be agreed with the relevant regulatory authorities during the review process of the EIA. Potential impacts associated with activities that might disturb sensitive species, including blasting, will be avoided wherever practicable, or minimised, through the careful management of construction activities and personnel and appropriate scheduling of works.
Potential impacts of noise, dust, waster pollution etc	Measures to minimise impacts associated with noise, dust, water pollution etc are described in the appropriate subsections of Section 6. The implementation of these measures will ensure that the impacts to flora and fauna are minimised.

POSOF WILDLIFE PROTECTION AREA

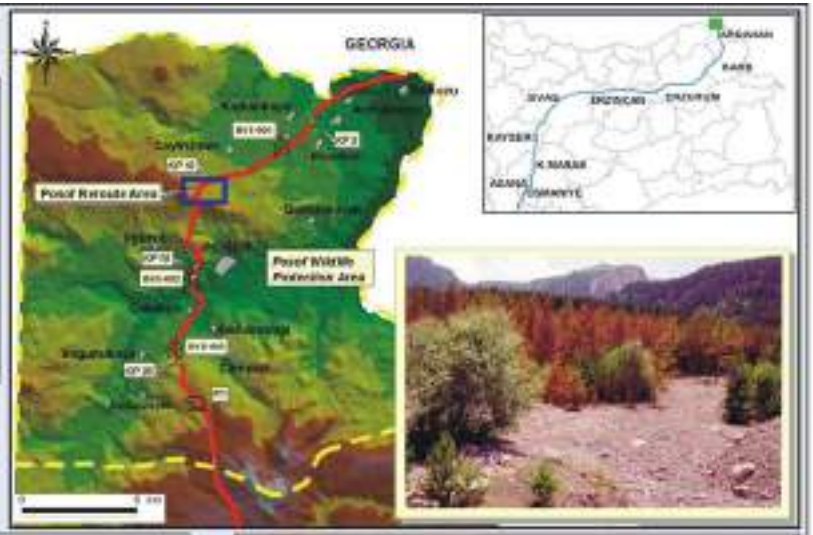
The **Posof Wildlife Protection Area** has designated status in order to protect the Caucasian Black Grouse (*Tetrao mlokosiewiczi*) which is a globally-threatened and restricted-range species, classified by the IUCN as Data Deficient. This species is found at higher elevations in the Caucasus and extreme north eastern part of Turkey. The mixture of Scot's Pine forest, forest edge and sub-alpine meadow with Rhododendron is the critical habitat for Caucasian Black Grouse, which breeds in this area between April and July inclusive.

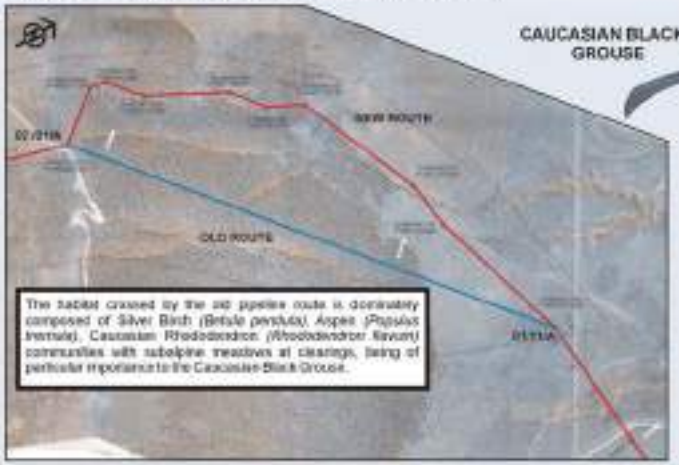
This species is under threat due to a decline of subalpine meadow areas. This is primarily due to over-grazing by sheep and goats although deforestation and excessive hunting are also contributory factors in the decline of the species.

An Ecologically Sensitive Area (ESA) 1 is identified between KP 10.3 to 15.3 for three globally-threatened and one nationally-threatened plant species.

Four globally-threatened amphibian species are located within the area: Caucasian Salamander, Caucasian Parsley Frog, Southern Crested Newt and the Tree Frog. These are listed in the IUCN 2000 Red List.

The **Posof Wildlife Protection Area** and the surrounding meadows are important for large mammals including Wild Goat (globally-threatened), Brown Bear, Grey Wolf, Eurasian Lynx and Roe Deer. Smaller mammals include Bechstein's Bat, Mediterranean Horseshoe Bat (both globally-threatened), Common Pipistrelle, Greater Mouse-eared Bat, Weasel, European Pine Marten, Beech Marten and Eurasian Badger.





CAUCASIAN BLACK GROUSE

The habitat crossed by the old pipeline route is dominately composed of Silver Birch (*Betula pendula*), Aspen (*Populus tremula*), Caucasian Rhododendron (*Rhododendron flavum*) communities with subalpine meadows at clearings, being of particular importance to the Caucasian Black Grouse.

GENERAL VIEWS OF POSOF FOREST

The aerial photograph illustrates a route change that was introduced in order to minimise pipeline impact to the grouse habitat within the constraints of elevation and pipeline hydraulics. The objective of the route change was to maximise the distance of sub-alpine meadow crossed, as this vegetation can be fully restored. The new route reduces the amount of coniferous forest traversed by one third. Although trees cannot be replanted over the pipeline, environmental offset measures will be implemented.

The RoW will be narrowed to 9m for a distance of 500m along the route in the **Posof Wildlife Protection Area**. Elsewhere the RoW will be between 15 and 28 m wide.

Preconstruction bird surveys will be undertaken within the **Posof Wildlife Protection Area**, particularly within the ESA , to establish the location and population densities of sensitive species. As a minimum, construction will be avoided within the Wildlife Protection Area between April and July, particularly for the Caucasian Black Grouse.

Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 1. The feasibility of translocating species will be assessed prior to construction.

The RoW within Posof Wildlife Protection, will not be fenced off during construction to ensure free passage of large mammals.

Specific requirements have been established in relation to human interaction with the Eurasian Brown Bear. In late summer/early autumn, in areas where bears have been recorded, preconstruction ground surveys will be undertaken to establish the presence of potential hibernation places.

The preconstruction survey will establish the presence and local distribution of Wild Goats, bats and amphibian surveys in the areas from which they have been recorded.

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ARDAHAN FOREST
IMPORTANT BIRD AREA (IBA)

The Ardahan Forest supports a healthy population of mammals including the Eurasian Brown Bear (*Ursus arctos*) and the Roe Deer (*Capreolus capreolus*). Within the Forest region there is also approximately 2,500 ha of grazed montane steppe and meadowland, high altitude Scot's Pine forests and 15 ha of marshland (Putka Lake). The whole region is classified as an Important Bird Area (IBA) (Magnin & Yarar, 1997) on account of the globally near-threatened Ferruginous Duck (*Aythya nyroca*) and an estimated 10 pairs of Montagu's Harrier (*Circus pygargus*) which are found to be breeding around the lake. The IBA has no legal protection status and lies c. 250 m from the pipeline route. Putka Lake, which provides a natural habitat for many other bird species, is approximately 1.5 km from the pipeline.

Pre-construction surveys will determine whether the right of way (RoW) is in close proximity to bear hibernation sites (dens), migratory routes and feeding areas. Where surveys indicate an abundance of bears in the immediate proximity to the RoW, the construction period in this section of the route will be scheduled to avoid November to April, which is the sensitive period for hibernation. Additional mitigation to be applied in areas of brown bear habitat will comprise education of workers to be alert and aware of the potential for human/bear interaction. Such education will include refuse management on sites (particularly where construction camps are located), and awareness of sensitive periods of the year (such as peak feeding activity in Spring).

The RoW will not be fenced off during construction to ensure free passage of large mammals. If any significant length of trench, in terms of interrupting normal paths or passage used by the various species, needs to be left open for more than a few days (72 hours), points of passage will be provided across it at regular intervals (500 m).

GENERAL VIEWS OF ARDAHAN FOREST

MONTAGU'S HARRIER

FERRUGINOUS DUCK

Globally and nationally threatened plant species, previously recorded during ecological surveys, will be identified and located during the pre-construction surveys, particularly within Ecologically Sensitive Area (ESA) 5. The construction planning aims to achieve a 21-day period from the time when the ESA is entered to the completion of reinstatement. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated, where practicable, outside of the RoW to a similar habitat if it exists, under supervision by a botanical specialist.

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6.7 AIR QUALITY

The potential impacts on air quality resulting from the construction of the pipeline are summarised in Table 6.6. Additional details on the protection of air quality during construction are set out in the EMMP and PPP (see Appendices C1 and C4). Vehicle emissions will be minimised through good practice (including proper maintenance, restrictions on idling etc), and the routing of vehicles away from residential areas, wherever practical. It is not considered likely that vehicle emissions will cause air quality standards to be breached. Measures for the control of site operations are detailed in Section 7 of the PPP (Appendix C4).

The potential for dust to be emitted during construction is strongly dependent on the type of activities taking place, such as the movement of vehicles along the working width and their speed, soil stripping, trench excavation, back-filling and reinstatement. Wind speed and whether winds carry emitted particles towards sensitive receptors are key factors in determining the frequencies and durations with which impacts might occur. Dust emissions are exacerbated by dry weather and high wind speeds and affectively reduced to zero when soils and/or ambient conditions are wet.

In dry soil conditions, at wind speeds above around 3m s^{-1}, dust particles may become airborne and be transported from their initial source. Of the particles that do become airborne, for a typical mean wind speed of 4m s^{-1}, particles larger than 100µm diameter are likely to settle within 6-10m and those between 30-100µm diameters are likely to settle within 100m of the source. Smaller particles, particularly those below 10µm in diameter, are more likely to have their settling rate retarded by atmospheric turbulence and to be transported further from their source.

In response to concerns raised by local communities a study of the potential effects of dust was undertaken by an agricultural engineer. The work followed protocols advocated in the Turkish Regulation on Preservation of Air Quality and was aimed at establishing the likely effects on arable plants and beekeeping, which represented the main concern of the local communities. The study (reported in full in Appendix B2) found that broadleaved plants (such as cotton and grape vine) would be potentially most at risk. However the rate of emission of dust, its predicted rates of deposition and the temporary nature of the dust-generating activities (ie only a few weeks at any one location) resulted in exposure levels that were predicted to be within acceptable limits.

Nevertheless, there is a considerable uncertainty in predicting impacts from dust emissions and episodes of sustained high winds in dry weather would likely have significant potential to cause dust nuisance to residences and temporary damage to crops (and natural habitats). For these reasons several measures will be employed to manage dust emissions (see PPP, Appendix C4).

Table 6.6 Summary of Major Generic Impacts and Mitigation Measures for Air Quality during Pipeline Construction

POTENTIAL IMPACT	MITIGATION MEASURES
Intermittent emissions of dust during the construction period	The storage and handling of spoil, subsoils, topsoil and materials will be carefully managed to minimise the risk of wind blown material and dust, eg by the use of suitable sheeting material. Additional measures for the control of vehicle movements on site will be employed in dry windy conditions. Those sections of the working width that are being trafficked over will be damped by controlled application of water sprays (eg by water bowser) as conditions dictate and where receptors are at risk. Any additives used for dust-control will be non-toxic, biodegradable and approved by the BOTAŞ representative prior to use. Hard standing areas will be regularly inspected and kept clean of all mud and dusty materials. There will be no burning on-site of any waste arising from any construction activities. All vehicles delivering dusty construction materials to the site or removing spoil will be enclosed and covered to prevent escape of dust. In areas where the soils contain large quantities of silt and fine sand, which has a tendency to blow in dry conditions, the Contractor will be responsible for ensuring that particular attention is paid towards dust suppression. Measures will be implemented to ensure that the transport of mud and dust from the site onto public highways and roads is limited. Such measures shall be developed in consultation with the BOTAŞ representative (refer to the TMP, Appendix C5).
Emissions from vehicle exhausts used for transport of workers, construction materials, vehicles and equipment.	The following measures for the avoidance of nuisance from exhaust emissions will be used: Vehicle engines will not be left running unnecessarily. The engines and exhaust systems of all vehicle and equipment will be maintained so that exhaust emissions do not breach statutory limits set for vehicle/equipment type and mode of operation, and that all vehicles and equipment are maintained in accordance with manufacturers' guidance. The exhausts of other equipment used for construction (eg generators) will be positioned at a sufficient height to ensure dispersal of exhaust emissions.
Soiling at nearby residential properties and settlement on agricultural areas	The storage and handling of spoil, sub-soils, topsoils and materials will be carefully managed to minimise the risk of wind blown material and dust. Measures for the control (above and beyond safety of personnel) of vehicle movements and speeds on site will be employed in dry windy conditions. Sections of the working width that are being trafficked over will be damped by controlled application of water sprays as conditions dictate. Hard standing areas will be regularly inspected and kept clean of all mud and dusty materials. There will be no burning on-site of any waste arising from any construction activities. Where necessary, windbreaks, netting screens or semi-permeable fences will be used to reduce dust emissions from working areas in close proximity to sensitive locations (be they residential, agricultural or natural habitats). All vehicles delivering dusty construction materials to the site or removing spoil will be enclosed and covered to prevent escape of dust. Measures will be implemented to ensure that the transport of mud and dust from the site onto public highways and roads is limited. Such measures shall be developed in consultation with the BOTAŞ representative (refer to the TMP).

6.8 NOISE AND VIBRATION

Construction of the pipeline will include the following noise-generating activities: RoW preparation; soil stripping; trenching; pipe stringing, welding and laying; and backfilling.

Generally, these activities involve the use of mobile plant along the spread. Each construction team will progress along the works at a rate of between some 200m and 1,000m/day (assumed to be an average of approximately 0.75km/day). Each team will follow the previous activity after a period of a few days and will pass by at a similar rate of progress. At certain locations trenchless crossing methods may be used. At these sites, activities could last in the order of three to four weeks (that is, the period from initial mobilisation to equipment leaving the site). Noise generating activities will occur intermittently, generally during the day. Sheet piling may be required for trench-less crossing locations, during the daytime only. Sheet-piling can also give rise to vibration. Levels of vibration generally fall to levels that are not perceptible beyond 100m.

Blasting may also be required in certain areas where rocky substrates prevent trenching by other means. This may give rise to noise and vibration at receptors located within the vicinity of the pipeline works (see PPP, Appendix C4). Grit and dust blasting will be operating under cover in order to minimise noise (and dust) emissions.

Other potential sources of noise impact include fixed plant operating at night for limited times and durations (eg generators for lighting/pumps). After pipe laying, the pipeline will be hydrostatically pressure tested. Provided that normal standards of noise control are in place (see PPP, Appendix C4), noise levels would be expected to be less than from the activities on the spread. Hydrostatic testing will take place on a continuous basis over a period of several days. Attention will be paid during detailed design to ensure pumps are appropriately located and if necessary, acoustically screened.

It is considered that measures required to mitigate noise-generating activities, as summarised in Table 6.8 and the PPP (see Appendix C4), will adequately protect the majority of residential properties from noise and vibration, as routine construction activities will take place during the daytime. At a number of locations along the route, the potential impacts will be greater due to factors such as their proximity to the works or the presence of night-time construction works, and specific noise controls would then be necessary at these locations, the noise control measures will be designed to suit local circumstances and the precise nature of the proposed activities. These locations are identified in the environmental impact tables in Supplement 1 of Volume 2. On implementation the EMMP and PPP (see Appendices C1 and C4) specific mitigation measures will be further developed at these locations.

Construction methods and generic plant items have been reviewed to estimate typical worst-case noise emission levels from both temporary and ‘continuous’ construction situations. Assuming noise propagation away from the construction site, it has been possible to calculate the ‘critical distance’ within which the noise assessment criteria for the two situations are likely to be exceeded. These critical distances are shown in Table 6.7. It should be noted that the ‘critical distances’ are the worst case ones, ie no allowance has been made for mitigation, use of quieter techniques (especially for piling) or the attenuating effects of ground and intervening terrain. The latter two factors would both be expected to have a considerable attenuating effect over the greater distances quoted in Table 6.7.

Table 6.7 Distances at which Construction Noise Criteria are met

CONSTRUCTION SITUATION	CRITICAL DISTANCE [1] (m)
Pipeline Construction – Day	
Soil Stripping	230
Trenching	90
Pipe Stringing	40
Bending	90
Welding and Lowering	175
Back Filling	130
Major Works – Day	
Sheet Piling	560
Excavation	165
Blasting [2] (annoyance)	115
Blasting (structural damage)	40

1. The distance within which the relevant noise standard may be exceeded.
2. Based on 1 1.5kg charge and worst-case ground constant for vibration (New, 1990).

The pipeline route has been analysed to identify groups of noise sensitive receptors within the critical distances for each of the general construction situations (see environmental impact tables, Supplement 1, Volume 2). In this way, the potential for noise impacts along the whole route has been assessed and the need for mitigation at each has been identified.

A similar 'critical distance approach' has been adopted for blasting activities. Blast induced noise and vibration has the potential to cause damage to property and to disturb or cause annoyance to local residents. Consequently, two critical distances have been developed, to identify settlements at which blasting may give rise to annoyance, and/or structural damage to property. Typical blast design characteristic (explosive weight, mounting type and delay time) have been reviewed from experience from other projects (since this data is not currently available for the Project), to estimate noise emission levels, and a critical distance identified within which noise from blasting may potentially be above the general background noise levels. Blasting will only occur during the day so as to avoid night time disturbances. The potential for 'startle' effects from blasting has then been assessed by identifying populated areas within the annoyance level critical distance of sections of the route where blasting is likely to be required. Mitigation measures have then been identified for these sections.

Table 6.8 Summary of Major Generic Impacts and Mitigation Measures for Noise and Vibration during Pipeline Construction

POTENTIAL IMPACT	MITIGATION MEASURES
Impacts from hours of work	Construction working hours will be agreed with the relevant authorities and BOTAŞ prior to mobilisation. Night-time working will be kept to a minimum and will be discussed and agreed in advance with BOTAŞ and the relevant authorities. Limited construction activities may have to continue on a 24-hour basis, eg construction of non-open cut crossing techniques, transportation of materials, hydrostatic pressure testing and other commissioning activities. Approval of relevant authorities and BOTAŞ will be obtained prior to commencement of any night-time works. If required, additional noise-reduction techniques will be implemented in order to minimise disturbance (see PPP, Appendix C4).
Noise emissions from construction plant	Noise levels expected from agreed method of working and chosen plant and equipment will be identified, measures will be incorporated into operating procedures to minimize impact of noise. All plant will be adequately maintained to minimize noise emissions; only inherently quiet plant will be selected for use on site (refer to Section 8 of the PPP, Appendix C4). For types of plant and equipment whose noise emissions are governed by the Turkish Regulation on Noise Control, only plant bearing an appropriate conformity mark will be brought to and used on the site. Measures will be taken to ensure that noise emissions from site are kept within the Turkish/World Bank standards at noise sensitive receptors. Any item of plant or equipment found to be emitting excessive noise levels due to a faulty silencer, broken or ill-fitting engine covers or other reasons, will immediately be taken out of service and be adequately serviced, repaired or replaced. Plant will be sited in locations as far from inhabited buildings as possible and will utilise all reasonable screening where necessary. Noise barriers will be used where significant noise impacts are anticipated. Plant known to emit noise strongly in one direction will, whenever possible, be orientated so that the noise is directed away from noise sensitive areas. Where practical, stockpiling of site materials, soil or spoil should be located where it can provide additional screening provided that any plant associated with this does not in itself generate nuisance. The transport of materials on or off site by road should take place during normal daytime working period and should also be routed away from particularly sensitive receptors in accordance with the project TMP (see Appendix C5). Site personnel will be trained in the proper use and maintenance of tools and equipment, and the positioning of machinery on site to reduce noise emissions to neighbouring communities.
Noise and vibration from piling and blasting construction plant	Piling activities, if needed, will be subject to rigid safety, noise and vibration control procedures including procedures to ensure adequate warning is given to anyone who may potentially be affected. These procedures will be agreed with the BOTAŞ representative prior to commencement of piling activities. Blasting activities, if needed, will be subject to rigid safety, noise and vibration control procedures including procedures to ensure adequate warning is given to anyone who may potentially be affected. These procedures will be agreed with the BOTAŞ representative prior to the commencement of blasting activities.

6.9 TRAFFIC AND TRANSPORT

The generic potential impacts and mitigation measures associated with construction of the pipeline and associated facilities are summarised in Table 6.9, which are more fully described in the Traffic Management Plan (TMP) (see Appendix C5).

It is anticipated that significant quantities of equipment, material and waste will be transported to/from the working width and construction lay down areas. However, it has not been possible to assess the impact of such movements in detail since the construction programme will not be determined until the Contractor has been appointed. However, indicative traffic flows are available, and these are discussed in Section 3 of the TMP (Appendix C5). There will also be a number of vehicle movements for delivery of construction plant and secondary construction material to the working width/spread.

A peak of construction vehicle activity will occur during pipeline construction when the construction equipment needs to be hauled to the construction site. Approximately 100 pieces of construction equipment will be required per construction team or spread. The equipment required will be a mix of heavy and medium construction equipment, light construction equipment and vehicles such as buses, pickup trucks and four-wheel drive cars.

Some of the items will constitute abnormal loads. This equipment will not be hauled out until the RoW is cleared. Thus, the equipment can move along it with the spread without having to access the public road system again, (although it may need to access the road system at water and railway crossings). All non-mobile equipment will need to be transported to the construction site using the existing highway system.

The most significant transportation requirement during the construction of the pipeline will involve the transport of the 12m long steel pipe sections from the point of receipt to temporary laydown yards. From here, they will need to be hauled to the actual point of construction along the working corridor. It may be possible in some areas to minimize handling and pick up materials at the point of receipt and deliver them directly to the construction areas.

Further traffic movements are likely to be generated in areas where no suitable fine materials can be found for bedding and surrounding the pipeline. It may be required to import as much as $2.2m^3$ of sand fill for each linear meter of pipeline construction in such areas. Constructing an average 1.2km of pipeline per day would necessitate up to 440 loads of imported sand in such sections. An alternative would be to use rock shield around the pipe, which would reduce this number of loads of sand required by as much as 60-70%. Wherever possible, the Construction Contractor will be required to utilise excavated subsoils as padding material.

Personnel movements to and from the spread will also generate increased traffic movements during construction. There will be typically 300 workers per pipeline ‘spread’. Between 60% and 75% of these workers will be bussed to the construction site. Approximately ten buses will be needed to distribute them along a 20 to 30km construction area as the spread moves along the working width. Supervisors, inspectors etc will use pickups and small trucks. A further 25 light trucks, such as pick-ups, may be used for transport of individual working parties to specific areas.

The Turkish section of the BTC Pipeline will comprise three construction lots and for each lot a primary camp location has been identified. Transport logistics with respect to delivery of line pipes, equipment and material to these camps (and onward to the construction corridor) will comprise an important aspect in the efficient and timely realisation of the Project. In this

regard, BOTAŞ is committed to maximising the use of rail transport as an effective means of delivery of materials to the construction sites. This strategy will minimise avoidable road congestion, potential for traffic accidents and reduce emission of greenhouse gases.

Potential impacts associated with construction of the BVS sites and their associated access roads are the same, or very similar, to those described for the construction of the pipeline and the same mitigation measures will be adopted during the construction of all BVS. In addition, although most BVS sites have been located away from residential settlement areas, eight are within 500m of a settlement area, which are specifically addressed in the environmental impact tables in Supplement 1, Volume 2 of the EIA. Particular attention will be paid to the control of dust, noise and traffic during construction at these sites (see Table 6.9 and the TMP, Appendix C5).

However, the transportation of the pump drivers to the pump stations is likely to represent the heaviest, highest load during the entire AGI construction period. Five HGV movements are likely to be necessary to transport each driver, ie the drivers will probably have to be dismantled into five transportable loads. Some of the roads to be used in this activity may need to be upgraded to ensure that they are suitable. Furthermore, the equipment may have to be hauled in mountainous terrain. The flows associated with transporting the equipment and other construction plant to the AGIs will be low compared to the baseline traffic flows on the major routes to the pumping stations. However, transporting abnormal loads of this type does have the potential to result in impacts on existing road users, such as increased delays or congestion. Liaison with the police and other authorities will occur prior to the movement of such loads.

Table 6.9 Summary of Major Generic Impacts and Mitigation Measures for Traffic and Transport during Pipeline Construction

POTENTIAL IMPACT	MITIGATION MEASURES
Temporary increases in traffic flows, potential for delays and congestion.	Possibility of significant environmental impacts associated with construction of access roads and working areas. Key access routes will be determined prior to commencement of any construction activities and will be discussed as part of the environmental process (refer to the TMP, Appendix C5). Routing of construction traffic will be agreed in advance with relevant authorities and warning will be given of closures (refer to Section 4.3 of the TMP). Parking of construction vehicles on footways / double parking will be prohibited on public highways in vicinity of working width, refer to Section 4.6 of the TMP. BOTAŞ is committed to maximising the use of rail transport as an effective means of delivery of materials to the construction sites.
Conflicts between motorised and non-motorised forms of transport;	Traffic flow will be supervised / managed wherever practicable, refer to Section 4.4 of the TMP for mitigation measures.
Short-term closures/diversions of existing transport routes (eg roads, paths, railways) where routes crossed.	Crossings of main roads and railways shall be undertaken by non-open cut methods (including thrust boring, pipe jacking and auger bore). The crossing of tracks and roads by open-cut techniques shall be expedited in the shortest time frame possible. Plans for all road and rail crossings shall be submitted to the relevant authorities for approval and permitting (refer to TMP).
Traffic accidents	BOTAŞ has identified that hazards to personnel associated with vehicle transportation will present one of the most significant risk exposures and, in response, has developed specific H & S transportation requirements in this regard. Accordingly, the Contractor will be expected to implement management systems and procedures to provide the highest level of control over these hazards (refer to the TMP). Education on traffic safety will provided by the Community Liaison Officers (CLOs) to communities not normally subjected to high traffic loads (refer to the TMP).

6.10 ARCHAEOLOGY AND CULTURAL HERITAGE

Direct physical impacts on the archaeological resource may arise wherever ground disturbance takes place. This has the potential to either partially or totally remove sites or remains. Topsoil stripping to create running tracks and the subsequent passage of vehicles within the working width may cause significant damage to fragile archaeological deposits, by compaction or rutting, which have hitherto been protected by a soil cover. The removal of topsoil in, and the use of, ancillary areas such as construction compounds, access tracks and quarries may have similar effects. These impacts will cause permanent (irreversible) changes to the archaeological resource.

Archaeology and cultural heritage are invariably key issues for pipeline projects and to address this an overall 'management framework' has been developed. The framework is founded on a phased approach briefly comprising:

- gaining a sufficient understanding, through studies of increasing intensity and detail, to advise the routing process through its various stages of development;
- further investigations of threatened and potentially threatened sites;
- construction phase management.

Routing of the pipeline has already taken the presence of a number of known significant archaeological resources into account (see Section 2) and the locations of the AGIs have been selected to avoid known archaeological sites. Mitigation measures have been developed to date in consultation with the Regional Directorates of the Ministry of Culture at Erzurum, Kayseri and Adana.

The assessment of impacts to cultural heritage has been based, to date, upon identified, aboveground features and known sites of archaeological interest. However, it is likely that, as yet, unrecorded archaeological deposits will be encountered during the construction phase. The archaeological watching brief and the deployment of the Archaeological Management Consultancy and the BOTAŞ' Archaeological Inspectors will ensure that potential sites and features are identified and that appropriate responses are instigated. The Cultural Heritage Management Plan (CHMP, Appendix C7) provides for a range of mitigatory response to ensure that archaeological information is retrieved through formal recording and excavation of revealed sites and features.

Further archaeological surveys (intrusive, geophysical etc) prior to construction will be undertaken to both minimise the potential for unknown sites to be encountered and to conduct the salvage excavations for identified archaeological sites and significant archaeological features that will be encountered during construction (see attached case study for Tasoluk (Igdelik) Mound).

It should be noted that a positive impact of such thorough surveys will contribute to the understanding of archaeology in the area, thereby increasing public awareness and contributing to local records.

The CHMP has been prepared to provide the management framework for this pre-construction work and the future construction phases. The Construction Contractor will strictly implement and adhere to the procedures set out in the Cultural Heritage Management Plan (CHMP), (see Appendix C7). Table 6.10 provides a summary of the key potential impacts to archaeological resources and management measures, which are fully described in the CHMP.

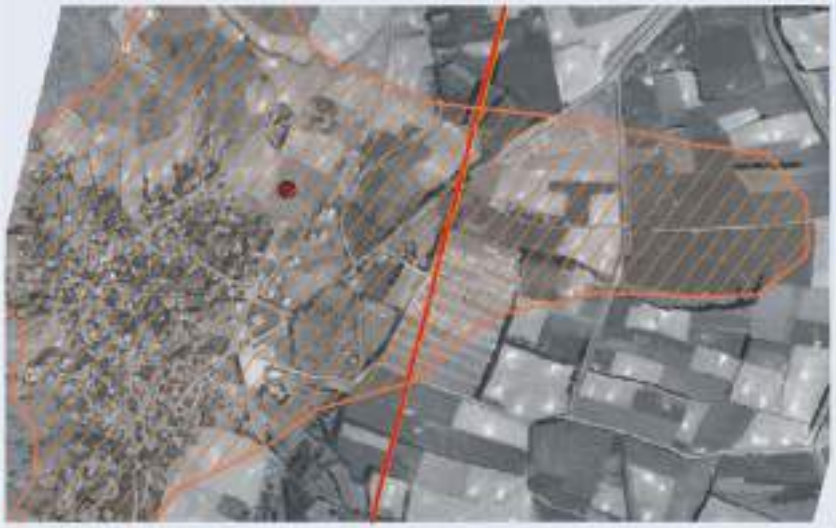
Table 6.10 Summary of Major Generic Impacts and Mitigation Measures for Archaeology and Cultural Heritage during Pipeline Construction

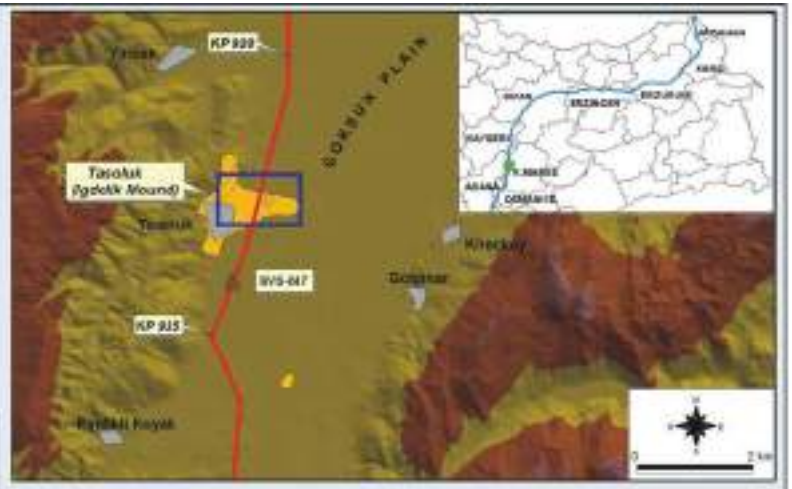
POTENTIAL IMPACT	MITIGATION MEASURES
Damage to fragile archaeological deposits / partial or total removal of sites or remains	A provisional list of areas where archaeological field evaluations are needed has been prepared. Further locations will be added to this list as areas of rerouted pipeline are surveyed. Where re-routing is not an option, archaeological evaluation will proceed at selected locations in order to determine the nature and extent of archaeological sites. Further work (extensive and intensive) will be carried out in between June and September 2002. In addition, the re-routes will be reviewed to establish if these are sufficient to avoid areas of concern. During this phase, extensive surveys will be conducted for PT2, PT3, IPT 1, the main construction camp locations, access road alignments and sections that could not be investigated during Phase 2 due to the seasonal constraints. The intensive surveys will be conducted for the sites that will be identified during the extensive survey. Following evaluation (which will establish the extent of threatened sites and enable updated project specifications to be produced), full-scale excavation of threatened sites will be carried out by archaeological work teams appointed by BOTAŞ and technically managed by the Archaeological Management Consultancy, with the assistance of the Ministry of Culture (MoC). This work will involve both non-intrusive techniques such as remote sensing and geophysics as well as the excavation of trial trenches (refer to CHMP, Appendix C7). Topsoil stripping down to the natural subsoil will be undertaken under archaeological supervision wherever the ground surface is to be disturbed along the proposed pipeline route; in advance of construction activities. When archaeological deposits are encountered they will be excavated. Observation of construction activities and recording of features exposed by trench digging will be undertaken by archaeological work teams (an archaeological watching brief). This will involve appropriately qualified and experience archaeological specialist present at each work spread. In addition, BOTAŞ will appoint archaeological inspectors who will oversee and monitor the implementation of the CHMP When archaeological deposits are encountered the appropriate chance finds procedure will be instigated (refer to the CHMP). Where archaeological discoveries are made, and by instruction of the relevant Museum Directorate representative, areas of working width may be demarcated to allow safe working for archaeological recording. This will normally be undertaken within the normal construction programme (ie after topsoil strip and prior to trench excavation). In some areas, this may involve restriction of the working width. If significant remains are discovered that cannot be recorded within the normal programme, it may become necessary, by instruction of the relevant Museum Directorate representative, to provide protection of deposits under the running track by provision of 'bog mats' or stone tracks. Prior to any archaeological fieldwork, desk based assessments should be produced for each site, in order that as much information as possible can be gathered before intrusive fieldwork commences. Thus archaeological fieldwork can be targeted with a specific agenda based on comprehensive desk-based knowledge. Following the completion of archaeological fieldwork, a post excavation (or post fieldwork, in the case of the monitoring archaeologist) assessment report and updated project design shall be prepared by the relevant archaeological work teams for the BTC Environmental Department. Following approval of these assessment reports and updated project specifications, final project reports shall be produced.
Damage due to offsite workers / vehicles	Archaeological briefings will be given for all construction personnel working in or close to archeologically sensitive areas.
Intrusion into the visual or historical setting of an archaeological site or historic building	Visual intrusion in the vicinity of known archaeological sites will be limited by to the construction phase of the BTC Project. In addition, to good site practice, temporary screening of works may be undertaken following discussions with the MoC.
Desiccation, oxidation or erosion of hitherto preserved organic or palaeoenvironmental deposits in waterlogged conditions	The watching brief provisions described above will be equally applied to waterlogged areas and examination of excavated materials by appropriately qualified archaeologists will inform the selection of appropriate response measures which may include sampling of deposits for detailed paleoenvironmental analysis or the recording of specific features *in situ*.

TASOLUK (IGDELIK MOUND)

Tasoluk Village is a (1st Degree Registered Archaeological Site). A classical monumental site consisting of traces of Roman and Byzantine structures, mosaics, peribolos wall, towers, a large church and necropolis. All these examples indicate uninterrupted settlement from the Helenistic Roman Period up to the current period. Due to extensive agricultural activities in this area and the thickness of alluvial sediments, it is not currently possible to define the exact boundaries of this site.

The oldest historical data within this area pertains to the Neolithic period dating back to between 8000-5000 B.C. The Hittite Empire controlled the region in the Middle Bronze Age and disappeared at the beginning of the 12th Century B.C. After the sovereignty of Babylon, which continued up until the middle of the 6th Century B.C., the region came under the control of Persian Empire. At the end of the 4th Century B.C., with the arrival of 3rd Aleksandros to Anatolia, the region came under Macedonian sovereignty. The district was declared a State of the Roman Empire at the beginning of the 1st Century B.C.





GENERAL VIEW OF IGDELIK MOUND

Tasoluk Settlement will be further investigated prior to construction to establish the boundaries of the site and to ensure that construction activities are minimised in areas of archaeological significance. The classification of this site will also be confirmed during pre-construction archaeological surveys. Settlement and river constraints located to the east and west, respectively, restricted route changes in this area. If a safe route is not possible, salvage excavations will be carried out at this site prior to the commencement of construction activities.

Construction will be carried out under the supervision of an archaeologist authorised by BOTAS and a member of the Ministry of Culture.

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6.11 WASTE MANAGEMENT

During construction and operation of the pipeline and its associated facilities, a variety of solid wastes will be generated and will require appropriate management.

An inventory of wastes classified by source, type and hazard is given in the Waste Management Plan (WMP), (see Appendix C3). At this stage the likely volumes of wastes arising have not been quantified. Improper waste management can lead to a number of potential impacts, including:

- soil contamination;
- surface and groundwater contamination;
- visual and aesthetic impacts due to trash and litter;
- health and safety hazards to humans, livestock and wildlife;
- air quality impacts through inappropriate combustion;
- pressures on existing waste management capacity.

The WMP has been developed for the construction and operational phases and is aimed at avoiding the above impacts or reducing them to an acceptable (minor level). In the first instance the WMP is based on a management hierarchy whereby the priority will be to:

- avoid generating the waste in the first place;
- minimise the amount that is produced;
- recover wastes through recycling and reuse;
- treat and process the waste, without causing secondary impacts to soils, water resources and air quality;
- dispose of the waste in a controlled way (ie to a licensed facility), without compromising existing waste management capacity.

Solid waste management is controlled in Turkey through several legal instruments:

- Solid Waste Regulation;
- Regulations Regarding the Control of Hazardous Waste;
- Regulations on the Control of Medical Waste.

Implementation of the WMP will be fully in accordance with the requirements of Turkish Legislation. Furthermore, full implementation of the WMP will ensure that potential impacts will be minor. However, there are uncertainties to be resolved mainly associated with the volumes of wastes that will arise and current capacity of existing waste management facilities to accept them. To address this, in advance of construction commencing the Construction Contractor will finalise the WMP, giving particular consideration to the following:

- The Construction Contractor will quantify waste volumes by type and the rate at which they will arise.
- The Construction Contractor will demonstrate that to the maximum practical extent avoidance, recycling and reuse will be fully applied.
- The Construction Contractor will determine that use of off-site waste disposal facilities is sustainable and will not compromise capacity and conflict with other users.

6.12 DEMOGRAPHICS AND MIGRATION

6.12.1 Community relations

6.12.1.1 Impacts

Good relations with neighbouring residents are increasingly recognised as essential to the overall success and smooth functioning of a project during both construction and operation. Efforts to establish good relations are consistent with the philosophy that the Project (including contractor workers) are guests in the project area and that the local residents are their hosts.

Minimising the negative environmental and social impacts is fundamental to establishing and maintaining good relations with local residents. However, on a construction project of this scale, unexpected events will always occur. Establishing and maintaining good relations with local residents (within a framework of on-going communication) will enable these events to be rapidly identified and resolved.

6.12.1.2 Mitigation objectives

The mitigation objectives with regard to Community Relations during construction are the following:

- To provide settlements affected by the Project with regular information on the progress of work and its implications for these settlements.
- To inform the Project/Contractors of any settlement related issues that may impact construction.
- To monitor implementation of mitigation measures and the impact of construction via direct monitoring and feedback from settlements.
- To identify any significant new issues that may arise during the construction period.
- To manage any disputes between the Project/Contractors and local residents.
- To take advantage of opportunities for construction activities to deliver benefits to local settlements.

Box 6.4 Settlements Directly Affected by Construction of Pipeline and AGIs

Settlements directly affected by pipeline construction by virtue of their location are defined as follows.

- settlements with land that is intersected by the pipeline;
- settlements that have occupied residences within 500m[(1)] of a construction site (pipeline, pipe dump, AGI);
- settlements within 1km of a construction site (accessible by foot during the working day);
- settlements that experience a substantial increase in traffic loads;
- settlements within 5km of a pump station or main construction camp.

6.12.1.3 Mitigation measures

To meet these objectives, a Community Relations Programme will be established for implementation by the Contractor, BOTAŞ and the BTC Co. Aspects of the Programme for implementation by the Contractor will be developed in more detail in the Contractor's Community Relations Plan. Aspects of the Programme for implementation by the Project will be implemented on the basis of the Community Liaison Management Plan in Appendix C8. Mitigation measures covered are outlined below.

Division of responsibilities

The Contractor will have day-to-day responsibility for community liaison, and will be the principal point of contact with affected settlements. During construction the work teams in each spread will be laying the pipeline in approximately 20km sections. Each work team will also be working at discrete locations to construct AGIs, operate pipe dumps and run a construction camp. Communication with affected settlements will be achieved by the Construction Contractor providing adequate resources to manage community liaison on each spread. As a guideline, the Construction Contractor shall appoint a full time dedicated Community Liaison Officer (CLO) for co-ordination of the project public relations and external liaison needs.

The Contractor shall appoint additional CLOs as required in order to fulfil the Scope of Work as detailed in the Social Management and Monitoring Plan (SMMP). Furthermore, the CLOs will manage the good reputation of both BOTAŞ and the Contractor. This position shall report directly to the Contractor's Project Manager and include regular on-going liaison with BOTAŞ' Community Relations Manager. In addition, the CLOs shall liase with third parties who are or may be affected by the execution of the Works as well as the interface with landowners.

The Project will also appoint staff with responsibilities for Community Relations. In accordance with the role of BOTAŞ as the Turnkey Contractor and the assurance role of the BTC Co, the team will consist of the following:

- BOTAŞ: one Community Relations Manager and seven Community Relations Supervisors (CRS) responsible for overseeing all works carried out by the Contractors (one of these CRSs will be dedicated to the marine terminal and another two will be office based – one full time in order to deal with free-phone inquiries related to the marine terminal, the pipeline and associated AGIs, and other part-time in the office and part-time along the pipeline route providing support to the remaining CRSs, as required)

1 Where the location of the nearest residence is not known, settlements with a centre less than 1km from the pipeline route have been identified as directly affected.

- The BTC Co: a Manager who will oversee all community relations activities (pipeline and marine terminal), supported by seven environmental and social inspectors

The Community Relations Team of the Project will be empowered to stop the works if they are of the opinion and can demonstrate that the requirements of the SMMP have been deviated from.

In order to carry out required pre-construction activities (see Table 6.11 for details), the BOTAŞ Community Relations Manager will be appointed. The five CRS of BOTAŞ will be appointed immediately following contract award. The CLOs of each Contractor will be appointed no less than one month prior to construction (ie during the construction mobilisation phase of the Project).

The CLOs will be Turkish speaking, preferably with an understanding of English and the project area. They will be graduates with a degree or diploma that has a social focus, with proven field skills in communications and a minimum of two years relevant experience, preferably in community relations. All appointments shall be subject to interview and approval by BOTAŞ.

The community relation roles will be duplicated for each contract. At the present time it is envisaged that there will be separate contracts for the following:

- One Contract for each Lot (thus three contracts in total)– including pipeline construction, pipe dumps, construction camps, access roads and block valve stations;
- One Contract for the four pump stations and for the pressure reduction station.

There will also be one Contract for the BTC Marine Terminal onshore and offshore facilities. The Community Relations Programme associated with these components of the BTC Project is discussed in Section 12.

The roles and responsibilities of the community relations teams are outlined in Table 6.11.

Plate 6.1 BOTAŞ Community Relations Supervisor With Local Residents In Sivas

Table 6.11 Roles and Responsibilities of the Community Relations teams

Contractor: Responsible for Adhering to Requirements of SMMP

- Provide primary interface between Project and affected settlements.
- Coordinate and implement required pre-construction activities, namely:
  - produce management plans for community relations, construction camps and transport;
  - train staff with community relations responsibilities;
  - implement induction training workshops for all construction staff.
- Assist in local recruitment process.
- Ensure on-going communication with affected settlements through the following activities:
  - Meet with settlement leaders and hold community meetings prior to arrival of construction teams in a given locality to inform local residents about construction activities, work schedule, construction staff Code of Conduct, Complaints Procedure, safety issues, dates of future meetings and contact details of Community Liaison staff.
  - Hold regular meetings with directly affected settlements during construction to provide information on progress and provide a channel for issues and queries to be raised.
- Liase with contract representatives on major issues arising, and ensure that local residents are kept informed of any expected or unexpected disruption through leaders and by maintaining a community notice board.
- Provide a focus for negotiation and resolution of specific disputes with residents if/when they arise, using the Complaints Procedure.
- Submit fortnightly and monthly community impacts report to the Project.

BOTAŞ: Overall Accountability

- Assist the contractors to develop community relations procedures prior to construction start-up, including required management plans, recruitment procedures, contracting procedures, CLO recruitment and training.
- Agree Complaints Procedure with the Project, Contractor and settlements.
- Monitor implementation of/adherence to all relevant management plans through liaison with the Contractor and meetings with affected settlements.
- Identify breaches of management plans and recommend corrective action. Stop the work in the event of breaches that may cause serious impacts on local settlements or on the reputation of the project.
- Track the social impact of the project against the BTC Objectives and Key Performance Indicators (KPIs) as stipulated in the SMMP and work with the contractors where amendments to the mitigation measures are required.
- Monitor processing and resolution of complaints and ensure alignment across the project with the Complaints Procedure.
- Provide regular information to the BTC Co on performance.
- Represent the Project at community meetings.

BTC Co: Monitoring and Assurance

- Review all community relations procedures compiled by contractors.
- Monitor performance through review of information provided by BOTAŞ (including performance against KPIs and targets), field observations and community meetings and submit recommendations for amendments or additions to community relations procedures.
- Make information on the project available to the public, including performance against KPIs.
- Monitoring and assurance of the processing and resolution of complaints.
- Monitor working practice of project security team.
- Monitor recruitment and contracting processes.
- Provide regular information to BOTAŞ Site Managers on performance.
- Assist at community meetings where necessary.

Complaints procedure

The Contractor will aim to prevent formal complaints through the community liaison mechanisms outlined above. However, a formal Complaints Procedure will be set up to enable any complaints to be made directly to the Contractor's CLOs. Details of the freephone telephone number and Complaints Procedure will be distributed to all settlements, landowners and occupiers in the vicinity of the working area, the construction camps and close to roads that will experience significant increases of traffic movements (See Appendix A1, the PCDP, for more detail on the Complaints Procedure).

The telephone will be answered in person and details of the complaint, source, its location and date/time of the offending event will be recorded. The Contractor's CLO will investigate the complaint in the first instance. All complaints received by local residents or local authorities will be processed and responded to within seven days.

To accommodate those that do not have access to a telephone, the Complaints Procedure addresses both written and verbal complaints (if delivered in person). Responses will be provided in writing or verbally, depending on what is more appropriate (eg if the complainant is illiterate, a verbal response will be provided).

Project affected settlements will also be provided with contact numbers for BOTAŞ in the event that the Contractor does not satisfactorily handle a complaint within seven days. The Complaints Procedure will include the right to third party arbitration that will be funded by the Project.

6.12.1.4 Residual impacts

Maintaining good relations offers the following significant benefits for both the Project and neighbouring settlements:

- increased cooperation from local residents (eg during the expropriation process);
- early warning received on potential problems, with the Project more likely to be given the benefit of the doubt when problems arise;
- a cooperative approach to problem solving is encouraged;
- through on-going communication, mitigation measures are refined and complaints resolved;
- decreased cause for protest action from neighbouring residents, for example, deliberate damage to property and/or disruption to the construction schedule.

In the areas affected by the East Anatolian Natural Gas Pipeline (NGP), good community relations will also depend upon the realisation of the BOTAŞ commitment to address outstanding reinstatement issues.

6.12.2 Management of construction workers

The three primary pipeline construction camps will be located in: Pasinler district, Erzurum; Zara district, Sivas; and Goksun district, Kahramanmaras. The Contractors selected to build the three sections of the pipeline will initially use these camps. The Contractors will then select sites for further camps as follows

- **A main camp** that may or may not be on the site of the primary camp. Each of the three pipeline Contractors will have a main camp that will be operational throughout the construction period. This will be used for administration, storage and maintenance purposes and will require a workforce of approximately 100 people for the duration of construction. The main camp will also be used to house non-local workers working on the spread (ie the skilled and some of the semi-skilled workers) when the pipeline passes within approximately 50km of the main camp. During this period of about six months the camp will therefore house approximately 250 workers.

- **Temporary camps** will be used when the main camps are more than 50km from the worksite. This is to meet Project HSE requirements, which stipulate that the Construction Contractors cannot travel more than 50km between the camps and the worksite. These camps will house non-local workers working on the pipeline. Approximately 40 people (primarily local workers) will work at each of these camps that will house approximately 150 workers for three to five months.

The community consultation process indicated mixed reactions to the location of construction camps in the vicinity of local settlements (see Box 6.5). On the one hand, residents expect to secure additional project benefits as a result of the nearby location of construction camps (eg preference for employment and provision of local goods to construction workers). On the other hand, residents are concerned about the conduct of the workforce and the potential for this to be in conflict with socio-cultural values of local settlements.

Box 6.5 Community Reactions towards Construction Camps

"*We want the construction camp closer to the village, it is better and this will provide more economic opportunities for the village.*" (Erzurum province)

"Women with high school educations in the village of Tasoluk are eager to work at the construction camps if jobs are available." (Kayseri province)

"As women we do not want to see a construction site near our village. Previously a construction camp was established near the village and we were disturbed. We do not want to be disturbed again." (Kayseri province)
(Source: Community Meetings)

6.12.2.1 Impacts

Although settlements located adjacent to construction camps will be targeted for preferential employment and could potentially benefit from sale of goods to construction workers, the possibility of tension developing between local residents and the workforce exists. This tension could be caused by the factors outlined in Table 6.12.

Table 6.12 Potential Sources of Tension due to Presence of Construction Workers

SOURCE OF TENSION	ASSESSMENT
Impacts of project activities	These impacts will include land expropriation, increased traffic congestion and dust levels, and impacts on other infrastructure, particularly utilities. They are considered under the other relevant sections. The Project will, however be largely self-sufficient, thus mitigating against any tensions developing in this regard.
Damage to land and property	Lack of control over the movements of construction workers (during and after working hours) could result in trespassing and damage to local land and property. This lack of control could also result in residents, particularly women, feeling vulnerable to the behaviour of construction personnel, as well as creating a sense of their privacy being invaded.
Differing socio-cultural values	The likelihood of differing socio-cultural values being a source of tension is dependent on the origin of the workforce staying in construction camps and the socio-cultural backgrounds of the neighbouring settlements. Optimising local employment within the boundaries of the Project, as detailed in the Employment Strategy (see Appendix C8), will minimise this source of tension as well as improve the relationship between the Project and those it will affect. Many respondents commented that contact between workers and local women would be a particular source of offence. The conservative traditions of many of the settlements will largely prevent this type of interaction, which is more likely in larger population centres used by workers on their days off.
Higher standards of living in construction camps	Residents in settlements close to construction camps may resent the relatively higher standards of living enjoyed by workers in the construction camps. Differences in health care for workers and local residents could become an area of tension should there be an emergency situation in a nearby settlement. However, mitigation measures have been developed to share the benefits of improved health care with local residents (See Section 6.12.2.4).
Prostitution	The potential for increased prostitution as a result of the BTC Project is considered to be low, particularly in the vicinity of rural settlements where local residents are generally conservative and thus unlikely to tolerate such activities. In the district and provincial centres, brothels are controlled by the government and include the implementation of regular health checks for all sex-workers.
Sale of alcohol	A number of cultural factors (eg religion) suggest that excessive alcohol consumption, as a result of increased disposable income, is less likely to be a concern in Turkey. However, the issue was raised as a concern by women during consultation, and is thus addressed in the Code of Conduct for the construction workers (See Appendix C8).
Gambling	Many of the workers will have large disposable incomes relative to the local residents. It is possible that gambling may increase as a result. This may cause tension in neighbouring settlements if local venues such as coffee houses are used for gambling purposes. The possibility of this occurring among the local workers is however considered unlikely due to cultural sensitivities regarding gambling.
Communicable diseases	All personnel, including subcontractors will be required to undergo health screening[1]. The Contractor will also be required to conduct regular health awareness training and personal health programmes (including check-ups and immunisations) in order to prevent illness occurring or spreading among

1 No one suffering from a transmittable disease will be allowed to work on the project.

SOURCE OF TENSION	ASSESSMENT
	the workforce. This will include awareness on HIV and STDs. These efforts will assist in ensuring that an increase in communicable diseases among neighbouring settlements, as a result of the construction workers, is kept to a minimum.

The settlements that will be primarily affected by construction workers fall into three categories[1]:

- Settlements that fall within a 5km radius of the construction camps and are therefore accessible on foot from the construction camps. Factors such as topography, road network and access to settlements (from the construction camps) will affect the extent to which settlements can be reached.

- Settlements located within 1km of the working area and are therefore accessible on foot from the working area, particularly during breaks in the workday.

- Settlements located along the access roads to the construction camp.

In addition, construction workers may drive to larger towns/district centres to purchase supplies and find entertainment.

6.12.2.2 Criteria for significance

Impacts caused by the conduct of construction workers on local residents are considered to be significant if they are perceived by local residents as offensive or may otherwise give cause for complaint. In addition, such tensions will be considered significant if they result in:

- any legal action initiated by local residents against the Project and/or the construction company;
- disruption to construction works by local residents;
- outbreaks of conflict and violence, including injury or damage to Contractor property and/or local property.

An increase in communicable diseases will be considered significant if:

- local health services are not able to effectively treat or contain the outbreak of such diseases.

6.12.2.3 Mitigation objectives

In order to address the potential impacts that might be caused by construction workers, the following mitigation objectives have been agreed to by the Project:

- To ensure that construction crews behave in a way that is consistent with the recognition that the local population are their hosts and the Contractors are guests in the project area.

- To prevent any negative impacts that could potentially accrue as a result of the presence of construction workers in the project area.

1 Settlements within 5km of one of the three proposed sites for the main construction camps are identified in section 7.

- To maintain effective dialogue between Construction Contractors and local residents such that potential issues can be rapidly identified and resolved.

6.12.2.4 Mitigation measures

The majority of the measures required to prevent impacts associated with construction workers are the responsibility of the Contractor and will be included in their contract for incorporation into their management plans. These requirements, plus additional mitigation measures that are the responsibility of the Project, are identified below.

Location of Construction Camps and Pipe Storage Yards

In order to minimise social disturbances as a result of construction workers' activities, certain requirements have been placed on the siting of construction camps and pipe storage yards (including pipe dumps). These are as follows:

- Camps and pipe storage yards will be placed in areas where the impact on local infrastructure and utilities can be kept to a minimum. First preference will be given to old camps used during construction of the NGP. Where these do not exist or are considered impracticable, state land will be preferred, followed by land where there is an identified and willing lessee.

- Construction camps will be located at least 2km from any settlement, wherever possible.

- Construction camps potentially located within 5km of settlements identified as having a resistance to the proximity of a construction camp shall be avoided wherever practicable.

Once a potential site has been agreed upon, there will be on-going community liaison by the Contractor as part of their community liaison responsibilities (See Section 6.12.1).

Affected land owners/users will be compensated as part of the land acquisition process for this project. This process will be compliant with World Bank standards. An overview of the land acquisition process is provided in Appendix C9.

Code of conduct

In order to minimise social disturbance (and resultant tension) from the behaviour of construction workers, a Worker Code of Conduct will be drawn up. This will include the following:

- respect for local people and customs;
- zero tolerance of bribery or requests for gifts from local residents;
- no purchase of goods or services at the camp gate;
- no hunting, fishing or unauthorised gathering of products;
- zero tolerance of illegal activities by construction personnel, including unlicensed prostitution, illegal sale or purchase of alcohol, sale, purchase or consumption of drugs;
- an alcohol and drugs policy;

- no use of camp vehicles for non-work business and no use of personal vehicles for work business, unless authorised by the camp manager;
- country-wide speed limits (10% lower than those legally imposed);
- limitations on hours of movement and use of security passes;
- no access to camps for non-authorised personnel;
- rules on access to, and use of, camp entertainment facilities.

The Code of Conduct will include the disciplinary measures for those that break the requirements. The Code will be publicised in settlements potentially affected by the construction camps to help ensure that the local residents are aware of the expected behaviour of construction workers. A system for submitting complaints about the behaviour of construction workers is included in the Complaints Procedure.

Entertainment facilities

The Contractor will provide adequate recreation and entertainment facilities at all permanent camps in order to minimise the potential for 'unruly' behaviour among construction workers outside the camp. To discourage workers seeking alcohol outside the camps, a limited volume and selection of alcoholic drinks, may be available within camps. Decisions regarding the enforcement of alcohol free camps will however be left to the discretion of the Contractor, as this is common practice in Turkey.

Induction Training

Training will be provided to all staff, both national and expatriate, on camp management rules and overall discipline and cultural awareness. Specifically, the induction training will include:

- a briefing on Camp Rules;
- training on BP Health, Safety and Environment (HSE) Policies and Procedures;
- a community relations orientation to increase awareness about the local area and about the Code of Conduct.

Workforce Health Strategy

The Project will develop and implement a Disease Awareness and Prevention Strategy in liaison with government health authorities and other expert health organisations. This will include:

- health screening for all personnel, including sub-contractors;
- health awareness training for workers (including HIV/AIDS and other STDs) at induction and then periodically throughout their employment;
- a personal health programme for workers, including check-ups and immunisations if required;
- awareness raising on health issues for settlements close to camps (via posters, leaflets, through health clinics, community meetings etc);
- condoms will be available without charge, from the camp doctor[(1)];
- on-going liaison with local health authorities.

[(1)] The camp doctors recruited by the Construction Contractor will be recognised members of a Chamber of Medicine associated with the Turkish Medical Association.

The Contractor will be prepared, at the request of the Project, to utilise the camp medical facilities and site medical personnel to provide training and support to local settlements.

Use of camp facilities and services

Entry to construction camps will be strictly limited to the workforce. In the event of a medical emergency being brought to the camp, the medical staff will offer immediate emergency medical support and lend reasonable assistance in organising transport to health services.

6.12.2.5 Residual impacts

Even with full implementation of these measures, the possibility of specific incidents or disputes between construction workers and members of local residents remain. However, the Project is committed to identifying and resolving these incidents in order to maintain the confidence of the local residents and the discipline of the workforce. This should ensure that any negative impacts are short term.

With regard to health, the implementation of the identified mitigation measures will ensure that the residual risk of an increase in communicable diseases is kept very low. This low residual risk will also be off-set by the training that the Project will deliver to construction workers – many of whom will be from local settlements – in health and safety (including hygiene and HIV/AIDS awareness).

6.12.3 In-migration

Large projects can directly or indirectly attract temporary or permanent in-migration into the area. However, the pipeline construction itself is transitory, with camps that will move with the pipeline. In addition, there will be three main construction camps that will be fixed for the construction period of 32 months.

The main drivers of in-migration could include the following:

- people travelling to the project site in search of direct employment or to sell goods or services to the workforce;
- new or upgraded roads, opening up areas of the country with previously poor access, thus attracting people who then exploit the land or resources of the area.

To assess the likelihood of in-migration, it is necessary to look at the geographical and historical context summarised below.

As presented in Section 5, the majority of the districts through which the pipeline passes have experienced high levels of out-migration over the past years as people have moved to Ankara or Istanbul in search of greater economic opportunities[1].

- Previous pipeline projects in Turkey that have passed through eastern Anatolia, such as the East Anatolian NGP, have not given rise to permanent in-migration into the project

1 The first major rural-urban migration in Turkey occurred during the 1960s and 1970s (especially high in Sivas and Kayseri) following the mechanisation of agriculture. Migration has also been high from south-eastern Turkey where unemployment has been a major push factor. Following a decline in migration movements in the 1980s, further increases occurred during the 1990s, including in the south of Turkey from Adana and other southern provinces to Istanbul.

area. However, there is evidence to suggest that sex-workers did move temporarily into nearby semi-urban centres.

- It is customary for Turkish workers to leave their families when they are working in a different location. As identified in the baseline section (Section 5.11.3), on average the heads of approximately 8% of surveyed households leave rural settlements to work for some periods of the year.

It is therefore considered that, in general, in-migration associated with the pipeline will be limited to people looking for work or hoping to sell their goods or services to the workforce close to the construction camps, and will be temporary. In some specific parts of the pipeline route, temporary access roads and the Right of Way itself will open new access to land and resources such as timber. These locations are identified in the social impact tables in Supplement 1, Volume 2.

6.12.3.1 Impacts

Where there is in-migration, potential impacts are as follows:

- development of informal settlements in the vicinity of the construction camps;
- decreased availability of and increased competition for infrastructure and services, key resources and sources of livelihoods. This could potentially result in conflict between local residents and new-comers

6.12.3.2 Criteria for significance

The occurrence of in-migration will be considered significant if:

- the ratio between number of people and capacity of local services exceeds levels considered acceptable by the relevant authorities;
- there is a recorded increase in levels of unemployment and under-employment within settlements within the 4km pipeline corridor (key indicators are decreased salary income and decreased numbers of hours worked within settlements within the 4km corridor[1]).

6.12.3.3 Mitigation objectives

In order to address the potential for in-migration to the project area, the Project has committed itself to discouraging in-migration in search of employment or other project benefits (eg provision of local goods).

6.12.3.4 Mitigation measures

In order to meet the above objective, the Project has agreed to the following mitigation measures:

1 State Institute of Statistics, 2002 (www.die.gov.tr)

Employment strategy

The Project will actively discourage informal in-migration in search of employment opportunities. It will develop and publicise an Employment Strategy in the local and national press that will contain the following procedures:

- No recruitment at the construction camp or worksite. Locations for registration for unskilled work will be within a three-hour journey by public transport for all directly affected settlements (eg district centres)[1]. For semi-skilled work, recruitment will be carried out in provincial centres or more locally. Skilled workers will be recruited from national centres.

- Preference for local labour.

Purchasing strategy

The Project will publicise the fact that products required by the camp will not be purchased at camp locations or work sites. However, the camp will look to maximise the purchase of local goods from recognised outlets (markets, shops etc).

For more information on both strategies see Section 6.14.

6.12.3.5 Residual impacts

The successful implementation of the above mitigation measures will assist in ensuring that uncontrolled in-migration and its associated impacts are kept to a minimum. However, Turkish citizens are free to move within their own country. Hence, there is a small likelihood of in-migration in search of employment and opportunities to provide goods and services. These impacts will be short term (ie for the duration of the construction phase) and will generally not have a significant impact on the local settlements.

6.12.4 Out-migration away from the Project Area

6.12.4.1 Impacts

The increased financial resources brought in by the Project could hasten the existing trend of migration to district centres and other urban areas in search of greater economic opportunities. Those that are successful in finding a job will have greater disposable income, which may encourage individuals or households to migrate. The income for unskilled workers will be no less than the annual minimum wage (gross) of approximately 1,655USD. After subtraction of taxes paid by the company (such as health and life insurance, income tax and contribution to the education fund) this is equivalent to 1,227USD net[2]. The net income level is greater than the average annual income as estimated by survey respondents in rural areas in Sivas (1,018USD) and Osmaniye (897USD) (see Section 5). Unskilled workers, however, will only be employed on the Project for limited durations and will thus only earn monthly equivalents (or less) of this level of payment.

1 However, if a settlement does not have access to public transport or if there are cases where the journey by public transport will exceed three hours, then the Construction Contractor will provide transportation for the applicants concerned.

2 For the period of 1 January 2002 to 30 June 2002 Reference: official gazette published by Asgari Ucret Tespit Komisyonu. Minimum wage is revised every 6 -12 months under Labour Law 1475. Conversion rates are based on January 2002 figures where 1million TL=1.6USD

6.12.4.2 Significance criteria

The occurrence of out-migration will be considered significant if skills and income, essential to the functioning of the rural settlement concerned, are lost as a result of departure.

6.12.4.3 Mitigation objectives

The mitigation objective is to reduce out-migration as a result of the Project, as far as possible.

6.12.4.4 Mitigation measures

The Employment Strategy (see Section 6.14) for the pipeline spread will result in short durations of employment for local people who are employed as unskilled workers on the pipeline. This will reduce the level of income received by any one household and therefore the likelihood that the Project will cause increased levels of out-migration in any particular settlement.

6.12.4.5 Residual Impacts

Additional income is generally considered to be a positive residual impact. Overall, there is a low risk of out-migration as a result of additional income. If out-migration does occur, there is unlikely to be any significant impact upon the livelihoods of settlements or of individual households.

6.12.5 Safety of local residents and BTC workers

6.12.5.1 Impacts

Safety was raised as a concern at many community meetings. Women were particularly interested in understanding how safety of children and livestock would be assured. Some of the feedback from these meetings is provided in Box 6.5.

Box 6.6 Safety: Community Feedback

The need for safe animal crossings was highlighted during consultations with the residents of Gulluce, Gumushane, who stated that '*in case the pipeline divides the pasture in two, the animals may not be able to graze on the other side of the pasture and there would be a risk of them falling into the excavated channels.*' **(Source: Community Meeting in Gumushane)**

Concerns over safety were very high in Erzurum, particularly in the settlements of Cayirtepe and Alvar as a result of negative experiences from previous construction projects. The following quotes were recorded during the community consultation meetings:

'They left wires everywhere and the wires injured our children's hands'

'Iron filings were left in the pasture land and made the animals sick'

'A man fell in one of the ditches [as a result of poor reinstatement of the land] and nearly died' (Erzurum)
(Source: Community Meetings in Erzurum)

The greatest safety hazard posed by the construction phase for local residents is the increased traffic loads on neighbouring roads. This is considered in Section 6.9.

During construction, the pipeline corridor presents a number of hazards including an open trench, at least 2.5m deep. It is likely to be deeper in places such as river crossings (where it could reach 15m), on gradual inclines, etc. There will also be many crossings over tracks, roads etc. The maximum duration that a trench will be left open is 40 days. Other hazards include heavy machinery and dangerous wastes (eg individuals reported that on past construction projects children played with sharp wastes and injured themselves).

Although only construction personnel will be permitted to enter the working corridor of 28m, consideration needs to be given to those who may not understand the hazards posed by the construction activity, such as small children and animals.

The construction phase also poses safety risks for the BTC workers. However, these risks will be minimised through compulsory adherence by both contractors and sub-contractors to all BP HSE policies and procedures.

6.12.5.2 Significance criteria

Regarding the safety of neighbouring settlements, the following will be considered significant:

- any injuries to local residents and BTC workers;
- injuries to livestock, where this impacts on the livelihood of local residents.

6.12.5.3 Mitigation objectives

Safety of the workforce and local residents is an absolute priority for the Project. The Project has therefore committed to preventing injury to local residents and BTC workers as a result of construction activities associated with the BTC Project, and wherever possible, to prevent injury to livestock as a result of construction activities associated with the BTC Project.

6.12.5.4 Mitigation measures

The hazards posed by construction activities will be mitigated through a combination of communication with local residents and by implementing good working practices as summarised below.

Community liaison meetings

In the weeks prior to construction, the community liaison team will hold meetings with settlements close to the pipeline and those affected by significantly increased transport loadings. A priority topic will be safety, including both road safety and also the hazards posed by construction activities on the working width.

Women's meetings

Particular effort will be made to brief women on safety measures. As the primary caretakers, women are well positioned to pass on safety information to their children. Separate women's meetings will also assist in addressing the sometimes low attendance and participation of women at community meetings. These meetings will be held in local schools or in other appropriate locations. In settlements identified as traditional or conservative, efforts will be made to ensure that a female CLO will run the meeting. Information will be provided orally with written material only used to back up key messages.

Plate 6.2 Womens Meeting Held During Disclosure Process In Sivas

Roads used for access to schools

The Contractor will identify those roads that are used by children to reach schools. Where these roads are to be used by construction traffic, road safety awareness information and briefings will be provided in local schools. Vehicle traffic will be minimised during hours that children are travelling to and from school (see Plate 6.3).

Plate 6.3 School Children in Erzurum

Securing the worksite

During construction, appropriate measures will be undertaken to ensure the safety of people and livestock from accidents caused by machinery and from falling into the trench. The Construction Contractor and BOTAŞ will be responsible for demonstrating that all practicable steps have been taken to ensure the safety of both employees and local residents. Hazards will be dealt with on an individual basis by carrying out a risk assessment for all construction activities prior to starting the activity, in particular where heavy equipment is involved, and

ensuring that appropriate safety measures are taken to reduce the risks to reasonably practicable levels. Reasonably practicable measures should include the following:

- the length of trench open at any one time on each spread is planned not to exceed 20km or a 40 day construction time, whichever is the shorter;
- demarcating open trenches with luminous temporary fencing that will act as a warning of the hazard;
- erecting stock-proof fencing in areas of danger for livestock (as agreed between the CLO and settlements in advance of construction);
- agreeing crossing points for livestock with settlements prior to construction;
- erecting protective barrier fencing (sufficient to impede young children) on sections that come within 500m of residential areas and in areas where the trench is deeper than 2.5m;
- fencing all crossing points over open trenches;
- securing heavy machinery in an agreed location over night;
- storing wastes properly overnight to avoid attracting animals in the case of organic wastes and causing a hazard to people or animals.

BP HSE Training

As part of induction training, all staff (both national and expatriate) will be trained in BP HSE policies and procedures.

6.12.5.5 Residual impacts

The measures identified will minimise the likelihood of serious injury to local residents and the BTC workforce. There will still be a residual, although small, likelihood of injury. In the event of injury caused directly by the Project, the Project will be responsible for necessary medical treatment and any compensation, if required. The level of compensation will be determined through the Project's Complaints Procedure.

6.13 LAND OWNERSHIP AND USE

Impacts on land ownership and use will result from temporary and permanent expropriation of land required for construction of the pipeline and associated facilities, most importantly the four pump stations, the pressure reduction station, the 52 block valve stations, pipe storage yards and construction camps.

This section also explores potential impacts to land and resource use outside of the expropriated area.

6.13.1 Land expropriation

In total, approximately 3,000ha of land along the pipeline corridor and AGIs will be expropriated, either permanently or temporarily (see Plate 6.4 which illustrates the site for Pump Station 4 in Sivas). This equates to a small portion of about 10,000 parcels of land, affecting about 25,000 landowners or users. The largest proportion of this land will be temporarily expropriated. The expropriation process will cover compensation for physical assets such as

crops, trees, fences and wells, as well as land. An overview of the land acquisition process is provided in Appendix C9.

Plate 6.4 Pump Station 4 Site

6.13.2 Use of land outside expropriated areas

6.13.2.1 Impacts

The major impacts that can arise during linear construction projects such as pipelines are the use of land outside of the expropriated areas by construction workers. This includes:

- clearing land beyond the working areas defined for the Project and therefore beyond that for which compensation has been paid prior to construction;
- vehicles or people straying off the defined working areas and access roads and thus causing damage to land and crops.

6.13.2.2 Significance criteria

Impacts on land outside of the expropriated areas will be considered significant if:

- affected households are denied access to their source of livelihood;
- impacts on land outside of the expropriated areas puts strain on relations between the affected households/settlements and the Project.

6.13.2.3 Mitigation objectives

The mitigation measures aim to prevent any use of land outside of the expropriated area.

6.13.2.4 Mitigation measures

The boundary of all working areas will be clearly marked. Permanent facilities will be fenced. For the pipeline RoW, marker posts will be placed and maintained to identify the working width.

The requirement to keep within the working area will be strictly enforced. Any breach will lead to disciplinary action against the Construction Contractor and potentially to dismissal.

6.13.2.5 Residual impacts

There is a low likelihood of residual impacts occurring. However, should any grievances arise, these will be dealt with through the Complaints Procedure.

6.13.3 Commercial and subsistence fisheries

6.13.3.1 Impacts

Fishing constitutes a source of livelihood (primarily for household consumption) in various settlements along the pipeline corridor. The identified settlements and households are listed in the social impact tables in Supplement 1, Volume 2.

There is a potential for fisheries to be impacted by construction of the pipeline across rivers both directly (through increased sediment levels) and indirectly, through impacts to their habitats.

Plate 6.5 Commercial Fish Farm in Sivas

6.13.3.2 Significance criteria

Impacts on fishing activities will be considered significant if the affected households are unable to sustain their original standards of living or income levels.

6.13.3.3 Mitigation objectives

The mitigation measures are aimed at preventing impacts on fisheries (commercial and artisanal) up to 2km downstream of pipeline crossings.

6.13.3.4 Mitigation measures

The following activities will be undertaken in order to identify potential impacts on fisheries due to project construction activities:

- Prior to construction, the Project will ascertain whether there are commercial or artisanal fisheries activities up to 2km downstream of all river crossings.

- Within this 2km stretch, the Project will identify any settlements. Muhtars from the identified settlements to be requested to submit names and contact details (eg addresses or phone numbers) of all commercial and artisanal fishermen to the relevant BOTAŞ CRS.

- Any reports of decreased fish yield to be assessed against results of water quality monitoring as well as monitoring against compliance with construction requirements for river crossings (see EMP, Appendix C1).

- Where there is a decrease in fish yield as a result of the project, the necessary compensation will be provided. The level of compensation will be determined through the Project's Complaints Procedure.

6.13.3.5 Residual impacts

There is a low likelihood of residual impacts occurring. However, should any decline in yield be experienced, these will be dealt with through the Complaints Procedure.

6.13.4 Commercial beekeeping

6.13.4.1 Impacts

The Project will physically disturb bees within about 250m to 300m of the pipeline (see Plate 6.7). This will be due to dust (bees are sensitive to intensive dust on themselves and the surrounding flora) and noise of the machinery and vibration at very short distances (bees are sensitive to noise of more than 90-120 dB). There is no evidence that bees will be disturbed by the sounds of explosives occurring at a distance beyond 250m to 300m.

Bees with hives within approximately 5km of the pipeline corridor will also be affected by loss of vegetation caused by the pipeline corridor. Assuming a corridor of 28m and an equal distribution of flora suitable for honey production in the 5km radius, the maximum loss of area would be less than 0.2%.

However, there are certain areas where the corridor passes over pastureland that is noted as particularly important for honey production. In such areas the percentage loss of suitable flora would be higher.

POTENTIAL IMPACTS ON BEE KEEPING

Consultation and Disclosure Results

Consultation at the settlement level conducted during September – October 2001 and again in July-August 2002 revealed concern regarding the potential impact of pipeline construction on bee keeping activities. Of particular concern, is the potential damage caused by construction activities to clover, which attracts bees. The disturbance to bees caused by noise was also raised as a concern.

'The region around Fettahdere [Kahramanmaras] is famous for its diverse flora and therefore honey produced is regarded as very valuable with bee keepers from outside the region competing for use of the flora. Bees fly over a distance of 4km to access flora for honey production. We are concerned that our bee keeping activities will be impacted by the construction of the pipeline, which will be approximately 1km from our village'.

Bee keeping is an important economic activity in some central and southern provinces through which the pipeline passes, including Sivas, Kayseri and Kahramanmaras.

BEE KEEPERS IN SIVAS (ABOVE AND BELOW)

STATIONARY (LEFT) AND MOBILE BEE HIVES (ABOVE RIGHT) ALONG THE PIPELINE ROUTE

Specialist Study of Impact on Bees

To address and investigate these concerns, a discrete study was undertaken by an agricultural engineer specialising in bee keeping and honey production in Turkey.

The study outlined the seasonality of bee keeping activities, the bee keeping methods (stationary and mobile) that are applied in Turkey, the economic aspects of bee keeping and the potential impacts of construction on bee keeping.

The recommendations of the study provided guidance in the development of the following mitigation and management measures:

- Prior identification of bee keeping activities and notification to bee keepers and authorities of construction activities and potential impacts
- Clear demarcation of expropriated land
- Removal of bee colonies at the stationary bee hives situated within a specified distance of the pipeline route
- Dust suppression methods
- Compensation for damages

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Plate 6.6 Bee Keeping Case Study

Plate 6.7 Beekeeping in Adana

6.13.4.2 Significance criteria

For some households, beekeeping is the primary source of income. For many others it is one of many income sources. Beekeepers may have spent many years building up their hives and any substantial disturbance could take a number of years to recover from.

Impacts on bees will be considered significant if colonies within 300m of construction activities are disturbed such that their production is decreased compared to colonies in similar habitats.

6.13.4.3 Mitigation objectives

The Project has committed to the following mitigation objectives:

- To prevent unnecessary disturbance of bees.
- To provide appropriate compensation for any unavoidable losses to bee-keeping activities. The level of compensation will be facilitated through the Project's Complaints Procedure. .

6.13.4.4 Mitigation measures

The following mitigation measures have been developed to meet these objectives:

Beekeeping: general measures

- The Project will confirm the presence of beekeeping activities and determine whether they are mobile or stationary apiaries[1]. This will be achieved by liaising with either sub-governors, agricultural departments and/or Muhtars.

- The area to be expropriated along the pipeline route will be clearly determined and marked at least two months before the beginning of the production season (before November from Ceyhan to the Taurus mountains and before January in all other areas).

- Sub-governors and Muhtars in all areas where beekeeping is carried out will be notified through an official letter that they should not give permission[2] to mobile beekeepers to position their hives within 300m of the pipeline route. Where possible, mobile beekeepers should position their hives further from the route in order to reduce the impact of the route on the area of productive land for nectar collection.

Beekeeping: additional measures for stationary beekeeping

- At least two months before the beginning of the production season, the Project will inform sub-governors and Muhtars of the need to move stationary apiaries more than 300m from the route. Levels of compensation for costs associated with the relocation of hives will be facilitated through the Project's Complaints Procedure.

- Should this notification not be carried out successfully, and stationary apiaries need to be moved during the production season, apiaries will be moved a distance of at least 7km[3]. The colonies will be kept at this position for 15 to 20 days before they are brought back to a point closer to their previous location (but beyond 300m of the route). In the event that this is the result of poor communication from the Project, the Project will investigate and provide compensation. The level of compensation will be facilitated through the Project's Complaints Procedures.

6.13.4.5 Residual impacts

The mitigation measures are aimed at preventing any significant impact on the bees themselves. In the event that any settlement believes that suitable foraging vegetation (generally wheat and clover on pasture lands) is going to be significantly affected (when compared to production in similar habitats), the Project will carry out a location-specific bee assessment.

6.13.5 Animal grazing

Animal grazing is common along the whole pipeline route, particularly in the north (see Plate 6.9). Grazing areas are well defined and may be a few kilometres from the main settlement. Other settlements that will need to cross the RoW during construction to reach grazing lands or water have not been identified.

1 As per the relevant circulars of the Ministry of Agriculture, mobile beekeepers are obliged to reach an agreement with the local governor or the Muhtar whilst selecting the place they will carry out beekeeping in any given season.

2 As above.

3 If a colony is carried less than approximately 5km from their original position during the production season, the field bees will travel to their previous location on returning from nectar collection and die since they cannot find their hives.

POTENTIAL IMPACTS ON LIVESTOCK GRAZING

Consultation Results

Animal husbandry and livestock grazing are important sources of livelihood in all provinces along the pipeline route, particularly in the north-east.
Grazing constitutes a primary activity of many surveyed respondents, who indicated that their grazing areas are generally well defined and used on a seasonal basis with 80% of them on common lands. They are typically within a few kilometres of their main settlement area, sometimes in higher plateau areas.
Seasonal grazing occurs mostly between April – October although 6% of households surveyed stated that they graze livestock throughout the year. In northern provinces, some settlements have been abandoned due to over-grazing in the area.

Potential Impacts of Construction

Construction activities associated with the BTC Pipeline Project have the potential to adversely affect the animals that are grazing by preventing their access to grazing lands and sources of drinking water or by causing injury due to livestock falling into trenches, being injured by vehicles or eating dangerous wastes.

SHEEP GRAZING IN SIVAS AND CATTLE IN NORTH-EAST ANATOLIA

Mitigating Impacts to Livestock

In order to ensure that livestock have safe movement and continuous access to pastureland the following mitigation objectives have been set for the Project.

Critical Settlement Identification: during land acquisition, Muhtars of settlements bordering the pipeline route will be asked to identify any settlements that move their animals across the proposed path of the Right of Way.

Crossing Point Locations: The locations of crossing points across the Right of Way will be agreed with landowners, land users (including seasonal grazers) and communities:

- crossings will be clearly visible and fenced
- open trenches will be demarcated with luminous temporary fencing
- stock-proof fencing will be erected in those areas where there is a high danger of livestock falling into a trench
- wastes will be properly stored overnight to avoid attracting livestock

Financial Compensation: This will be given in these instances where there are residual impacts, like injury to animals.

CONSULTATION IN ESENDERE, ERZURUM

btc

, 2002

Plate 6.8 Seasonal Grazing Case Study

Plate 6.9 Livestock Grazing in Erzurum

6.13.5.1 Impacts

Potential impacts on livestock are as follows:

- lack of access to grazing lands or sources of drinking water;
- injury due to livestock falling into trenches, being injured by vehicles or eating dangerous wastes.

6.13.5.2 Significance criteria

Impacts to livestock will be considered significant if households dependent on the affected livestock are no longer able to secure a living equivalent to that originally experienced.

6.13.5.3 Mitigation objectives

The Project has committed to the following objectives:

- To ensure the safe movement of livestock across the RoW.
- To ensure undisrupted access for livestock across the RoW.

6.13.5.4 Mitigation measures

The following mitigation measures have been developed to meet these objectives:

- During land acquisition, Muhtars of settlements bordering the pipeline route will be asked to identify any settlements that move their livestock across the proposed path of the RoW.
- The locations of crossing points across the RoW will be agreed with landowners, land users (including seasonal grazers) and local residents.

The following measures will be undertaken to prevent injury to livestock:

- crossings will be clearly visible and fenced;
- open trenches will be demarcated with luminous temporary fencing;
- areas where there is a high danger of livestock falling into a trench will be identified with relevant settlements and livestock owners in advance. Stock-proof fencing will be erected in these areas;
- wastes will be properly stored overnight to avoid attracting livestock, in the case of organic wastes, or causing a hazard to them.

6.13.5.5 Residual impacts

There is a potential for minor accidents involving livestock. The level of compensation will be facilitated through the Project's Complaints Procedure.

6.13.6 Hunting

6.13.6.1 Impacts

Hunting is not a source of income for surveyed settlements, and is mainly undertaken to reduce the killing of livestock by wolves or wild boar. Very few households hunt as a form of subsistence and where this is the case, it is a minor contribution to overall livelihoods.

The noise and activity caused by the construction activity will cause animals to move away from the area temporarily. This is considered in Section 6.8. However, due to the low contribution of wild animals to the livelihood of settlement this impact is not considered to be significant and does not require mitigation.

6.14 EMPLOYMENT, SKILLS AND LIVELIHOODS

Opportunities for paid employment are low, particularly in rural areas. Employment is therefore considered to be the most important potential benefits that the Project can bring to local settlements (see Box 6.6 and Plate 6.10).

Box 6.6: Community Consultation Feedback

Villages have a preference for employment of local people not an 'out-of-town workforce'. They requested the *'clear and transparent announcement of jobs and hiring of local labour force'*. (**Source: Community Meeting in Erzincan)**

'If a construction camp is built on the land of this village, priority in employment should be given to villagers.'
(Source: Community Meeting in Erzurum)

Plate 6.10 Tractor in Goksun, Kahramanmaras

The number of contractors who will work on the construction of the BTC Pipeline is as follows:

- For each Lot (thus a total of three contracts) – including pipeline construction, pipe dumps, construction camps, access roads and block valve stations. Each contractor will require work teams that will work simultaneously on different sections, or "spreads", of the pipeline route.

- One Contractor for the four pump stations and the pressure reduction station.

There will also be a separate contract for the BTC Marine Terminal onshore and offshore facilities. Employment opportunities associated with these contracts are outlined in Section 12.

6.14.1 Direct impacts

6.14.1.1 Employment

It is estimated that these contractors will employ approximately 5,000 workers at the peak of the construction phase. This will include those required for construction activities and those required to construct and run campsites and the overall operation. Each team will require skilled, semi-skilled and unskilled labour and numbers will peak over approximately 21 months. The construction phase will have an overall duration of 32 months.

Table 6.13 provides further information on opportunities for employment during the construction phase for the pipeline and AGIs. It should be noted that the number of workers and the division of skilled, semi-skilled and unskilled labour will depend on the exact construction methods used and number of construction camps. These will be determined by the Contractors. The figures provided should therefore only be taken as a guide.

Table 6.13 Estimates of Employment Opportunities during Construction

Task	Number of Employees (approximately)	Skills Mix % (unskilled: semi-skilled / skilled)	Duration (peak employment for semi-skilled and skilled employees only)
Each Pipeline Lot (3 in total)	1,100	30 : 70	26 months
Each Pump Station and Pressure Reduction Station (5 in total)	300	20 : 80	28 – 32 months
TOTAL	4,800		

6.14.1.2 Security of Livelihoods

Those individuals that secure permanent or long-term employment on the pipeline will experience increased security of livelihoods. This is particularly relevant for individuals dependent on agriculture (particularly seasonal workers or individuals dependent on rain-fed agriculture) and other sources of livelihood that are highly vulnerable to climatic or economic fluctuations. However, these benefits will not be widespread as employment opportunities associated with the Project are relatively low and mainly short-term.

6.14.1.3 Skills Upgrade

Construction will require skilled, semi-skilled and unskilled labour. The skilled workers will include welders and machinery operators and workers who will typically require recognised qualifications and 10-15 years experience in pipeline construction in order to ensure the required quality of work. The semi-skilled workers will require 5-10 years experience. Unskilled workers will require no prior construction experience, but will be required to be literate. A list of the types of personnel that will be required is provided in Table 6.14.

In general, given the short timeframe of the construction phase along the spread, there will be limited, if any, possibility for unskilled workers to develop other skills. However, as the duration of construction of pump stations and operation of construction camps is longer, it is expected that there will be greater opportunities for training. All workers will, however receive additional skills training such as health and safety training and job specific training (eg defensive driver training).

Table 6.14 Types of Personnel Required for Pipeline Construction Activities

SKILLED WORKERS			
Project Manager	Engineer	Environmentalist	Winchman
Construction Manager	CAD Draughtsman	Hydrologist	Electrical/CP
		Welder/Welders	
Quantity Surveyor	Surveyor	Mate	Technician
Planning Engineer	Chainman	Radiographer	Fitter
Commercial Manager	Ecologist	Spread Boss	Chargehand
Accountant	Archaeologist	Foremen	Mechanic
DCC Manager	Biologist	Fencer	Rock Blaster
Procurement Officer	Botanist	Civil Tradesman	Miner
Office Manager	Security Manager	Painter/Blaster	Wrapper
Camp Boss	Safety Manager	Bending Engineer	Auto Electrician
Accommodation Manager	QA/QC Manager	Spacer	Driver: light, heavy
	QA/QC Inspector	Clamper	Chef
Transport Manager	Community	Intelligent Pig	Cleaning Gauging and
Plant Manager	Relations Officers	Operator	Testing crew
Operators (side boom, pay-welder, grader, loader, bulldozer, trenching machine, rock saw, padding machine, excavator, crane, directional drilling)			
SEMI-SKILLED WORKERS			
Rigger	Banksman	Clerks/Secretarial	Security guards
UNSKILLED WORKERS			
Labourer	Watchmen	Domestic Worker (catering assistants, cleaners, laundry staff etc)	

6.14.1.3 Procurement of Goods and Services During Construction

The construction of the pipeline, pump stations and construction camps will require a variety of goods and services. These goods and services will not be known until after the contracts are awarded, but will typically include:

- catering services to camps and construction sites;
- laundry services to camps;
- security services at camps and construction sites;
- supply of vehicles[1] (including dump trucks, font-end loaders, tractors, trailers, bulldozers and cranes);
- provision of food supplies (indirectly through catering services);
- supply of construction equipment including: compressors; back hoes; bending, bevelling and cutting rigs; drills; dragline; generators; induction coil; ground breaking equipment; road rollers; side booms; pumps; welding machines; X-ray equipment; water tanks;
- provision of construction materials including: aggregates/sand; concrete; building materials; timber and straw bales (for silt control).

The expectations of local residents regarding the provision of goods and services to the Project are high (see Box 6.7).

1 All vehicles used will be required to meet standards set by the Project.

Plate 6.11 Cheese Production in North

Box 6.7 Community Feedback on Provision of Goods and Services

"One of the main economic activities in the settlement is transportation. There are 60 trucks in the settlement that were used in the construction of the NGP and are available for BTC. The drivers worked as subcontractors to Alarko during the natural gas pipeline construction."

(Source: Community Meeting in Erzurum)

"Residents are ready and able to provide local goods and services like bread, milk, cheese and butter."

(Source: Construction Camp Community Meeting in Erzurum)

" Residents would welcome construction workers visiting and spending time in their village. There are two small markets and two coffee houses in the village and villagers would like workers to shop at the markets and visit the coffee houses."

(Source: Construction Camp Community Meeting in Erzurum)

"There are unused empty stores in the village that the villagers claim will be re-opened if a camp is established in close vicinity to the district."

(Source: Construction Camp Community Meeting in Erzurum)

There are expectations that the Project will increase demand for regional raw materials such as rocks, sand, gravel and manufactured goods such as foodstuffs, cement, bricks and services such as transportation.

(**Source: Consultation meeting in Sivas**)

Residents want construction workers to *'do their shopping in our town.'*

(**Source: Consultation Meeting in Kahramanmaras**)

6.14.2 Indirect Impacts

The employment of local labour will generate the following indirect benefits:

- increased demand for goods and services as a result of increased available income;
- (mainly short-term) income to those who receive employment on the Project;
- generation of skills and experience that may assist people to secure other employment;

- demonstration that employment can be managed in a fair and transparent manner;
- reduced cost to the Project, as local workers do not need to live in construction camps;
- improved community relations.

There are a number of potential negative impacts associated with the employment of local labour, although these are considered to be insignificant alongside the benefits that will be delivered to local settlements through the implementation of the mitigation measures outlined above. These potential impacts are briefly outlined below.

- Residents in settlements that are not considered to be directly affected may be frustrated that they will not get priority access to jobs despite their proximity to the pipeline route. This could result in resentment and hostility towards directly affected settlements and the Project. Measures to manage expectations regarding employment opportunities will help to reduce this. However, it is likely to remain a key concern given the high number of settlements and the degree of interest in employment found during the consultation process.

- Workers may give up their normal employment (formal, self-employed or informal) for perhaps higher paid temporary employment during pipeline construction. This can result in the loss of longer-term livelihoods. However, households are considered best able to make decisions about their future well-being. The responsibility of the Project will be to provide clear information on the limited timescales of employment opportunities.

- Other family members such as children may take over work, (eg agricultural work), during the construction period. This is already a common practice during harvest and it would be expected to occur along the pipeline route, particularly during peaks in the agricultural season. Given the limited timescales of most employment opportunities, this is not considered to be a significant negative impact.

- Employment may change the socio-economic status of individuals and as a result, disrupt existing economic power balances and relations between individuals in a settlement. The magnitude of this would depend on the relative size of the income earned by the construction worker. However, this potential impact is considered insignificant in contrast to the tension that would result should recruitment practices not be open to local residents.

- Wage levels could potentially be pushed up where there is a shortage of labour, making for example the contracting of seasonal cultivators too expensive for local landowners. As there is a high availability of labour (ie high levels of unemployment, underemployment and family workers), it is considered that this impact would not be general in nature, but would rather be localised and only at specific times of year (eg during harvest close to the Goksun valley, Kahramanmaras province). This is not considered to be a significant impact, given the low percentage of temporary labour that will be employed on the Project.

- Increased spending power of employees may temporarily increase the cost of local and regional supplies. Again, given the relatively low percentage of the local population who will be employed on the Project, this is not considered to be a significant impact.

6.14.3 Optimisation objectives

The Project aims to maximise the opportunities for employment for local settlements, local centres and to Turkey as a whole, whilst recognising the varied skill sets necessary for the

construction and operation of a pipeline of this size and other limitations such as the project timetable, financial constraints and safety of the Project. Accordingly, the Project has established the following objectives:

- To increase employment of country nationals, and in particular those in settlements along the pipeline route, subject to availability of appropriate skills[1].

- To establish recruitment procedures that are transparent, public and open to all regardless of ethnicity, religion, gender or sexual orientation.

- To manage expectations on employment opportunities, by providing information on the level and duration of employment requirements.

6.14.4 Optimisation measures

The following optimisation measures will increase the prospects for the employment of and procurement of local goods and services by Turkish nationals, particularly for those living in settlements directly affected by construction and those in the districts through which the pipeline passes. There are six types of optimisation measures:

- those that will optimise local employment opportunities;
- measures to spread employment opportunities evenly along the pipeline;
- those related to the integrity of the recruitment process;
- measures needed to manage public expectations on employment;
- measures for sourcing local goods and services;
- measures to deliver skills to employees.

6.14.4.1 Optimise local employment opportunities[2]

Settlements directly affected by pipeline construction will have priority, followed by workers in the districts and then provinces through which the pipeline passes. Turkish nationals will always be given priority over expatriates, who will only be used where their particular skills and experience cannot be supplied by Turkish nationals.

Opportunities for direct employment will be constrained by the availability of appropriate skills. Taking into consideration the skills limitations along the pipeline route, the focus of the Employment Strategy will be on the unskilled and semi-skilled workforce. The Project expects that:

- the vast majority (target of 90%) of the unskilled workforce will come from the settlements directly affected by pipeline construction;

- a high proportion of the semi-skilled workforce (target of 80%) will come from the districts and provinces through which the pipeline passes;

- a high proportion of the skilled workforce will be Turkish nationals (target of 80%).

1 There is precedent for this kind of prioritisation in Turkey. Council of Ministers decree reference: 84/7893 (Date of approval: 29 March 1984) prioritised impacted households for employment on a coal mine project.

2 The Employment Strategy seeks to balance the high expectations of local residents with the needs and realities of the Project, such as the need for suitably qualified workers, the project timeframe and project budget. The proposed measures were discussed and developed with stakeholders such as NGOs, multilateral organisations and the Turkish Employment Organisation.

The Project will agree an Employment Strategy with the Contractor that will include the expected level of local input for all categories (skilled, semi-skilled and unskilled). This strategy will be written into the Contractors' contract and, providing levels are acceptable to the Contractor such that financial and contractual limitations are not impaired, performance will be monitored against these targets. This information will be made available to third parties upon request. If these targets are not met, the Contractor will be required to provide justification to the Project.

6.14.4.2 Even distribution of employment opportunities

The unskilled workforce will be changed as the Contractor moves construction camps. In keeping with Project HSE policies, the Construction Contractor workers are not allowed to travel more than 50km from construction camp to worksite each day. In general this will mean that unskilled workers will only work in the district in which they live and potentially in neighbouring districts up to a distance of 50km from their place of residence. This will provide employment opportunities to more people, but will reduce the duration of employment of any unskilled worker. Assuming the rate of progress is an average of 0.75km per day and that there is a distance of 50km between construction camps, the average period of employment will be approximately 60 working days.

Given that semi-skilled workers will often require a higher level of induction training, the Construction Contractor will have the option of using the same semi-skilled workers for the duration of the construction phase, with additional workers being selected along the route as required. However, the Construction Contractor will be required to demonstrate an even distribution of semi-skilled workers from the different provinces and districts through which the pipeline passes. Where this is not possible, an explanation and evidence thereof will need to be submitted to BOTAŞ and the BTC Co for review.

6.14.4.3 Integrity of recruitment and employment process

The Project will develop an Employment Strategy, which will be discussed and agreed with each contractor. It will then be publicised and used as a benchmark for recruitment practices throughout the Project. All sub-contractors employing more than 50 staff will be required to apply a similar strategy.

The employment strategy will include the following:

- Recruitment Principles explaining how they contribute to the BTC Project Objectives (see Section 17).
- Mechanisms by which preferential recruitment of local workers will be achieved (see Box 6.8, for the currently preferred process for recruitment of workers).
- Mechanisms by which all directly affected settlements will be able to access the recruitment process.
- Mechanisms to ensure that the recruitment procedure is transparent and that there is no discrimination.
- Procedures to monitor the compliance of the Contractor with employment principles.

The Project will also develop an Employees' Policy to cover employees and contractors involved in the Project. This will include commitments to: pay and conditions; collective

bargaining; working hours; maternity leave; wage levels etc, that is in accordance with Turkish regulations and all relevant international standards (eg International Labour Organisation Conventions). Skills development, an alcohol and drug policy and disciplinary procedures will also be included. The policy shall ensure that wages for local workers are equivalent to what would have been paid to those doing similar work in Turkey and are above the statutory minimum wage.

Box 6.8 Proposed Process for Recruiting Unskilled Workers

Stage 1: Identification of Candidates
The CLOs will inform settlements about the application process and of conditions for employment. Appropriate communications channels will be used to ensure that all directly affected settlements are informed, for example, through advertisements and notices in the media, through village leaders, through the mosque, through loud speakers in the village, posters in bus stops etc.

The Construction Contractor will prepare lists of positions available with required skills and availability, divided into the "preferential" categories: directly affected settlements, affected districts, affected provinces. These lists will be reviewed by BOTAŞ (with assurance from BTC Co.). Furthermore, these lists will be available for inspection and will be posted in accessible locations. Lists for unskilled, semi skilled and skilled positions will be posted in locations such as Muhtars office notice board, coffee shops, community notice boards etc, to ensure wide distribution of information for the provision of equal work opportunities. The lists for semi skilled and skilled positions will also be posted in sub governor and governor offices in the districts and provinces through which the pipeline passes.

Stage 2: Application for Employment
For unskilled employment, local residents to submit an application for employment to the Muhtars, teachers, Imams or representatives of the Council of Village Elders. The application forms to be forwarded to the Construction Contractor. For each settlement, the CLOs and CRSs to identify the most suitable settlement representative (one of the above) for this coordinating role. This selection to be based on CLO and CRS perceptions of who is most trusted and respected in the settlement as well as who is most willing and able to carry out this responsibility.

Each applicant to receive a registered receipt of their application. This receipt to indicate that the registration is free of charge and can be used to audit the Muhtar or relevant settlement representative. When applying for employment, applicants to present an appropriately authorised document showing location of residence of at least six months (this document which is authenticated by the Muhtar is commonly required in Turkey, eg to obtain utility services). After the application deadline, the list of applicants to be signed by a notary public to verify its authenticity. The list of applicants to be posted in public places for a three day period. The list will be reviewed by BOTAŞ Personnel Management and Community Relations Management. This mechanism will create a fair and transparent system that will ensure that each applicant has been registered. An applicant may notify the CLO within these three days if he/she is not on the posted list. Receipt to be provided as evidence. No late applications will be accepted.

Stage 3: Selection of Candidates
As part of the application process, the applicants will be required to fill out an evaluation form that assesses the extent to which an applicant is disadvantaged. The objective of this assessment (applied via a scoring system) is to give priority to those applicants that are most disadvantaged.

The CLOs will actively take part in this scoring process to ensure consistency and to verify that the most disadvantaged sections of the population are identified.

The Construction Contractor will be responsible for the selection of employees from the identified disadvantaged group.

Interviewing of applicants will be done by the Contractor in their offices or in BOTAŞ DSA Offices, whichever is closer. No applicant (from a directly affected settlement) will be required to travel more than a 3 hour journey by public transport. However, if a settlement does not have access to public transport or if there are cases where the journey by public transport will exceed three hours, then the Construction Contractor will provide transportation for the applicants concerned. The exact locations for recruitment are currently being determined by BOTAŞ.

Following the selection of applicants, the Construction Contractor to notify the selected personnel and forward their names to the BOTAŞ Personnel Management.

Semi-skilled workers to be recruited from the provinces through which the pipeline 'Lot' will cross such that workers in each province have an equal opportunity to apply. Those resident in directly affected settlements again to have priority for semi-skilled employment, followed by those living in the districts and then the provinces through which the pipeline passes.

Skilled workers to be recruited on a nationwide basis in line with the employment targets. Priority will be given to the project affected settlements followed by the districts and provinces through which the pipeline passes.

6.14.4.4 Information provision

Provision of information on employment opportunities and the recruitment process is an essential component of the Employment Strategy. It is required in order to manage expectations and allow individuals to decide whether they wish to apply for temporary employment. It is also required to ensure that all those eligible have access to the recruitment process and to allow outside agencies to monitor the quality of the recruitment and employment process.

The Employment Strategy will be distributed to all pipeline affected settlements, at least one month prior to the date of recruitment. This will include information on the projected number and duration of employment opportunities, recruitment procedures, pick-up points, the location of recruitment centres and dates of recruitment. This will be done via the following: distribution of leaflets and posters via local representatives (eg Muhtar or mayor and sub-governor); placing information in public locations (eg bus stops, markets and coffee houses) and distributed orally (eg through the mosque). The Employment Strategy will also be disclosed in local and national media and on the Project web page.

The Employment Strategy will also be publicised to sub-governors of districts along the route. All governors in Turkey will be informed.

6.14.4.5 Procurement of local goods and services

As far as possible, the Contractor will procure goods from local suppliers both through preferential letting of sub-contracts to local firms (subject to availability, quality and cost) and purchasing of goods from local retailers.

The Contractor will be required to develop a Purchasing Strategy that indicates the percentage cost of goods to be procured from suppliers in the districts and provinces through which the pipeline passes. This will include the goods required by the construction camps and workers. An outline of the way in which the Contractor will monitor the actual goods and services purchased at the district and provincial level will also be included. Agreed targets for local

content will serve as KPIs against which the Contractor's performance will be monitored. The purchasing strategy will be required to adhere to all BP HSE policies and procedures.

Advance information on contracting opportunities will be provided to local businesses through trade and industry chambers and local business organisations along the pipeline route.

6.14.4.6 Skills enhancement

Induction will be required prior to construction. The Project will carry out training of contractors on the Project HSE and social policies and on requirements and plans including the SMMP for this project. All workers will have a minimum of five days HSE awareness training. In addition, Site Foremen/supervisors will receive an extra three to five days training on HSE.

The Contractors will be required to develop training strategies for potential employees. Training strategies will include provision for both pre-construction skills training and on-the-job training and identify the contribution that this strategy will make to the local content of employment (directly affected settlements, district, provincial and national levels), and also how it will improve the future employability of workers. The strategy should therefore focus on skills that are transferable, such as language and management skills, or where there is a future market in the local area (eg construction, driving etc).

6.14.5 Residual Impacts

Expectations regarding employment on the BTC Project are high. The number of people who will gain employment on construction of the BTC Pipeline (approximately 5,000), although substantial, is low when compared to the population of the directly affected settlements and surrounding area. Residents in directly affected settlements who are unsuccessful in their job applications to work on the pipeline construction, or within the camps, may become frustrated when they do not gain employment. It is also likely that residents of settlements just outside the directly affected project area will be frustrated that they will not get priority access to jobs despite their relative proximity to the pipeline route. These unmet expectations could create resentment towards those who succeed in getting jobs, and also towards the Project.

Measures to manage expectations regarding employment opportunities through the disclosure process of the EIA and also a wider communication strategy will help to reduce this potential impact.

6.15 INFRASTRUCTURE AND SERVICES[1]

6.15.1 Impacts

There is a strong interrelationship between quality of infrastructure and standard of living in the settlements along the pipeline route. Infrastructure has been identified as being of poor quality by local settlements (see Box 6.7): schools and health care are reported to be over-stretched; local roads require repair; electricity and phone connections are of a low standard and sometimes absent; and water supply and waste management has limited coverage. Government development programmes continue to emphasise the need to improve infrastructure and services (eg Department of State Road Programme). Local residents and local authorities are thus sensitive to temporary or permanent reduction in infrastructure or services.

[1] Note: Roads and Traffic and Waste are considered in the TMP and WMP respectively.

6.15.1.1 Irrigation network

The pipeline route crosses areas where land is irrigated. Open surface irrigation systems, either trapezoidal (earth) or perpendicular (cemented) are the predominant systems used. However, pressurised irrigation (sprinkler and drip irrigation) systems have come into use over recent years. There are four types of irrigation systems: informal earth ditches (rare), cemented channels at ground level, aerial channels and large covered systems. The irrigation systems in many areas are used from April to October (see Section 5 for further details).

Construction activities could potentially cause the following impacts:

- temporary loss of flow as a result of planned disruption or accidental damage to the irrigation channels. As many of the irrigation networks are extensive, disruption may result in the loss of irrigation to farmers up to a 100km downstream;

- spills or increased sediment loads in channels that could result in health impacts on animals that use the irrigation channels as a source of drinking water or on people where they use water from channels (see Plate 6.12);

- inadequate reinstatement of irrigation channels that are disrupted or damaged during construction.

Plate 6.12 Irrigation Channels in Goksun, Kahramanmaras

6.15.1.2 Utilities

The Project will be largely self-sufficient in telecommunications, energy, water (other than water used for hydro-testing which is considered in the PPP, Appendix C4) and sewage treatment as summarised below:

- **Telephone:** during construction the Project will use both landline and mobile networks.

- **Energy:** information on energy requirements during construction was not available at the time of writing the report. However, the Project has committed to only using the national grid, providing that it does not impact on local settlement needs. If surplus capacity is not available, the Project will be self sufficient through the use of generators.

Energy requirements during operation will be limited to the pump stations/other AGIs, which will have stand-alone electricity generation systems.

- **Water supplies:** the main requirements for water will be for hydrostatic testing of the pipeline. Construction camps will also be large users of water.

- **Sewage treatment:** sewage treatment facilities will be installed at all main camp sites and pump stations. The temporary construction camps will use packaged sewage treatment units and tanks to receive waste from chemical toilets. Waste will then be transported for off-site treatment (see Plate 6.13).

- **Waste:** waste disposal is discussed in the WMP (see Appendix C3).

Plate 6.13 Lot A Construction Camp Site in Erzurum

Potential impacts of the use of utilities during construction are as follows:

- an overload of the existing service in particular for electricity, mobile phone networks and water supply;

- accidental or planned disruption to utilities during construction;

- potential for 'spin-off' benefits to local settlements from infrastructure required by the Project.

6.15.1.3 Education

There will be no direct impacts on the education infrastructure, as all construction workers will be employed on a single status basis. Nevertheless, there are a number of potential secondary impacts that could cause education levels to be impacted.

- In-migration into the project area resulting in increased pressure on schools. However, as discussed in Section 6.12.3, levels of in-migration are predicted to be insignificant.

- Children of school age may replace parents with temporary construction jobs in 'family work' such as farming, animal husbandry or looking after family members. Children of

school age already undertake unpaid family work in busy agricultural seasons, particularly at harvest time. This is likely to increase if parents are successful in securing employment. This is considered in Section 6.14.

- Blocking of roads and general disturbance may pose a hazard to children travelling to schools.

6.15.1.4 Health Provision

Construction camps will have their own health facilities and will not therefore use the health infrastructure of the local settlements. Nevertheless, there are potential impacts associated with health provision and the perception of health provision by the local settlements. These may include the following:

- a strain on community relations close to construction camps due to the superior health provision provided to the construction workforce;

- blocking of roads that prevent access to health care or extend the time to reach health care.

The first two of these impacts have been considered under community relations (see Section 6.12.1), whilst the second is considered under the mitigation measures below.

6.15.2 Significance criteria

Impacts on infrastructure are considered to be significant if:

- there is a permanent loss or improvement in the quality of the infrastructure or services used by local residents;

- there is a temporary change in infrastructure or service that impacts adversely on the ability of local residents to undertake subsistence or economic activities;

- there is a temporary or permanent change in access to emergency services.

Specific significance criteria adopted for the different infrastructure and services are provided in Table 6.15 below.

Table 6.15 Criteria for Identifying Significant Impacts on Infrastructure and Services

INFRASTRUCTURE / SERVICE	SIGNIFICANCE CRITERIA
Roads	• Closure of roads that prevent public transport services from continuing. • Diversion of more than 500m for pedestrians or livestock.
Transport	• See Section 6.9.
Irrigation	• Any unplanned stoppage of irrigation. • Any planned reduction of irrigation supply during periods of irrigation of a time greater than that determined by the appropriate Irrigation Authority. In the absence of specific information the impact will be considered significant if the supply is reduced for more than 24 hours.
Utilities (including telecommunications, water supply, sewerage, electricity)	• Any reduction in the quality of the services without three days prior notice. • Any planned reduction in the services for more than 12 hours without appropriate alternatives where risk assessment has shown this to be detrimental to health or livelihoods.
Emergency services	• Any reduction in the quality or access of the services, including time to get to hospitals.
Benefits	• Improvement to infrastructure or services, either temporary or permanent.

6.15.3 Mitigation objectives

The following mitigation objectives have been developed:

- minimise damage to settlement and household assets from the construction process;
- no significant temporary loss of, or access to, infrastructure or services (see Table 6.15 above);
- no permanent net loss of infrastructure and services to local settlements;
- no reduction in services available to local settlements due to the use of that service by the Project.

In addition, the Project will seek opportunities for local settlements to benefit from the activities undertaken, and infrastructure required, by the Project.

6.15.4 Mitigation measures

6.15.4.1 General mitigation measures

The majority of the measures to be implemented are the responsibility of the Contractor. As such, detailed requirements will be included in agreement of the Contractor. The Contractor will be required to incorporate them into their management plans and ensure that they are included in any sub-contracts. These requirements, plus additional mitigation measures that are the responsibility of the Project, are outlined below.

The mitigation strategy to prevent adverse impacts on all types of infrastructure is fundamentally the same.

To minimise disruption to infrastructure and services, the Project will:

- Use appropriate construction techniques, examples of which have been identified in the project description (eg thrust-boring crossings of main roads). Although the Contractors will be able to suggest alternate or additional measures, they will be required to demonstrate that these measures will achieve the mitigation objectives as efficiently as those specified in this EIA.

- Prepare a 'line-list' of items to be protected and/or reinstated in each area prior to construction. These items will include the location of state infrastructure that may be impacted upon by pipeline construction such as telephone masts, electricity cables, water pipes and private infrastructure agreed to by the Project and landowners during the land expropriation process. This 'line-list' will be provided to the Contractor who will identify any item that cannot be protected. This will be communicated to the affected owner/user or settlement and, if compensation is required, this will be undertaken prior to the commencement of construction activities.

- Work within specified working areas. These will be determined prior to construction and demarcated using fencing, marker posts or signs for roads. Any failure to stay within the working width will be a serious disciplinary offence that may result in termination of employment.

To avoid significant temporary impacts on infrastructure or services the Project will:

- Identify potential disruption in advance.

- Where the planned disruption will last beyond 12 hours the Project will carry out a risk analysis in consultation with the affected settlements and appropriate authorities to identify the impacts that this disruption would cause. Where the risk analysis shows that there will be a risk to health or impact on livelihood of affected settlements, appropriate alternatives will be put in place, or the job will be re-planned.

- Communicate the timing and duration of any disruption to infrastructure to affected settlements at least three days ahead of the disruption (see Section 6.12.1).

Should infrastructure or services be disrupted without warning, the Project will:

- Wherever possible, inform the authorities of the affected settlements within two hours of the disruption occurring, providing the reason for the disruption and the expected duration of the disruption. Within one day, written information will be provided to the village Muhtar/s (or mayors of the district centres) providing details of the disruption, of measures already taken and any additional measures that will be taken to assess the damage caused as a result of the disruption. The CLO will ensure that there is an announcement in the mosque and that notices are posted on the settlement notice board, such that the local residents are informed of the disruption.

- Ensure that it has the resources to respond to any such disruption within time periods that will not result in damage to the health or safety of those affected.

To avoid any net loss of infrastructure or services, the Contractor will:

- Undertake a pre-condition survey to assess the existing condition of the working area (including local roads used by construction traffic). Photographs will be taken as a record of condition. Local authorities will be requested to verify these photographs and be provided with copies.

- Agree a timetable of any planned disruption with the authorities and local settlements. Should the disruption be judged by the affected party to result in a loss in livelihood, the validity of the claim and necessary compensation will be determined.

- Where possible, undertake immediate repair of any damage to infrastructure caused by the construction. Such work will not cease until the infrastructure has been repaired to its pre-construction condition. All such reinstatements will be completed within 2 months of completing substantive work in that area. Should this timescale be expected to be exceeded, a plan for the work will be prepared and presented to the affected settlements and local authorities.

- Resolve all complaints from local residents regarding interruption to infrastructure or access to resources within seven days. Where this is not possible, a response plan will be agreed with local settlements within this timeframe.

- Inspect all reinstatement measures after completion of the works and periodically during the lifetime of the Project. Any deterioration related to inadequacy of construction and reinstatement activities over the first year will be restored by the Contractor.

To avoid any net loss of infrastructure or services, the Project will:

- monitor the compliance of the Contractor with the above measures;
- hold post-construction community meetings to discuss any residual problems.

Specific additional measures for mitigation of impacts on particular infrastructure and services are identified in the Sections 6.15.4.2 to 6.15.4.4.

6.15.4.2 Mitigation Measures for Irrigation Channels

- Where possible, flow in all irrigation channels will be maintained. This may either be done by avoiding any damage to the irrigation channels (eg by excavating below the channel and building a bridge over the irrigation channel to allow the passage of construction vehicles), by installing diversions for the water flow prior to damaging a section of the channel, by using sediment control measures or by any other method that guarantees adequate supply and quality of water.

- If disruption is unavoidable, the Contractor will consult with the State Hydraulic Works or the General Directorate of Rural Affairs and liase with them to provide sufficient notice to land owners. Should disruption exceed the time considered acceptable by State Hydraulic Works or the General Directorate of Rural Affairs, or otherwise impact upon the yield of crops, compensation will be agreed in advance of disruption as specified in the principles and procedures of the land acquisition process (Appendix C9).

- Where the water in the channels is also used for drinking by people, the Project will inform the State Hydraulic Works or the General Directorate of Rural Affairs, and liase with them to ensure that alternative sources of supply are provided to settlements during

the period of construction. These settlements are identified in the social impact tables in Supplement 1, Volume 2.

6.15.4.3 Mitigation Measures for Utility Services (other than waste management [1])

- The Project will hold discussions with the utility service providers to establish whether use of utility services by the Project will result in a reduction in service received by local communities and identify measures to mitigate any reduction.

- In cases where utilities need to be disrupted for less than 12 hours the CLO will inform the leaders of local settlements within 2km of operations, ensure that there is an announcement in the mosque and that notices are posted on the settlement notice board at least three days in advance of disruption. Announcements will include information on the timing, duration and safety precautions (where relevant) associated with activity concerned.

- Where deliberate disruption to utility services (telephone, electricity, water) for more than 12 hours is required, the Project or the Contractors will liase with the responsible Authorities/Suppliers to provide alternative supplies. Where alternative supplies cannot be provided, a risk assessment will be carried out which will include consideration of the impact that a disruption to services will have on the livelihood of local settlements. This risk assessment will require consultation with the affected communities. Where the risk assessment demonstrates either an impact on livelihoods, or where the disruption is not acceptable to local residents, the job will be re-planned.

- The Project will be self sufficient in waste management and sewerage as identified in the WMP (see Appendix C3).

6.15.4.4 Additional Mitigation Measures for Roads

- The Contractor will consult with the Muhtar/s and/or mayors of settlements that will experience significant increases in traffic volumes prior to the start of activities to ensure that the most appropriate road is being used.

- Ambulances and fire services will be consulted regarding road diversions. These diversions will not increase the response time of these services to local settlements.

- Access, or agreed alternative access, to residential and commercial properties will be maintained.

- If road closures are required, diversions will be planned and communicated to the authorities (including emergency services and public transport providers) and affected communities in advance (via the pre-construction community meeting)[2] and will be adequately sign-posted. Crossing for pedestrians and animals will be provided to avoid the need for a diversion wherever practicable. No diversion will be permitted that prevents a public transport service from continuing or requires a diversion of more than 500m for pedestrians or livestock.

1 Waste Management is considered in the WMP, Appendix C3.

2 Notification periods for road closures are as follows: two weeks minimum notice on closure of up to 28 days; one month minimum notice on closure of 28 days to three months; three months notice for closure over three months or for permanent closure.

- Where local residents or landowners request that a temporary access road be left in place, the Project will consult with regulators and other stakeholders to ensure that this is acceptable and that any environmental concerns can be taken into consideration.

- The Project will assess the likely impact on houses close to all routes identified in the TMP (see Appendix C5), pinch points and above any horizontal drilling points.

- Where there is the likelihood of an impact, the Project will provide the house owner/occupant with a copy of a structural assessment prior to commencement of activities.

The Project will compensate for traffic related damage as specified by the procedures above, or in accordance with the procedures of the land acquisition process.

6.15.5 Potential benefits: infrastructure spin-offs

The Project is likely to require the construction of new infrastructure and may require the enhancement of some existing infrastructure. There are examples where projects have successfully managed to work together with government, civil society and local residents in order to pool skills and resources in order to achieve sustainable benefits for local settlements.

For the BTC Project, areas where these 'spin-offs' may be realised include the following:

- **Roads:** some temporary roads will need to be constructed and others will need to be temporarily upgraded to allow for the increase in traffic loads. After construction, repairs will need to be made to roads that have been damaged through the movement of construction traffic.

- **Water:** boreholes may be required to provide water to construction camps and pump stations. Such systems may be able to be left to benefit local settlements.

- **Telecommunications:** whilst it is technically feasible to use the fibre optic cable to improve telecommunications in the area, this is likely to be problematic due to licensing issues. Essentially, the system will be strictly licensed for the BTC Project only and may not serve other purposes. However, surplus capacity could be designed in to keep open the opportunity for extended use.

- **Sewage Treatment:** sewage treatment facilities required for the permanent facilities and temporary camps could be extended to meet the needs of settlements.

- **Waste Management:** rather than exporting the waste to suitable disposal sites elsewhere, disposal sites could be designated locally (with the approval of the relevant regulator) and designed for shared use by settlements.

- **Health Facilities:** the Contractor will be prepared, at the request of the Project, to hand over camp medical facilities to neighbouring settlements at the closure of the camp.

Prior to construction, the Project will consider these opportunities on a case-by-case basis in accordance with the Community Investment Programme. Any enhancements will, where possible, be linked into existing infrastructure plans in order to contribute to long-term enhancement of the infrastructure in the areas crossed by the pipeline.

6.15.6 Residual impacts

The mitigation measures identified above, implemented correctly and in full, will prevent any planned significant impacts on infrastructure and services. However, in a project of this size there will be instances when infrastructure is disrupted without notice and prior planning. Such disruptions could affect large numbers of people living over extensive areas and, although temporary, it is likely that any disruption of infrastructure and services that are considered significant in Table 6.15 would have implications for income generation of those affected. Such instances will need to be dealt with through the Complaints Procedure.

Significant additional benefits for local settlements will be realised by the Project, should they be successful in linking Project infrastructure needs into existing local infrastructure plans.

6.16 SITE-SPECIFIC IMPACT AND MITIGATION TABLES

This Section of the EIA Report provides an assessment of the **site-specific** environmental and social impacts associated with the BTC Pipeline Project along the route. This is required in order to take account of the wide variety of landscapes, habitats and settlements that the pipeline will pass through, and differences in construction activities required in different locations. As a consequence of such factors, the nature and significance of potential impacts associated with the Project at different locations along the route are likely to vary.

The assessments are presented in a series of environmental and social **impact tables** (see Supplement 1, Volume 2) linked to 1:50,000 schematic maps of the route (see Supplement 2, Volume 2). The **impact tables** provide the following information for each section of the route covered by the relevant map.

- **Highlights:** a brief description of the pipeline route including project specific information (eg the presence of a pump station) and socio-economic highlights.

- **Baseline:** environmental resources and receptors, and social receptors (eg specific characteristics of settlements) in the vicinity of the pipeline route.

- **Impacts:** potential site-specific impacts above and beyond the generic measures outlined earlier in Sections 6.2 to 6.15.

- **Mitigation:** the site-specific mitigation measures that will be adopted by the Project to avoid, reduce, repair or compensate for potential impacts.

- **Residual impact:** the significance of the residual impact that is predicted to occur following the implementation of the specified mitigation measures.

The **impact tables** (environmental and social) highlight those baseline features identified during scoping and consultation that are of most interest due to their importance or susceptibility to potential impacts. It is not the intention of the tables to repeat the detailed **generic** baseline or impacts information presented earlier but to identify **site-specific** features and activities and their associated impacts and mitigations measures.

7 BTC PIPELINE – ROUTINE OPERATIONAL IMPACTS AND MITIGATION

7.1 INTRODUCTION

7.1.1 Overview

This section of the EIA Report assesses the potential impacts that may arise during the normal operation of the pipeline and the Above Ground Installations (AGIs) along the pipeline route and the mitigation measures that will be adopted to address them. This section also describes the impacts that are predicted to occur despite the adoption of the mitigation measures (ie the residual impacts).

The assessment methodologies and significance criteria that have been adopted in assessing the significance of potential impacts are described in Section 3.

It should be noted that the majority of potential impacts, such as those to air, ecology, water etc associated with the pipeline occur during the construction stage (refer to Section 6) because, during operation, the pipeline will be beneath ground level.

Permanent AGIs include the following:

- four pump stations (PT1, PT2, PT3 and PT4);
- one pressure reduction station (IPT1);
- 52 block valve stations.

The socio-economic operational impacts and mitigation are similar for the pipeline and AGIs, with the exception of the extent and significance of permanent land take. Where the impacts and mitigation are similar for the pipeline and AGIs, these are jointly discussed. Discussions around permanent land take are provided separately for each facility.

With the exception of land take for Pump Station One (PT1), the intensity of activity associated with the facilities will be low: the pipeline will be buried and require minimal maintenance; the AGIs will be fenced; and there will be limited vehicle movements. Opportunities for local people to benefit from operation (eg through employment) are concentrated near the AGIs. However, these opportunities are relatively limited.

Purpose built infrastructure associated with these AGIs include access roads. The majority of access roads are temporary and will only be utilised during the construction phase (refer to Section 6). Any permanent access roads will be managed according to the Traffic Management Plan (see Appendix C5). The permanent AGI and pipeline facilities and operational activities are described in Section 4. Potential impacts associated with construction of the permanent AGIs and the pipeline are discussed in Section 6 and non-routine operation of the pipeline and AGIs is addressed in Section 8. This Section therefore concerns only the routine operational impacts that will occur in the long-term. The facilities associated with the marine terminal are discussed separately in Volume 3 of the EIA Report.

7.1.2 Location and layout of AGIs

The proposed layout of the four pump stations and one pressure reduction station, overlain on aerial photographs, are shown in Figures 7.1 to 7.5. A description of the facilities at each AGI site is contained in Section 4.7.

As the PT2, PT3 and PT4 sites have only recently been selected as the preferred locations for these pump stations, full environmental surveys at these sites have not yet been undertaken. Additional surveys to record existing baseline conditions will be undertaken at these sites during the summer of 2002. These environmental surveys will include the following at all three locations:

- baseline noise monitoring;
- baseline air quality monitoring;
- soil sampling to identify any areas of existing soil contamination.

In addition, at PT2, PT3 and IPT1, archaeological investigations of surface features at the sites and surrounding areas will be undertaken to confirm the presence, or potential presence, of archaeological features. Archaeological investigations have already been undertaken at the other AGI sites. An ecological survey including vegetative mapping of globally threatened plant species at the site and in areas potentially affected by construction activities will be undertaken at the PT2 and PT3 sites as these sites have been located outside the 500m preferred pipeline corridor for which habitat information has been collected.

A soil survey of the IPT1 site will be undertaken prior to construction activities commencing in order to identify areas of existing contamination.

Figure 7.1 Location and layout of PT1

Figure 7.2 Location and layout of PT2

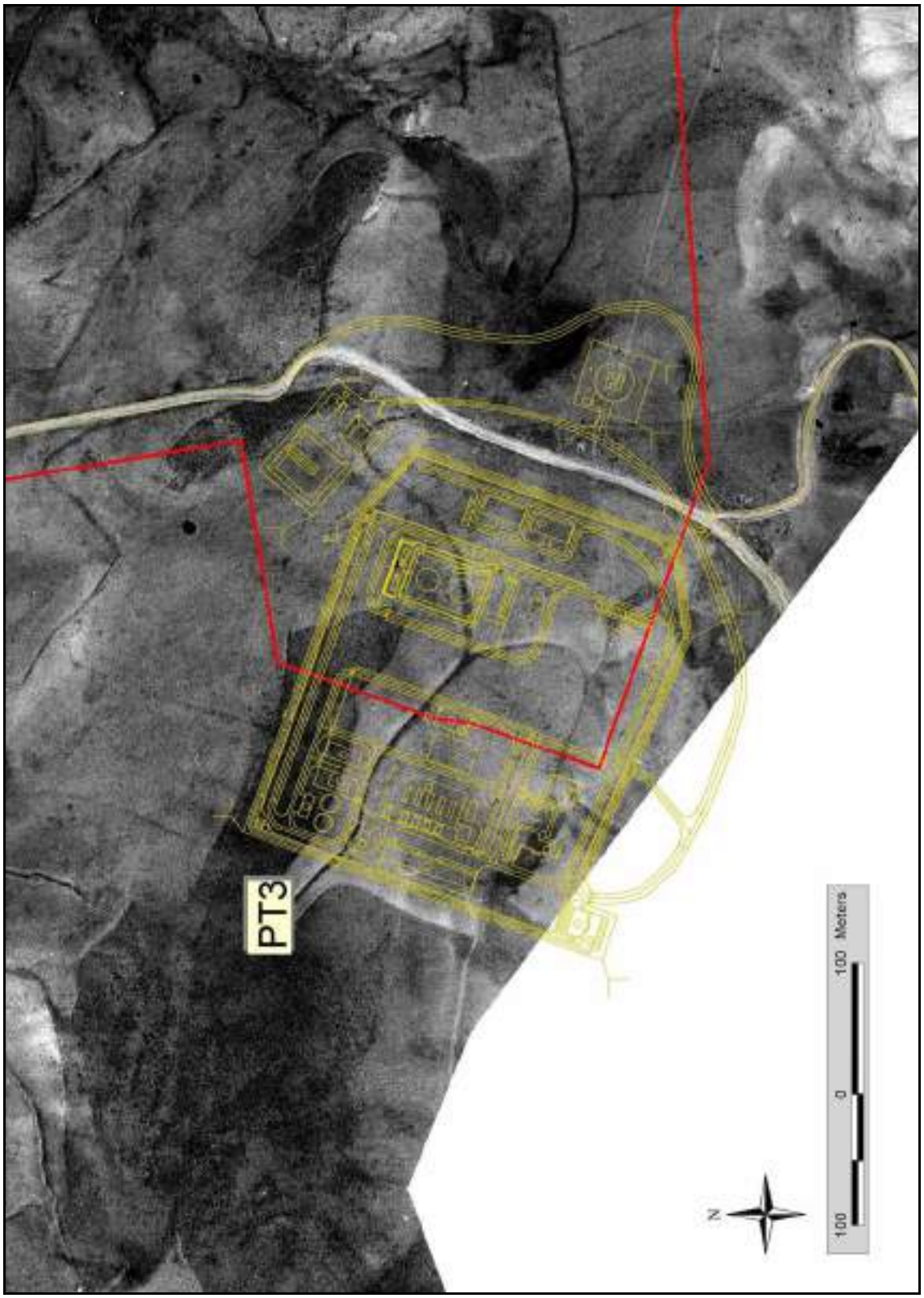


Figure 7.3 Location and layout of PT3

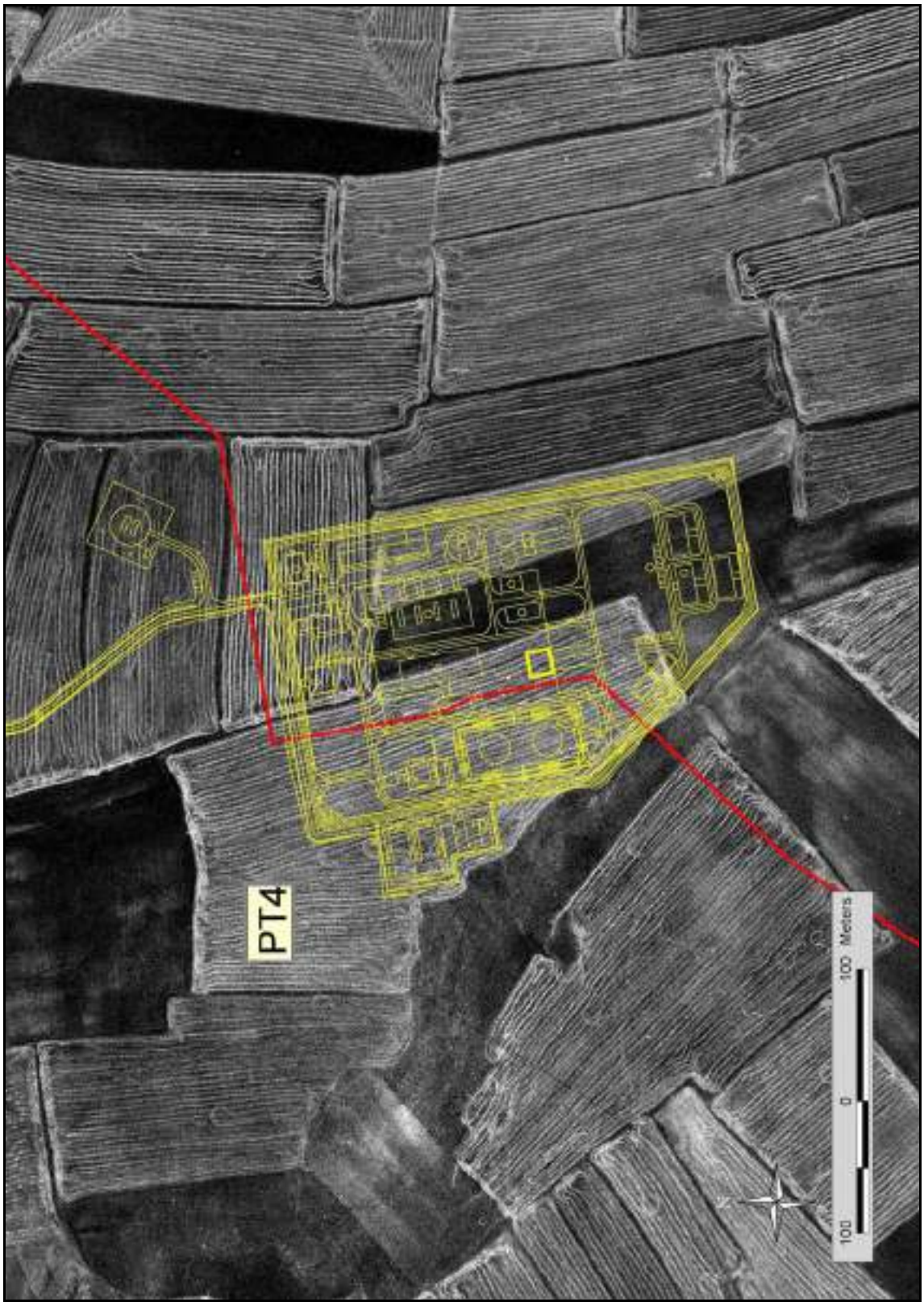


Figure 7.4 Location and layout of PT4

Figure 7.5 Location and layout of IPT1

7.2 PIPELINE IMPACTS

7.2.1 Introduction

Details of the procedures and activities associated with routine operation of the pipeline are described in Section 4.12. The majority of operational activities will occur at the AGIs and at the BTC Marine Terminal. Potential environmental impacts associated with AGI operation are discussed in Sections 7.3 to 7.11 and those associated with BTC Marine Terminal operation are discussed in Sections 12 and 13.

7.2.2 Impacts associated with inspection and maintenance

Operational activities associated with the pipeline itself will be limited to activities associated with inspection and maintenance of the pipeline. Details of the maintenance and inspection programme have yet to be determined but are likely to include regular pigging of the pipeline and regular above ground visual inspections of the pipeline route and at block valve locations. Pig launching and receiving activities will be limited to the various AGI sites.

Inspection activities along the pipeline are likely to be undertaken by foot patrol, vehicle and/or helicopter. Some disturbance to the local fauna and residents will occur during such inspections however these inspections will be a relatively infrequent occurrence, of limited duration and any impacts that result will be minor.

7.2.3 Impacts associated with pipeline operation

A simulation process has been carried out to analyse the temperature behaviour of the Turkish section of the pipeline, [Ref 4]. During pipeline operation the temperature distribution in the area around the pipeline is expected to increase due to the heat influx from the pipeline to the surrounding medium. The oil in the pipe will be at temperatures of up to 30ºC, representing a potentially significant differential with surface soil temperatures in winter.

The temperature profile for the longitudinal and across the pipeline route direction was calculated using a simulation process that considers transient behaviour for the heat exchange between the medium (ie design crude oil) and the surrounding soil. Based on two different available data sets for the soil temperatures along the Turkish part of the pipeline route (PLE data / Bechtel data), the cooling/heating behaviour of the medium in the pipeline was studied, assuming a worse case scenario ie the minimum soil temperature that will occur at the pipeline centre (-6.2ºC) and the maximum flow rate (6700m^3/h) ie highest anticipated fluid temperature of 30ºC.

The results show that the main changes with regards to heat transfer into the surrounding medium occur during the initial 15 weeks. After that period, the temperature field changes only minimally.

Table 7.1 shows the change in temperature immediately above the pipeline, between the undisturbed soil state and the state after 15 weeks of pipeline operation.

Table 7.1 Temperature Change Above the Pipeline

SOIL DEPTH (M)	TEMPERATURE BEFORE (°C)	TEMPERATURE AFTER (°C)
0	-11	-9.5
0.5	-9.5	-0.5
1.0	-8	8.5

Table 7.2 shows the change in temperature immediately to the east and west of the pipeline (1m soil depth), between the undisturbed soil state and the state after 15 weeks of pipeline operation.

Table 7.2 Temperature Change to the East and West of the Pipeline

DISTANCE TO EAST/WEST OF PIPELINE (M)	TEMPERATURE BEFORE (°C)	TEMPERATURE AFTER (°C)
0	-6.5	>10
1	-6.5	2.5
2	-6.5	-3.5
3	-6.5	-6.5
4	-6.5	-8.0

A change in the temperature of soil influences its water content, which is important in terms of the availability for plant uptake. In this regard, a soil temperature profile is crucial for assessing the potential impacts on the environment.

Temperature changes within the root depth are expected to have positive impacts on both plants and micro-organisms due to an early vegetation season along the parts of the corridor that traverse provinces possessing long winter seasons; such as Ardahan, Kars and Erzurum. The affected width in terms of temperature change is about 2-3m on either side of the pipeline; therefore there will be only about 4-6m wide corridor being affected by the soil temperature change. This impact will be observed in the north-eastern parts of the route where the soil freezes in winter. High soil temperature will protect the plant roots against freezing and support the root growth. In addition, it increases the rate of dissolution of the nutrient elements useful for the plant. Any impacted areas through arable fields will easily be ploughed, as their soil texture will be right for this process, earlier than the usual cultivation season in the region.

The expected effects in the soil due to temperature change discussed above are summarised below.

- Decrease in the required time for ploughing as the soil will quickly reach its damp condition.
- Increase in the number of crop yield seasons in one year.
- Preservation of air and moisture level in the soil for nitrogen cycle and nitrification.
- Increase in the resistance of soil against erosion with a stronger root growth.
- Preservation of plant root against frost conditions.
- Unbalanced growth of root and plant body due to temperature differences between the root zone and the above ground.

The following mitigation techniques can be used to control such temperature changes:

- Mulching;
- irrigation and drainage works;
- changing the physical characteristics of the soil surface.

Potential impacts and mitigation measures associated with non-routine operation of the pipeline and AGIs are discussed in Section 8.

7.3 SOILS AND SEDIMENTS

7.3.1 Introduction

Soil surveys have been carried out along the pipeline route, the results of which are discussed in Section 5.4. The significance of impacts on soils has been evaluated using professional judgement and recognised soils science techniques, as discussed in Section 3.8.2.

7.3.2 Baseline summary

The soils at PT1 (Cryo-mesic Clayey-skeletal to Loamy-skeletal Lithic Xerochrepts) are thin, brown, and have a high content of coarse angular gravel derived from the underlying parent material.

The mesic, poorly drained soils in the vicinity of PT2 support marginal crops of rain-fed cereals. The station's soils are deep, pale-brown coloured, and probably class as Mesic Coarse-loamy to Coarse-silty Xerorthents. The bottom of Kuru Creek exposes the gravel and cobbles that make up the soil's underlying alluvium.

At PT3 the meso-cryic soils are probably shallow and stony (Lithic Sandy-skeletal Cryochrepts).

Soils at PT4 derive from carbonates and probably class as Mesic Typic Calcixerolls. The absence of riparian vegetation along minor streams about 1km to the north probably reflects high permeability with resulting low soil moisture storage near the surface.

At IPT1 the soils derive from alluvium and colluvium from the surrounding slopes, and probably class as Mesic Coarse-silty Xerorthents.

7.3.3 Potential impacts and mitigation during operation of AGIs

Potential impacts, mitigation measures and assessment methods in relation to soils are described in Section 6.

Potential impacts on soils during operation of the AGIs will be limited to the potential for contamination of soils due to spillage of fuels, chemicals or the crude oil. The allowable limit levels for heavy metals in soils according to Turkish Regulation on Control of Soil Pollution are provided in Table 3.1 of the RP (Appendix C2).

The potential for such spills will be minimised by the adoption of mitigation measures described in Section 6.2. Site-specific operational spill response procedures will be developed for each AGI, which will be consistent and aligned with the overall Project Oil Spill Response

Framework (see Appendix C6). Based on the criteria described in Section 3.9 and the adoption of the specified mitigation measures, any potential operational impacts on the soils will be minor.

7.4 LANDSCAPE AND VISUAL

7.4.1 Introduction

A desk study and field assessment of the pipeline route were carried out as described in Section 3.8. The landscape and topography of the entire pipeline route is described in Section 5.3.

For the purposes of this assessment, it is assumed that reinstatement will be successful and that there will therefore potentially be insignificant landscape and visual impact during the normal operation of the pipeline. However, it is acknowledged that residual impacts, (as discussed in Section 15.2.1.3), may derive as a consequence of the timescales involved in reinstatement (see the Reinstatement Plan in Appendix C2).

7.4.2 Baseline summary

7.4.2.1 PT1

PT1 occupies a broad, mid-slope bench on otherwise steeply dissected terrain about 3km south of the Posof River and 150m west of the Ardahan-Posof roadway at an altitude of approximately 2,140m.

The region provides of some of the most spectacular scenery along the pipeline route. It is an area of high mountains rich in springtime flowers and deep valleys with light forests providing autumn colour; backed by distant jagged, snow-capped mountains. There are some existing visually intrusive factors along the valley, which detract from views, notably a series of high-tension electricity transmission cables and pylons and the Ardahan-Posof road. In some places, over-grazing by sheep has reduced the sub-alpine meadow to close-cropped turf or even eroded areas of exposed soil.

The 'Zone of Visual Influence' (ZVI) of PT1 (ie the area from which the facilities are predicted to be visible) is shown in Figure 7.6. Due to the mountainous terrain, views of the PT1 will be relatively limited in extent and receptor points will be largely remote and little visited. However, the longest axis of the ZVI lies along the main Ardahan-Posof Road from the southeast, and although a little peripheral to the best views along this approach, it will still be visually intrusive to them. PT1 and the Ardahan-Posof Road are located in an area of high scenic value.

Although there are a number of summer-migrant settlements, few people reside in the area, and the pump station will not be visible to any of the surrounding settlements – resident or summer. The main receptors will be travellers journeying to Posof, as those travelling to Ardahan will have the pump station behind them (see Figure 7.6), and to visitors using the Posof Wildlife Area for recreational purposes. The potential that tourist numbers may soon increase in this area is indicated by the construction of a new hotel along the main road south of the PT1 site.

A landscape plan will be developed that identifies detailed measures to reduce potential landscape and visual impact. This will be developed by a landscape specialist employed by BOTAŞ, based on the building and site layout, alignment and location within the context of immediate and more distant landscape features (see section 21.7 of Reinstatement Plan). The

following mitigation measures indicate the general mitigation strategy that will be clarified in conjunction with detailed design and construction planning.

- Landscape planting within the site boundary will be undertaken at the earliest opportunity and will be carried out no later than the immediate completion of construction by BOTAŞ. This will be undertaken to screen the facility from potential viewers and to obscure the hard structural features within this highly scenic area. Trees and bushes native to the area (eg *Pinus sylvestris, Prunus* spp., *Quercus* spp.) will be used for this purpose and specialists in landscaping will be consulted to ensure the planting is undertaken in a way that complements the surrounding landscape. Clumped planting will be used in preference to linear tree screens to ensure that the area does not look artificial and pronounced.

- Opportunities to retain existing landform screening will be maximised, ie site levelling will be avoided. If possible existing hollows or mounds may be used to integrate built features within the landform, thereby allowing the landscape to act as a natural screen.

- New landform screening (eg bunds and mounds) will be introduced where this might compliment the existing landform character.

- On structural surfaces, neutral tones in natural colours such as pale stone, grey-greens, earth browns that reflect those of the existing terrain and vegetation will be used.

- External lighting will be minimised to that necessary for safety and operational purposes; and downward facing lighting and lighting of the same colour will be used to minimise spill and potential offsite impacts.

It is predicted that the potential residual landscape and visual impact due to the presence of PT1, assuming the implementation of the mitigation measures noted above, will be moderate, affecting both the valued landscape resource and the visual amenity of recreational users of the area and people travelling on the main road. An indicative photomontage of PT1 is presented as Figure 7.7.

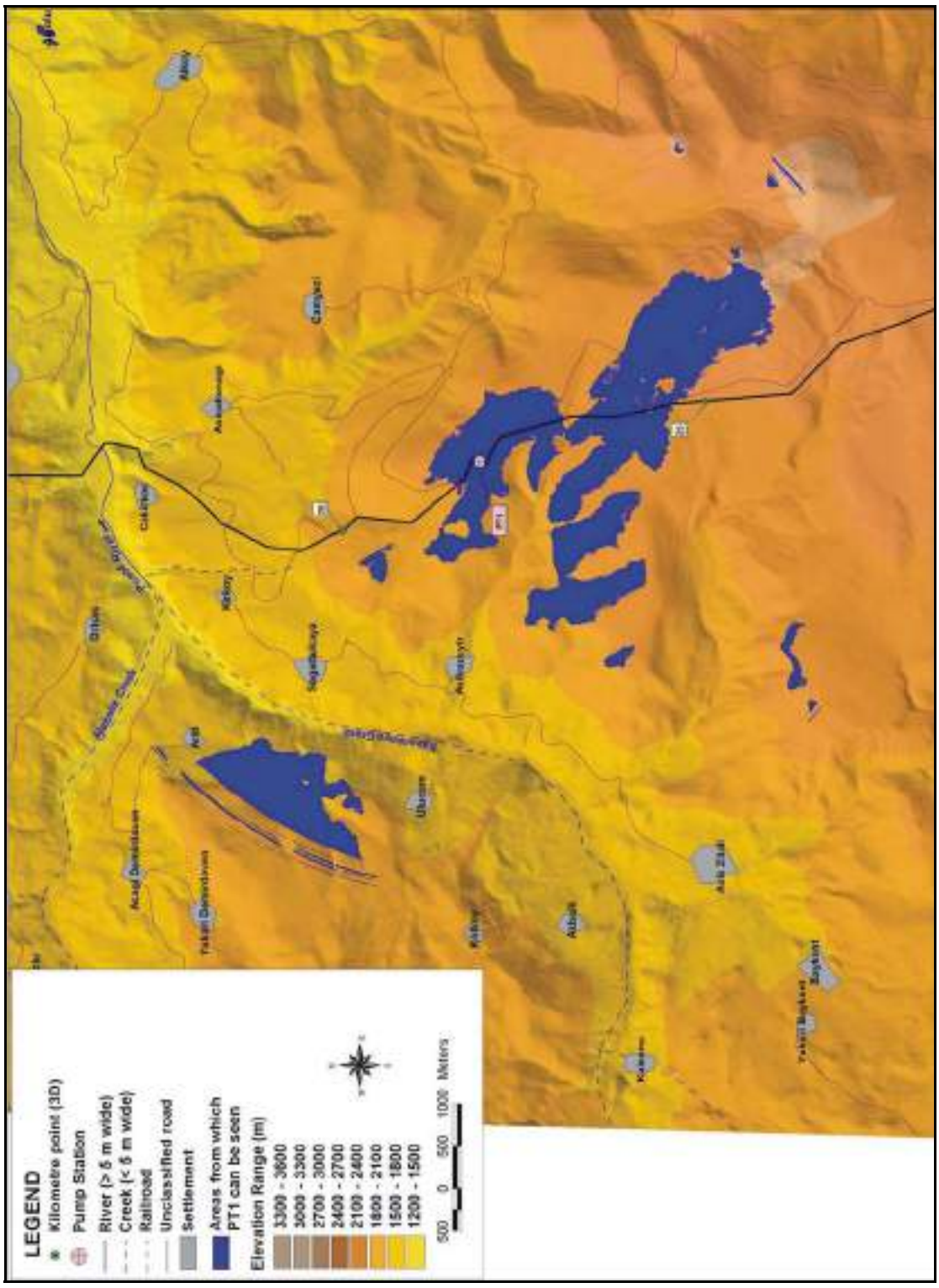


Figure 7.6 Zone of Visual Influence (ZVI) of PT1

Figure 7.7 General view of PT1 on a photograph taken from a SE to NW direction
(Visual Receptor Point: UTM Zone 38 0310104E 4591381N)

7.4.2.2 PT2

PT2 occupies flat land about 4.5km north-west of the settlement of Alvar approximately 500m to the north of an industrial area served by a west-east railway at an altitude of approximately 1720m. A national highway is located approximately 2km to the north of the site and there are a number of unclassified roads in the surrounding area. The landscape value in this area is low due to the generally flat, agricultural nature of the surrounding area combined with the presence of the industrial area to the south of the site. Groups of mature trees and a number of electricity transmission pylons are prominent features of the landscape.

The ZVI for PT2 is shown in Figure 7.8. The facility is predicted to be visible for up to 5km from the site in most directions. This relatively large area of visual influence is due to the generally flat terrain in which the site is located. There is some screening of the facility to the northwest.

Given the highly exposed location of PT2 and the generally degraded setting that derives from the nearby industrial area, mitigation need not be extensive. Traditional measures such as screening and planting are likely to be largely ineffective since they will accentuate the site's prominence and may look out-of-place. Mitigation will concentrate on employing good design and architectural measures to minimise potential impacts. For example, using prominent colours on one structure to draw attention from the pump station as a whole. Some boundary bunding may also be effective in screening familiar ground-level features and thereby de-emphasising the scale of the facility; such measures will be utilised where appropriate. An indicative photomontage of PT2 is presented as Figure 7.9.

Lighting will be minimised to that which is necessary for safety and operational purposes. Where appropriate, downward-facing covers will be employed to minimise potential spill and offsite impacts.

The main receptors that will experience short-distance (approximately 500m) views of the facility are workers at the industrial area to the south of PT2. However, as these receptors are located in an existing industrial setting they are considered to have a low sensitivity and will only potentially experience minor visual impacts.

Long distance (approximately 5km) views of the facility will be experienced by residents on the western edge of Alvar settlement and the northern edge of Yukari Cakmak. Residential receptors are high sensitivity viewers, however, both of these settlements are on the edge of the ZVI and the change in view from these residential areas will be small due to the distance from the site. Consequently, the potential visual impact will also be minor for these residents.

The area is not known to be popular for recreational activities and landscape values in the area are considered to be low, therefore potential visual impacts on recreational users have not been considered. Passing motorists on local roads are also likely to experience views of the sites, however, due to the low sensitivity of these viewers, the existing industrial nature of the surrounding area and the generally low landscape value, potential impacts on these viewers will also be minor.

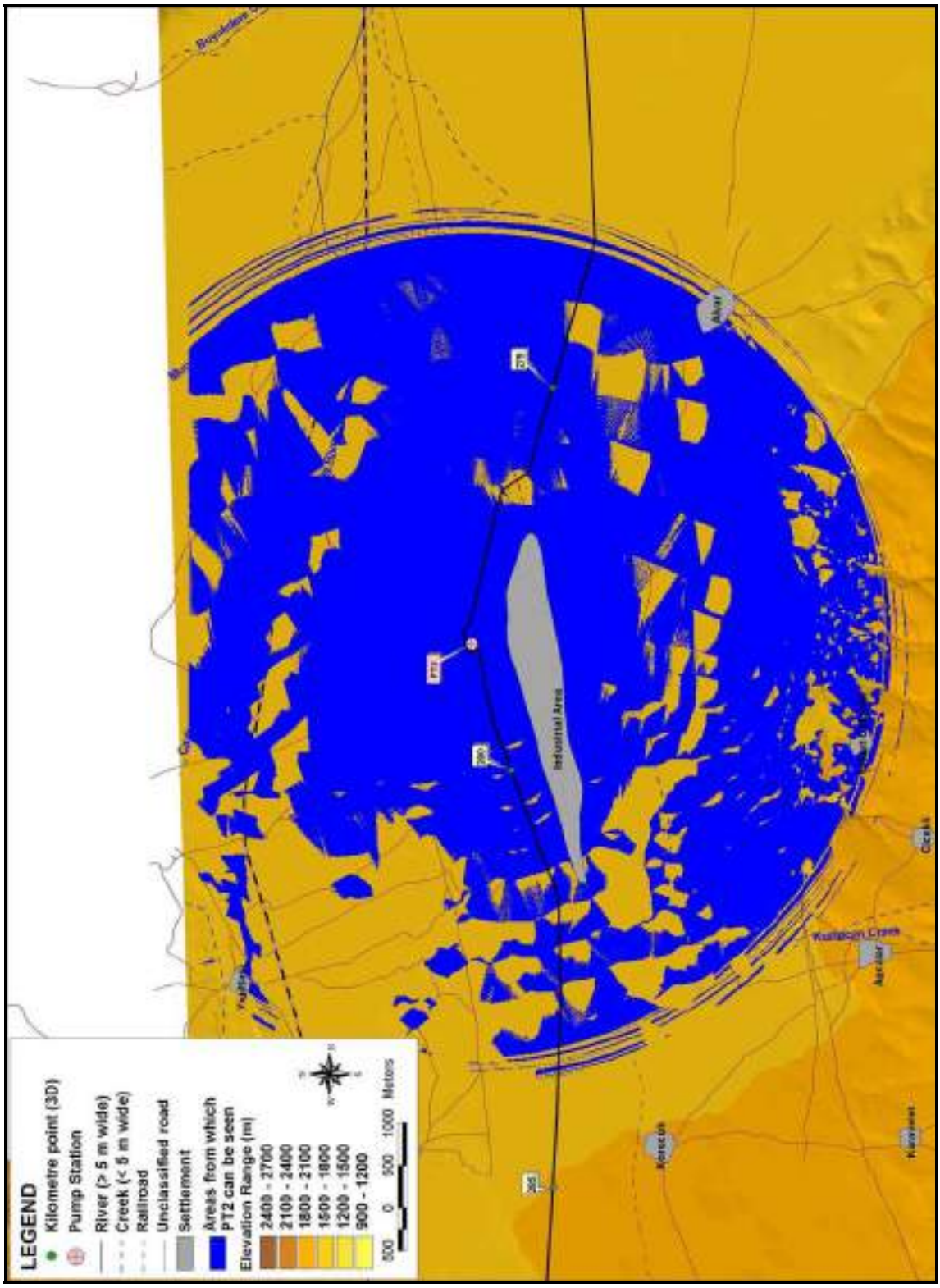


Figure 7.8 Zone of Visual Influence (ZVI) of PT2

7.4.2.3 PT3

The PT3 site occupies a mid-slope position about 1.3km due south of the settlement of Baskoy at an altitude of approximately 2,040m. A small road lies about 250m east of the site. This area is generally composed of semi-arid areas with subsistence crops and sheep-grazing. The landscape contains hilly and steeply dissected land. Landscape value is considered to be low.

The ZVI for PT3 is shown in Figure 7.10. The facility is predicted to be visible for up to approximately 4km predominantly to the north and south. The facility is largely screened to the west by hilly terrain with views only from the tops of hills.

The locally varied terrain around PT3 will offer some natural screening potential. Landscape mitigation will focus on maximising any opportunities to retain existing landform screening and introducing new landform screening (eg bunds, trees and mounds) where this might compliment the existing landform character. Careful attention will be made to the planting of trees such that they do not look incongruous in this landscape (refer to the Reinstatement Plan, Appendix C2). It is not envisaged that additional land take will be required to accommodate planting.

Structural and architectural measures will also be employed to de-emphasise the facility's prominence in the landscape, eg through sensitive use of colour to reflect existing tones. Lighting will be minimised to that which is necessary for safety and operational purposes. Where appropriate, downward-facing covers will be employed to minimise potential spill and offsite impacts. An indicative photomontage showing a general view of PT3 is provided in Figure 7.11.

The high sensitivity viewers that will experience the closest views of the facility are residents in the settlement of Baskoy, particularly those on the southern edge of the settlement whose view will not be screened by other houses. The southern edge of Baskoy is approximately 1.25km from PT3. These residents are predicted to experience moderate potential impacts due to the facility. Longer distance views will be experienced from residential properties on the southern side of Yaylalar, which is over 3km from the facility. Potential impacts on these viewers are predicted to be low due to the distance from which the facility will be seen.

The area is not known to be popular for recreational activities and landscape values in the area are considered to be low, therefore potential visual impacts on recreational users have not been considered.

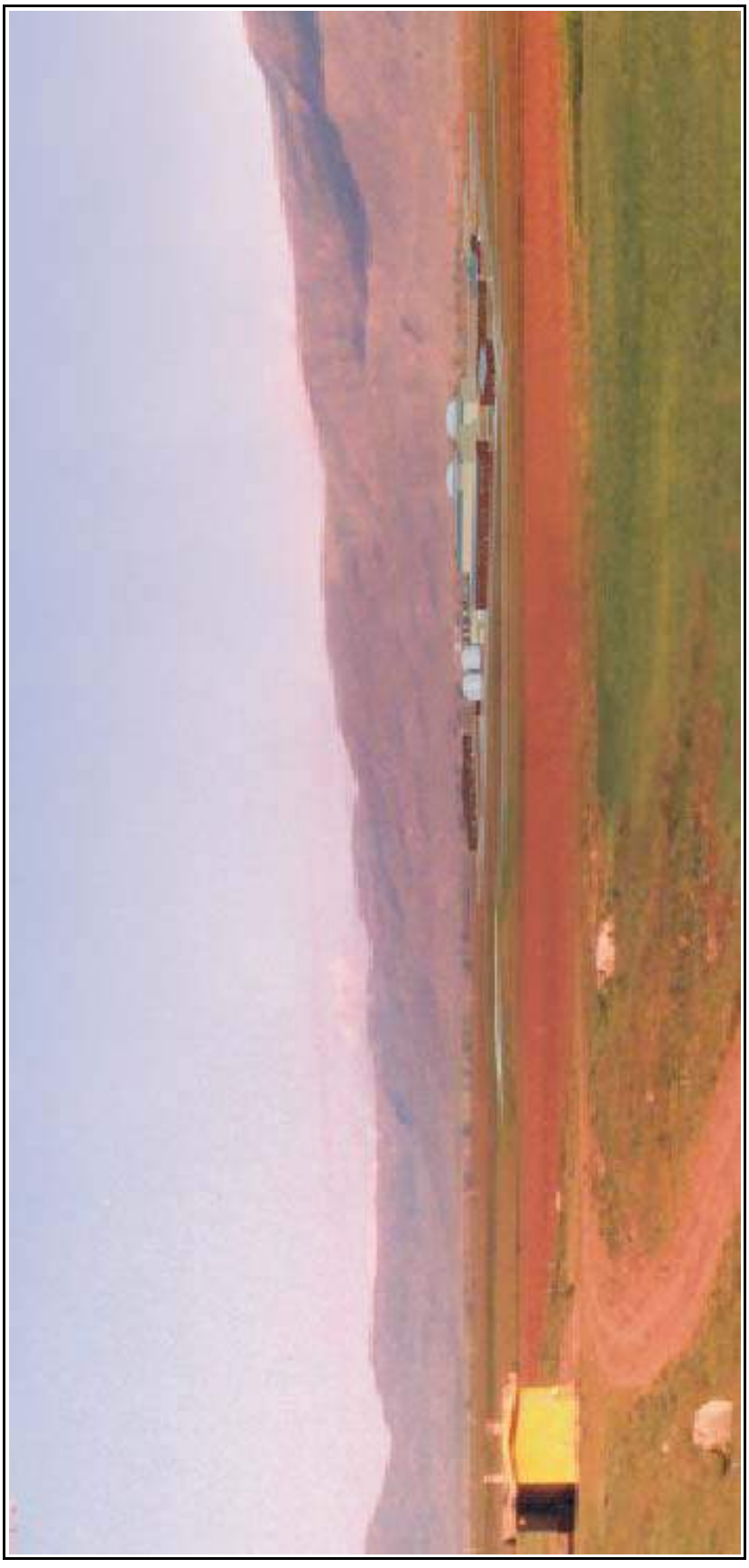


Figure 7.9 General view of PT2 on a photograph taken from a ESE to WNW direction (Visual Receptor Point: UTM Zone 37 0720217E 4427011N, Alvar Settlement Train Station)

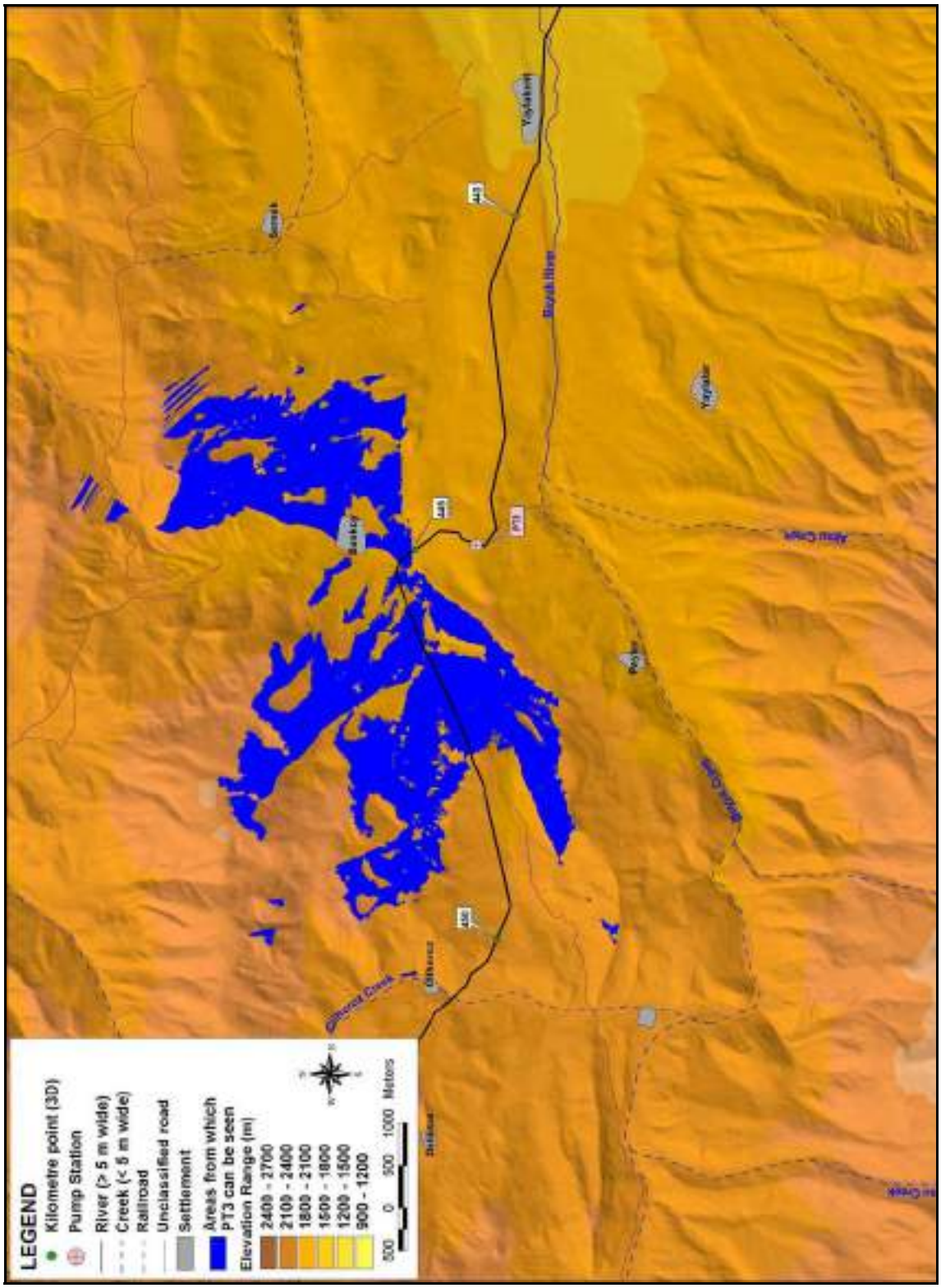


Figure 7.10 Zone of Visual Influence (ZVI) of PT3

Figure 7.11 General view of PT3 on a photograph taken from a NNE to SSW direction (Visual Receptor Point: UTM Zone 37 0567456E 4415614N, from the hill in front of Baskoy Settlement)

7.4.2.4 PT4

PT4 occupies flat terrain about 2km east of the settlement of Alaca, at an altitude of approximately 1,590m. A main road is located approximately 5km to the east of the site. The location provides broad vistas dominated by grasslands and rain-fed cereals. Landscape value is low due to the featurelessness of the terrain and the barrenness of the gravely, sparsely-vegetated land.

The ZVI of PT4 is shown in Figure 7.12. The facility is predicted to be visible for up to 5km from the site particularly to the southwest, south and southeast of the facility. This relatively large area of visual influence is due to the generally flat terrain in which the site is located.

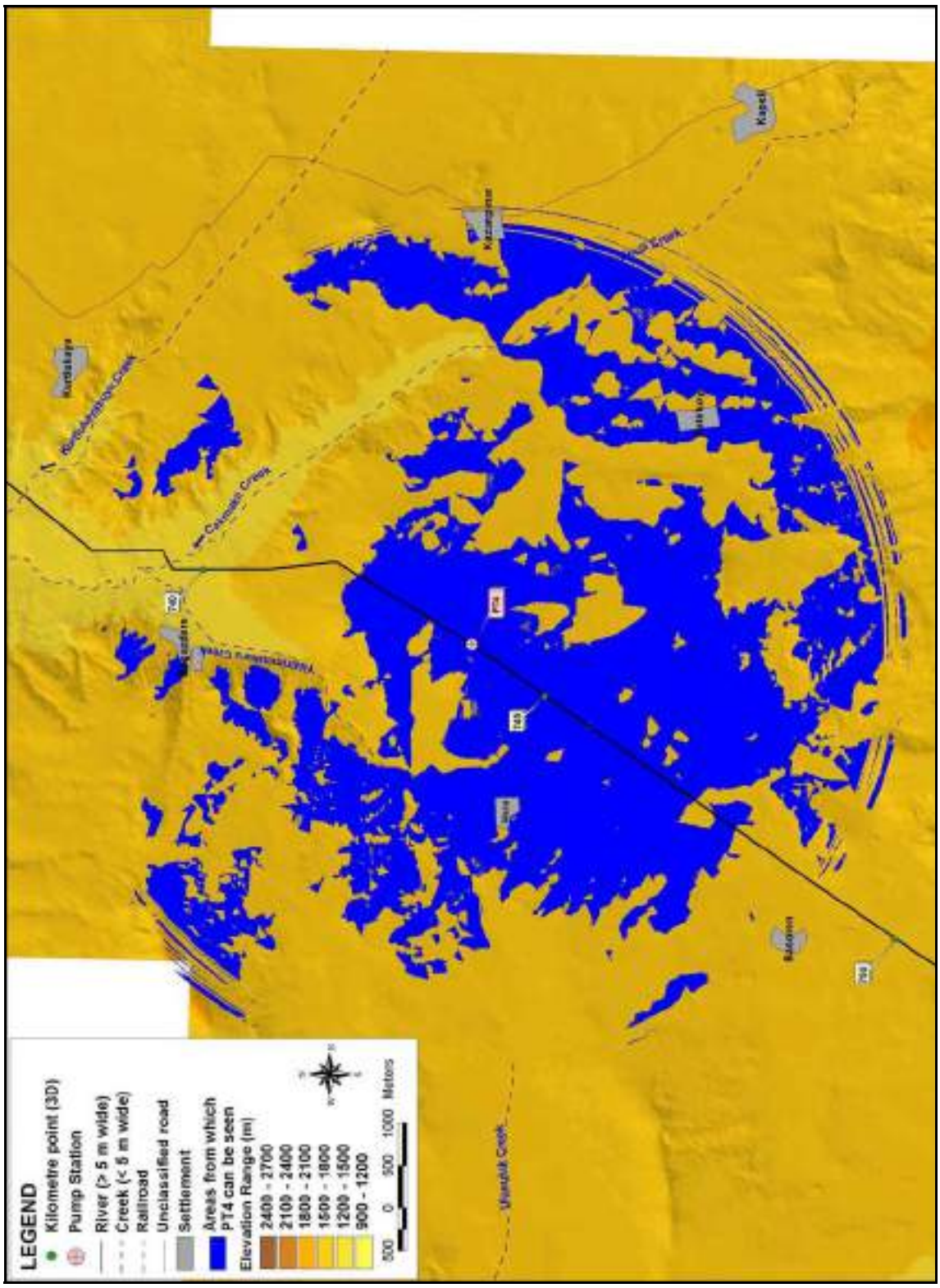
The residential properties that will experience the clearest views of the facility are those located in the settlement of Alaca to the west of the site; the occupants of these properties will see clear, long distance views of the facility (approximately 2km away). Residential properties on the eastern edge of the settlement will be most affected as settlement houses will screen views from the west side of the settlement. The facility is also predicted to be visible from parts of the settlements of Bogazdere (Kantariz) (3.5km to the north), Kazanpinar (5km to the east) and Patirkoy (3.5km to the south-east). Views from these settlements will be more distant that those from Alaca and only those residents on the edges of the town closest to the PT4 site are likely to experience views of the facility.

Users of the main road, approximately 5km to the east of the site, are unlikely to see the facility and the area is not known to be popular with recreational users.

The landscape is undulating and opportunities to use the existing landform features to conceal parts of the facility will be further investigated during detailed design of the facility, possibly even integrating new landform screens with existing mounds, banks and hollows. In this highly exposed landscape, careful planting will be required to ensure that the screening does not look too incongruous (refer to the Reinstatement Plan, Appendix C2). It is not envisaged that additional land take will be required to accommodate planting.

Structural and architectural measures will also be employed to de-emphasise the facility's prominence in the landscape. Colour schemes are to be developed by landscape specialists during detailed engineering once the site layout confirmations are finalised. Lighting will be minimised to that which is necessary for safety and operational purposes. Where appropriate, downward-facing covers will be employed to minimise potential spill and offsite impacts. An indicative photomontage showing a general view of PT4 is provided in Figure 7.13.

Long distant views of the facility will be experienced by a limited number of residential properties in Alaca, Bogazdere, Kazanpinar and Patirkoy resulting in a low visual change in the view from these properties. The landscape itself is considered to be of low landscape value. Accordingly, a moderate visual impact is predicted at these properties. Due to the low value of the landscape and the predominantly agricultural nature of the area, only minor impacts on other viewers in the area (eg farm workers) are predicted.



.Figure 7.12 Zone of Visual Influence (ZVI) of PT4

Figure 7.13 General view of PT4 on a photograph taken from a NNE to SSW direction (Visual Receptor Point: UTM Zone 37 0319016E 4356719N, near Alaca Settlement)

7.4.2.5 IPT1

The pressure reduction station (IPT1) occupies agricultural land within a flat valley approximately 2.5km south-west of the settlement of Geben, at an altitude of approximately 1,300m .

The ZVI for IPT1 is shown in Figure 7.14. In general, the facility will be visible over a smaller distance than the four pump stations due to the smaller size of the facility, (permanent land take will be approximately 3.17ha, while temporary landtake comprises 3.49ha), and its location in a valley surrounded on most sides by hills. Most views will be within a short distance of the facility although longer distance views will be possible from the tops of some of the surrounding hills.

The facility will be located in a distinctive agricultural landscape with exposure to views from surrounding valley sides, so it will require sensitive landscaping treatment. The site's terrain is generally flat so landform screening would generally be inappropriate. However, the scattered woodland that is characteristic of the area lends a theme to a landscape planting strategy. Indigenous and locally characteristic trees and scrubs will be employed to conceal the facility, although linear tree belts will be avoided (refer to the Reinstatement Plan, Appendix C2).

Structural and architectural measures will also be employed to de-emphasise the facility's prominence in the landscape, eg through sensitive use of colours that reflect the tones of the existing landscape. Lighting will be minimised to that which is necessary for safety and operational purposes. An indicative photomontage of IPT1 is presented in Figure 7.15.

More detailed measures to reduce potential landscape and visual impact will be developed in conjunction with detailed design and construction planning on the basis of knowledge of the building and site layout, alignment and location and within the context of the immediate landscape setting.

Based on the implementation of the described mitigation measures the potential landscape or visuals impacts of the IPT1 is predicted to be minor.

Due to the remote location of the site, there are no high sensitivity residential viewers that will experience views of the facility.

The area is considered to be of high landscape value and is likely to be relatively popular with recreational users. Recreational users are considered to be moderately sensitive viewers however, as the facility will be visible over a relatively small area, potential impacts on recreational users in the area are considered to be minor.

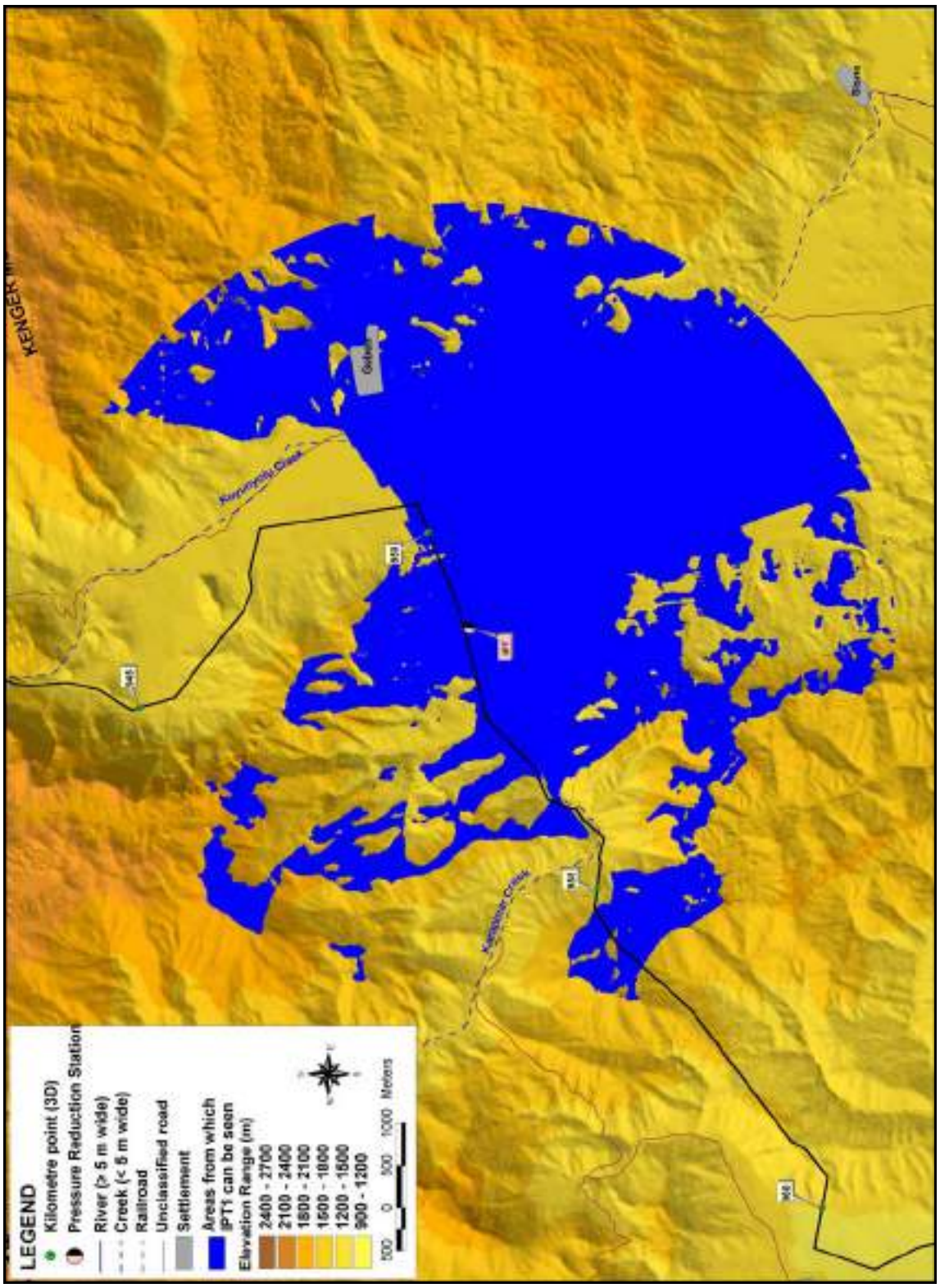


Figure 7.14 Zone of Visual Influence (ZVI) of IPT1

Figure 7.15 General view of IPT on a photograph taken from a E to W direction (Visual Receptor Point: UTM Zone 0273111E 4184119N, near Geben)

7.5 GEOLOGY AND GEO-HAZARDS

7.5.1 Introduction

The identification of geological features and geohazards along the pipeline route corridor during project development has included a number of detailed studies, which are discussed fully in Section 5.5.

7.5.2 Baseline summary

Geology in the vicinity of PT1 is composed of a slightly cemented pyroclastic series, consisting of tuffs, agglomerates and volcanic sandstones, which are highly weatherable. Investigative borings undertaken by the detailed design engineers have shown that the bedrock units are covered with a thin layer of topsoil and the underlying pyroclastics are moderately to highly weathered.

Although there are no landslides at the site of PT1, there is an area of potential slope instability to the north-west, however, further investigations have concluded that the area is not subject to a possible landslide. The proposed site is not located in the vicinity of any other known geohazards.

There are no fault zones within close proximity to the PT2 site but approximately 16km to the west of the site are the Erzurum East 1 Segment and Erzurum East 2 Segment faults.

Geology in the vicinity of PT3 is characterised by bedrock of shallow marine and lacustrine origin overlain by residual soil. The bedrock is covered with clayey, gravely silt up to 4m thick. Borehole investigations in the area indicate that the bedrock, unique siltstone, is slightly to highly weathered.

Bedrock at the PT4 site consists of siltstone, sandstone and conglomerate and is overlain by up to 5m of thick sandy, gravely silt. The top of the sequence is formed by up to 0.5m of topsoil. The bedrock is slightly to highly weathered. Deliler Fault, which is a class A fault, is located approximately 1.5km to the north of the site.

The Cokak fault, an active fault approximately 3km long, is located approximately 6.2km southwest of IPT1. Sakartas fault, is located approximately 1.4km north east of the site. An energy transmission line (>154kV) is located approximately 200m to the south of IPT1.

7.5.3 Potential impacts and mitigation during operation of AGIs

The locations of AGIs have been selected to avoid areas of geohazard (eg landslides, faults) as far as practicable however there are a number of faults nearby which could potential result in damaging earthquake events. In particular, the following faults are noted:

- Erzurum East 1 Segment and Erzurum East 2 Segment faults located approximately 16km to the west of PT2;
- Deliler fault located approximately 1.5km to the north of PT4;
- Cokak fault located approximately 6.2 km southwest of IPT1.

To ensure the integrity of the AGI facilities in the event of an earthquake, the AGIs will be constructed in accordance with the following specifications and codes:

- Turkish Earthquake Resistant Design Code 1997, with Amendment 1998;
- Specification for Structures to be Built in Disaster Areas (Ministry of Public Works and Settlement, Government of Republic of Turkey, Official Gazette 23098, 02.09.1997, Amended Official Gazette 23390, 02.07.1998);
- Guidelines for the Seismic Design of Oil, Gas Pipeline Systems (ASCE, 1984);
- Uniform Building Code.

Project investigations undertaken to determine the location and nature of fault systems in the vicinity of the pipeline route are described in Section 5.6.

7.6 SURFACE AND GROUNDWATER

7.6.1 Introduction

Desk based assessments, water quality data collection and field surveys have been undertaken for all major rivers along the pipeline route (refer to Section 5.6.1). Planned discharges to the marine environment will always be treated to a specified quality that meets the requirements of World Bank and Turkish standards, refer to Section 3.8.4 and 3.8.5.

7.6.2 Baseline summary

At PT1, springs emerge upslope of the Ardahan-Posof roadway located 150m to the east of the site. While no streams cross the site, a small stream is located 200m west and downslope of the site. Groundwater was found at approximately 18m below the surface during borehole investigations at the site.

Shallow tributaries occur within the PT2 site and approximately 100m to the north and south. Incesu Creek lies approximately 500m to the southeast of the PT2 site and the Hasankale River is 1km to the north. Borehole records from the area indicate that groundwater occurred at between 6.5 and 8.2m. The site overlies an aquifer, which is confined to the gravel layers. The thickness of the confining layer is approximately 50m.

At PT3, springs emerge from the lower third of the slope about 500m north of the site; other springs emerge about 300m to the east. Groundwater in the area was found at various depths between 1.8 and 9.3m. Since no continuous aquifer was found in the investigation area, this water is interpreted as horizons of seepage water with limited extension. The groundwater is not a major source for the local residents, who prefer to abstract water from the nearby rivers and streams.

The investigated borehole depth at PT4 was approximately 30m, no springs or watercourses were observed. Creeks, less than 5m in width, are located approximately 1.5km to the west and 3.5km to the east of the proposed site. The creek to the west feeds into the Bogazdere Irrigation Pond, which is located approximately 2km to the north west of the site. Shallow groundwater was not encountered during borehole investigations.

Due to the recent relocation of IPT1, the surface and groundwater conditions at the site itself are yet to be surveyed. Karapinar Creek is located 800M to the south of IPT1 and Cinarli Creek is 80m to the northeast. The site is located approximately in close proximity to a large unconfined aquifer.

7.6.3 Potential impacts and mitigation during operation of AGIs

The anticipated raw water demand for each pump station is 100m^3/day, with a significantly lower demand required for IPT1. The source of water supply for each AGI is currently subject to ongoing evaluation to confirm long-term sustainability of supply. Considerations include seasonal constraints, demands of existing and known future users and water quality. The sources under consideration for each pump station are described in Section 4 and 7.10 and can be summarised as follows:

- PT1: spring 3km south of PT1 station, via gravity flow line;
- PT2: new water well(s) on site or in vicinity of site;
- PT3: spring upstream of Kom Creek;
- PT4: new water well at creek located 2km NE of pump station.

The location of raw water supply to IPT1 has yet to be determined owing to the recent relocation of this station. Each of these sources is anticipated to be able to sustain the 100m^3/day design demand load and has been selected in consultation with local users to ensure that there is no significant resource constraints.

Each of the water sources listed above is of either Class II or III water quality (ie none are of Class I), thereby requiring on-site water treatment. On this basis, provided sustainability of supply is proven and the abstraction is licensed by the State Hydraulic Affairs (DSI) and the relevant local authority, potential impacts are likely to be minor. However, pending the outcome of such tests and selection of the raw water source for IPT1, this potential impact has been designated as moderate for the purposes of this assessment.

As described in Section 4.7.13, each AGI will contain on-site facilities to contain and treat all liquid waste streams arising on-site including slop oil, oily water, sewage and surface drainage. No liquid stream will leave the site without some level of containment, treatment and controlled discharge. The effluents leaving the site will comply with the relevant Turkish Standard and World Bank guidelines for effluent discharge and will be subject to the permitting of the relevant authority (ie the DSI). Discharge will be under operator control, subject to spot sampling and analysis to ensure that design effluent quality is maintained.

Discharge for each AGI will be via a single outfall. Whole discharge to irrigation will be the preferred option (the feasibility of which is subject to ongoing investigation), and each outfall will have the facility to discharge to a seepage shaft above a tile bed soakaway for discharge to groundwater. The locations of the seepage shafts for the four pump stations have been selected; IPT1 is currently subject to ongoing evaluation as a result of its recent relocation. These locations are as follows:

- PT1 X = 330.622; Y = 116.975
- PT2 X = 46.620; Y = 32.250
- PT3 X = 405.669; Y = 247.263
- PT4 X = 126.616; Y = 101.204

The pump stations and associated seepage shafts are all located outside areas of unconfined aquifer and the discharges are all located at least 50m from a spring or existing well. Groundwater at each soakaway is either Class II or Class III quality (ie not Class I). Therefore, the potential impacts due to discharge by soakaway will be minor or moderate (depending on the distance to the closest well) based on the criteria outlined in Section 3.9. Owing to the current lack of information concerning water discharge for IPT1 (owing to its recent relocation), and the element of remaining uncertainty regarding location of all existing abstractions in the vicinity of PT1/2/3/4, this potential impact has been designated as moderate for the purposes of this assessment. It is likely that this will be downgraded to minor at each AGI upon further field investigations. The methodology described in Section 12.4.3.2 that is to be used for locating soakaways, will be applied at the stations.

In addition, the groundwater sensitivity in the catchment of each discharge (whether for irrigation or via soakaway) will be categorised methodically as part of BOTAŞ' Groundwater Protection Strategy for the proposed BTC Pipeline. This will provide a mechanism for long-term management of groundwater resources and protection of supplies to other users in the vicinity of the discharge. Careful planning will ensure that soakaway discharges will not contaminate groundwater wells owned by private individuals or the BTC Project.

7.7 BIOLOGICAL ENVIRONMENT

7.7.1 Introduction

The sources of information for the biological environment along the pipeline route are discussed in Section 5.7. Site-specific information for the route is provided in Section 6 in the baseline and impact tables as well as ecological maps, and the information for the AGIs is given below.

7.7.2 Baseline summary

PT1 will require a permanent land take of 8.5ha. The site of PT1 is located within the Posof Wildlife Reserve, (refer to Section 6 for the flora and fauna in the vicinity of this site), which has been designated for the protection of the Caucasian Black Grouse, a bird of coniferous forest and forest edge habitats. This reserve does not have an IUCN Cat IV value and hence is not included in the United Nations List of National Reserves (see Section 5.8.4). There are no restrictions regarding development within this area according to National legislation (see Appendix D). Vegetation at the proposed site is composed of sub-alpine meadow and is distant from forest areas, therefore as the PT1 location is outside of any Caucasian Black Grouse habitats it is not considered to be sensitive (see Section 6).

The PT2 site is not located in a known Ecologically Sensitive Area (ESA). The location of PT2 has only recently been determined and this site is located outside of the original 500m corridor. Therefore, there is no site-specific ecological baseline information for this site. Site-specific habitat and bird surveys will be undertaken prior to construction to determine the presence of any important plant or animal species. Site-specific mitigation measures will then be identified, as appropriate, based on the results of this survey. The surrounding land use consists of intensive irrigated farming of vegetables, root crops and cereals. A permanent land take of 8.0ha will be required at this site.

The location of PT3 has only recently been determined and as this site is located outside the 500m corridor there is limited site-specific baseline information available. However vegetation at the PT3 site is known to be composed of Montane Steppe and the site is located on the eastern border of ESA-19. This area is identified as ecologically sensitive due to the presence of five globally threatened plant species (*Onosma liparioides, Campnula hedgei, Isatis*

cappadocica ssp. a*lyssifolia*, *Astragalus elbistanicus* and *Haplophyllum cappadocicum*). Further site-specific investigation is required to determine the presence and abundance of any globally threatened plant species at the site itself. Fauna surveys, including birds, will also be undertaken at this site prior to construction and site-specific mitigation measures will be identified as appropriate based on the results of these surveys. A permanent land take of 9.5ha will be required at this site.

Vegetation at the PT4 site is composed of cultivated land. An ESA is located less than 100m to the north of the site location, therefore globally or nationally important animal or plant species may be present in the vicinity of the site (see map 38b in Section 6). Further site specific investigation is required to determine the presence and abundance of any globally threatened plant species at the site itself. Fauna surveys, including birds, will also be undertaken at this site prior to construction and site-specific mitigation measures will be identified as appropriate based on the results of these surveys. A permanent land take of 8.0ha will be required at this site.

IPT1 will be subject to further detailed ecological assessment but the site itself is located within agricultural land. An ESA is located within the broader area of the site. Two important animal species, Mehely's Horseshoe Bat (*Rhinolophus mehelyi*) and the Forest Dormouse (*Dryomus nitedula*) and one nationally threatened bird species are reported to occur within the wider area (see Appendix B1). The permanent land take area for IPT1 will be approximately 3.17ha.

7.7.3 Potential impacts and mitigation during operation of AGIs

Potential impacts on the biological environment during normal operation of the AGIs relate to the permanent land take and resulting habitat loss, and the potential for disturbance of surrounding fauna due to noise and traffic associated with the AGI operation. Noise levels at the site boundary will be 24 hour and therefore surrounding species are likely to become accustomed to such a minor impact (see Section 7.3.6.7).

Potential impacts on the ecological environment at the five AGI sites during operation have been predicted based on the assessment criteria outlined in Section 3.9. The predicted potential impacts at each site are presented in Table 7.3.

Table 7.3 Predicted Ecological Impacts at AGI Sites During Operations

Site	Significance of Flora/Fauna at Site	Magnitude of Impact	Predicted Significance of Ecological Impact	Notes
PT1	Locally Important	Moderate (loss of 8.5ha of sub-alpine meadow)	Minor	Located within Posof Wildlife Protection Area but no nationally or internationally important species observed at the site. Therefore no potential impacts on these species are predicted during operations as disturbance impacts due to noise and traffic will be negligible.
PT2	Locally Important	Moderate (loss of 8ha of habitat	Minor	Preliminary assessment based on habitat in surrounding areas. To be confirmed based on results of site-specific survey.
PT3	Internationally Important	Moderate (loss of 9.5ha of Montana Steppe habitat)	Major	Preliminary assessment – presence and abundance of globally threatened species to be confirmed by site-specific surveys and appropriate mitigation measures to be developed.
PT4	Internationally Important	Moderate (loss of 8ha of cultivated land)	Moderate	Preliminary assessment – presence and abundance of globally threatened species to be confirmed by site-specific surveys and appropriate mitigation measures to be developed.
IPT1	Locally Important	Moderate (loss of 3.17ha of cultivated land)	Minor	Preliminary assessment based on habitat in surrounding areas. To be confirmed based on results of site-specific survey.

The majority of AGI sites are not located in ESAs. The exception to this is the potential site for PT3. Measures to be adopted prior to and during construction at this site to mitigate the potential impacts of land take on globally threatened plants are described in Section 6 (Table 6.24). A potentially major impact at PT3 has been predicted due to the potential loss of 9.5ha of Montane Steppe habitat, which may include a number of globally threatened plant species. However, it is noted that there is currently a high level of uncertainty attached to this assessment. The site is located outside the 500m corridor and no site-specific habitat surveys have been carried out at this site due to the recent selection of this site and the seasonal survey constraints. Consequently, although the globally threatened plant species noted in the Baseline Summary of Section 7.2.4 above are likely to occur at the PT3 site, the actual presence and abundance of such species at this site is not known and the assignment of a major potential impact is considered a conservative prediction. This uncertainty will be addressed through site-specific habitat and bird surveys, which will be undertaken during summer 2002. Based on the results of these surveys, appropriate mitigation measures will be developed to mitigate the potential impacts of habitat loss at this site. Mitigation may involve measures such as the translocation of protected species, changes in site layout or the creation of new habitats.

A number of alternative locations have been considered for the location of PT3 including the potential for siting outside for ESA–19. However, the identification of a suitable site outside of ESA-19 has not been possible due to a number of other constraints including the following:

- hydraulic constraints governing the location of the pump station;
- a suitable relatively flat site;
- avoidance of areas of unconfined aquifer;
- avoidance of landslide areas.

The siting of IPT1 on cultivated land will ensure that the loss of deciduous and coniferous forest habitat is avoided. A site specific survey at the new location of IPT1 will provide further information on the presence and abundance of the important birds and fauna discussed in Section 7.7.2. The results of this survey will further inform mitigation measures for this site. Noise emissions at this site will be significantly lower than at the pump station sites. Consequently, potential impacts associated with the disturbance of local fauna due to noise will be minor. An assessment of operational noise emissions from the site is contained in Section 7.2.6. Operational traffic at the site will be minimal and no potential disturbance impacts on fauna due to operational traffic are anticipated (see Section 7.2.7).

All waste disposal containers at the AGI sites will be animal proof to avoid attracting local fauna to the site (see Waste Management Plan, Appendix C3). The potential impacts of site lighting on local fauna will be minimised by limiting external lighting to that necessary for safety, security and operational purposes. Consequently, the potential impacts on local fauna due to site lighting will be minor.

7.8 AIR QUALITY

7.8.1 Introduction

An air quality survey was conducted at the four pump station and the pressure reduction station locations to obtain specific baseline information on the background air quality conditions at these five major AGI sites.

7.8.2 Air quality survey results

The proposed pump station locations are in rural areas where the gaseous pollutant (eg SO_2, NO_x, VOC, CO, CH_4) concentrations are expected to be at their natural background levels.

However, the ambient background concentrations of suspended particulate matters (SPM) arising from wind erosion of exposed surfaces are anticipated to be relatively high during dry and windy conditions. Emissions of SPM will be generated during the construction of the AGI. Therefore, an air quality survey for SPM over a seven-day period was conducted at each of the proposed pump stations (PT1, PT2, PT3, PT4) and pressure reduction station (IPT1) locations. The fraction of SPM that is smaller than 10 micrometers in diameter (PM_{10}) was surveyed using a low-volume filter sampler. A summary of the results is given in Table 7.4.

Table 7.4 PM_{10} Concentrations at the Proposed Pump Station and Pressure Reduction Station Locations

LOCATION	AVERAGE CONCENTRATION ($\mu g/m^3$)	MAXIMUM CONCENTRATION ($\mu g/m^3$)
PT1	11.6	13.4
PT2	12.4	22.7
PT3	10.6	14.4
PT4	12.6	30.7
IPT1	46.7	83.1

As expected, the PM_{10} concentrations rose with increasing wind speeds. The IPT1 location recorded concentrations higher than the PM_{10} concentration of the proposed pump station locations. This may be attributable to the fact that the IPT1 is proposed at a location that has an open surface cover more prone to wind erosion. All PM_{10} concentrations recorded were well within the World Bank short-term PM_{10} guideline value for ambient air quality of $150\mu g/m^3$ and the guideline in the Turkish Regulations for the Preservation of Air Quality of $300\mu g/m^3$.

7.8.3 Pump station design emission parameters

The design emission parameters used in the impact assessment are given in Table 7.5. In cases of uncertainty, parameter values that would yield the highest ground-level concentrations were used in the model simulations to increase the conservatism of the impact assessment.

Combustion of natural gas at the pump stations will result in the release of mainly nitrogen oxides (NO_x) and very small amounts of sulphur dioxide (SO_2). The worst-case emissions from the pump stations will be below the air quality modelling 'de-minis' levels specified by the Turkish Regulation for the Preservation of Air Quality (RPAQ)[1]. Nevertheless, emissions of both pollutants (ie NO_x and SO_2) have been considered.

It is noted that the NO_x emission values presented below are within the World Bank guideline of 320 $mg/Nm^3$for emissions from gas-fired onshore oil and gas production facilities.

Table 7.5 Pump Station Design Values Used in Impact Assessment

PARAMETERS	PUMP STATIONS			
	PT1	PT2	PT3	PT4
Number of Units	4	3	4	3
Maximum Power Rating (kW/unit)	5,508	5,508	5,508	5,508
Stack Height (m)	16	16	16	16
Stack Diameter (m)	1	1	1	1
Building Height (m)	6	6	6	6
Building Width (m)	28	28	28	28
Building Length (m)	60	60	60	60
Exhaust Gas Temperature (°C)	370	370	370	370
Exhaust Gas Flow Rate ($Nm^3/h/kW$)	5.49	5.49	5.49	5.49
Total Exhaust Gas Flow Rate (Nm^3/h)	120,966	90,717	120,966	90,717
Stack Gas Exit Velocity (m/s)	42.8	32.1	42.8	32.1
NO_x Emission (mg/Nm^3)	200	200	200	200
NO_x Emission Rate (g/s)	6.72	5.04	6.72	5.04
SO_2 Emission Rate (g/s)	0.37	0.28	0.37	0.28

[1] For NO_x emissions below 40 kg/hr no air quality modeling is required.

7.8.4 Modelling results

The pump station stack heights were evaluated for possible building downwash occurrences. No building cavity or wake effects are anticipated for the design stack height and building dimensions.

The pump station emissions were modelled taking into account the surrounding topography. Topographical cross-sections for eight cardinal directions (ie North (N), South (S), East (E), West (W), Northeast (NE), Southwest (SW), Northwest (NW), and Southeast (SE)) were constructed up to 5km distance from the stack base using 1:25,000-scale maps (see Appendix B2). Based on the relative terrain elevation (ie difference of terrain elevation and stack elevation), the surrounding terrain was classified as either flat or complex terrain. Model simulations were conducted separately for flat and complex terrain conditions at several downwind distances. The maximum of the worst-case concentrations predicted for varying downwind distances was chosen to represent the worst-case impact for that direction.

Regarding Nitrogen Oxides (NO_x), the maximum worst-case hourly, daily, and annual ground level NO_x concentrations for each pump station are given in Table 7.6 Also provided in Table 7.6 are the meteorological conditions (wind speed and Pasquill stability class) associated with the maximum worst-case impact, relative terrain elevation, and distance from the stack base to the point of maximum impact.

Dispersion models such as SCREEN rely on the use of Pasquill stability classes to describe the stability of the atmospheric boundary layer, in which plumes are dispersing. These stability classes are labelled A to F and provide a means of classifying the amount of vertical mixing present. In unstable conditions, (denoted by A, B and C), heating of the surface by day promotes convection and a high degree of mixing; with Class A being the most unstable. When these conditions occur, plumes emitted from chimneys are subject to sharp vertical movements and may briefly come to the ground close to their source.

Stable conditions, (Classes E and F) occur at night under clear skies, when the surface is cold and a temperature inversion exists. In these circumstances, vertical mixing is suppressed and plumes remain intact and concentrated. These are poor dispersion conditions for ground level releases. Stability Class D occurs when turbulence induced by the wind is balanced by that induced through heating of the ground and is often referred to as a 'neutral' stability. This is the best atmospheric state for dispersion and arises typically under cloudy skies with some wind present.

The maximum worst-case hourly NO_x concentrations for all pump stations are predicted to be below the WHO/EU hourly nitrogen dioxide (NO_2) guideline of 200 $\mu g/m^3$. The maximum worst-case daily NO_x concentrations are also well below the Turkish daily NO_2 standard of 300 $\mu g/m^3$. The worst-case annual average NO_x concentrations are all well below both the Turkish annual NO_2 standard of 100 $\mu g/m^3$ and the WHO/EU annual NO_2 guideline of 40 $\mu g/m^3$.

Sulphur dioxide emissions have been assessed based on the composition of the Shah Deniz and NGL natural gas supply sources. The two fuels have almost identical sulphur content (110 g/Nm^3 maximum). Mass emission rates of SO_2 are an order of magnitude lower than those of NOx and will result in correspondingly lower ground level concentrations. The predicted annual average ground level for SO_2 fell far below the 1% Environmental Assessment Level (EAL).

Table 7.6 The Maximum Worst-Case Concentrations NO_x

Direction	Terrain	Max Concentration (µg/m^3)			Meteorology		Relative Elevation (m)	Distance (m)
		Hourly	Daily	Annual	Wind Speed	Pasquill Stability Class		
PT1								
W, NE, NW	Flat	28.1	16.9	2.8	10 m/s	C	0	597
N	Complex	54.9	33.0	5.5	20 m/s	D	30	500
S	Complex	96.0	57.6	9.6	2.5 m/s	F	70	800
E	Complex	188.5	113.1	18.9	2.5 m/s	F	90	500
SW	Complex	28.0	16.8	2.8	2.5 m/s	F	70	2,300
SE	Complex	131.1	78.7	13.1	2.5 m/s	F	70	600
PT2								
E, NE, SE	Flat	28.6	17.2	2.9	10 m/s	C	0	506
N	Complex	21.1	12.6	2.1	1.0 m/s	F	55	5,000
S	Complex	21.0	12.6	2.1	1.0 m/s	F	70	4,500
W	Complex	21.1	12.6	2.1	1.0 m/s	F	65	5,000
SW	Complex	21.1	12.6	2.1	1.0 m/s	F	70	4,900
NW	Complex	21.1	12.6	2.1	1.0 m/s	F	30	4,800
PT3								
E, SE	Flat	28.5	17.1	2.9	10 m/s	C	0	593
N	Complex	20.7	12.4	2.1	2.5 m/s	F	80	3,100
S	Complex	23.7	14.2	2.4	2.5 m/s	F	80	2,800
W	Complex	101.6	61.0	10.2	2.5 m/s	F	60	500
NW	Complex	41.8	25.1	4.2	2.5 m/s	F	100	1,800
NE	Complex	21.0	12.6	2.1	1.5 m/s	F	60	4,700
SW	Complex	31.3	18.8	3.1	2.5 m/s	F	70	2,100
PT4								
N, E, NE, SW, SE	Flat	28.4	17.0	2.8	10 m/s	C	0	509
S	Complex	20.8	12.5	2.1	1.5 m/s	F	60	3,800
W	Complex	20.8	12.5	2.1	1.5 m/s	F	25	3,800
NW	Complex	20.2	12.1	2.0	2.5 m/s	F	70	2,700

The Environmental Assessment Level (EAL, see Section 3.8.7.3) for long-term SO_2 ground level concentrations would be either the Turkish annual mean limit of 150µgm^{-3} or the WHO annual mean limit of 50 µgm^{-3}. Utilising the 1% of EAL criterion established for determining significance, corresponds to 1.5 and 0.5 µgm^{-3} for Turkish and WHO standards respectively. Since the anticipated annual average ground level SO_2 concentrations associated with pump station emissions fall within this limit, SO_2 emissions are determined to be insignificant (utilising the criteria outlined in Section 3.8.7.3) and are not assessed further.

7.8.4.1 Modelling assessment

The modelling assessment indicated the following:

- Based on the air quality model simulations presented above, it is concluded that the potential impact of emissions to atmosphere from the pump stations will be within the national and international ambient air quality standards with regard to both NO_x and SO_2.

- Based on the modelling results presented in Table 7.6 the highest ground-level concentrations of NO_x are predicted to occur 500m east of PT1 under the complex terrain scenario.

- Based on the significance criteria presented in Table 3.16 in Section 3 for short-term (24 hour) ground level concentrations of NOx, this worst case scenario would result in a minor potential impact to local air quality as the predicted daily peak ground level concentration of 113.1 μgm^{-3} is well below 225 μgm^{-3} (75% of the EAL which is the Turkish 24 hour maximum limit of 300 μgm^{-3}).

- Based on the significance criteria presented in Table 3.17 in Section 3 for long-term (annual average) ground level concentrations of NOx, this worst case scenario would result in a minor potential impact to local air quality as the predicted annual average ground level concentration of 18.9 μgm^{-3} is well below 28 μgm^{-3} (70% of the EAL which is the WHO annual average guideline value of 40 μgm^{-3}).

Under all other scenarios at PT1 and under all scenarios at PT2/3/4, ground level concentrations will be lower than those considered above.

In summary, based on the criteria for determining impact significance presented in Section 3.8.7, emissions to atmosphere will constitute a minor impact to ambient air quality.

7.8.4.2 Greenhouse gas emissions

Emissions from the pump stations will include Carbon Dioxide (CO_2) and relatively much smaller quantities of methane (CH_4) and Nitrous Oxide (N_2O). Emissions of these so-called greenhouse gases are not significant in terms of potential health effects on nearby human receptors or direct impacts on ecological receptors in the area. However they are considered to be a potential contributor to global warming. For this reason an estimate of the CO_2 equivalent (CO_2-e) emissions from the pump stations during operations is presented in Table 7.7.

Table 7.7 CO_2 Emissions During Pump Station Operation

Pump Station	Hourly Emission Rate (1) (kg/hour CO_2)	Annual Emission Rate (2) (tonnes/year CO_2)	Annual Emission Rate (tonnes/year CO_2-e)
PT1	368.9	134,633	134,758
PT2	245.9	89,755	89,839
PT3	368.9	134,633	134,758
PT4	245.9	89,755	89,839
Total	**1,229.6**	**448,776**	**449,194**

(1) Based on stoichiometric (100%) combustion of Turkmenistan natural gas containing 83% methane, 11% ethane, 3.15% propane, 2% butane, 1% pentane, and 3% carbon dioxide.
(2) Assuming no downtime.

There are no relevant guidelines or standards against which these emissions can be compared. However, their contribution to cumulative greenhouse gas emissions is relevant and is discussed in Section 16 (Cumulative Impacts).

Owing to the high efficiency of the gas-fired combustion engines proposed for the pump station drivers, emissions of gases having global warming potential has been minimised.

7.9 NOISE

7.9.1 Introduction

A noise survey was conducted at receptors close to pump station sites in order to (i) provide background noise levels for succeeding noise assessment and (ii) to provide baseline data for the monitoring of Project performance during the construction and operation phases of the Project. The survey was undertaken in September 2001.

Daily continuous (24 hrs) measurements were conducted at residential areas (ie settlements) near two proposed pump station sites (ie PT1 and PT2).

The location of PT3 and PT4 had not been determined at the time of the survey and the location of PT2 was changed subsequent to undertaking the noise survey.A second noise survey was undertaken in July and August 2002 at residential receptors close to the PT2, PT3, PT4 and IPT1 sites to provide baseline data at these locations, following confirmation of their locations.

7.9.2 Noise survey results

The results of noise monitoring at settlements close to the pump stations and pressure reduction station sites are presented below in Table 7.8 to Table 7.17. Descriptions of day and night time are different in the Turkish Noise Control Regulation and World Bank Standards therefore day and night time L_{eq} values relevant to both standards are given in the tables below.

Table 7.8 Day & Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements in Sogutlukaya Settlement (week day) near PT1

	Measurements Based on Turkish NCR (day; 06:00-22:00) (night; 22:00-06:00)	**Measurements based on World Bank Criteria. (day; 07:00-22:00) (night; 22:00-07:00)**
L_{eq} (day), in dB(A)	59.3	59.1
L_{eq} (night), in dB(A)	51.2	52.5
L_{eq} (daily-24 hr), in dB(A)	56.6	

Table 7.9 Day & Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements in Sogutlukaya Settlement (weekend) near PT1

	Measurements based on Turkish NCR (day; 06:00-22:00) (night; 22:00-06:00)	**Measurements based on World Bank Criteria. (day; 07:00-22:00) (night; 22:00-07:00)**
Leq (day) , in dB(A)	63.0	62.6
Leq (night) , in dB(A)	52.8	54.5
Leq (daily-24 hr), in dB(A)	59.6	

Table 7.10 Day & Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements in Korucu Settlement (weekday) near proposed PT2 Site

	Measurements based on Turkish NCR (day; 06:00-22:00) (night; 22:00-06:00)	**Measurements based on World Bank Criteria. (day; 07:00-22:00) (night; 22:00-07:00)**
L_{eq} (day) , in dB(A)	49.7 (43 to 59)	49.1
L_{eq} (night) , in dB(A)	40.7 (35 to 47)	42.8
L_{eq} (daily-24 hr), in dB(A)	46.7	

Table 7.11 Day & Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements in Korucu Settlement (weekend) near proposed PT2 Site

	Measurements based on Turkish NCR (day; 06:00-22:00) (night; 22:00-06:00)	**Measurements based on World Bank Criteria. (day; 07:00-22:00) (night; 22:00-07:00)**
L_{eq} (day) , in dB(A)	46.3 (41 to 43)	46.5
L_{eq} (night) , in dB(A)	45.7 (40 to 47)	45.4
L_{eq} (daily-24 hr), in dB(A)	46.1	

Table 7.3 Day & Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements in Baskoy Settlement (weekday) near proposed PT3 Site

	Measurements based on Turkish NCR (day; 06:00-22:00) (night; 22:00-06:00)	**Measurements based on World Bank Criteria. (day; 07:00-22:00) (night; 22:00-07:00)**
L_{eq} (day) , in dB(A)	52.1 (42 to 62)	52.6
L_{eq} (night) , in dB(A)	45.5 (41 to 53)	45.3
L_{eq} (daily-24 hr), in dB(A)	49.9	

Table 7.4 Day & Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements in Baskoy Settlement (weekend) near proposed PT3 Site

	Measurements based on Turkish NCR (day; 06:00-22:00) (night; 22:00-06:00)	**Measurements based on World Bank Criteria. (day; 07:00-22:00) (night; 22:00-07:00)**
L_{eq} (day) , in dB(A)	47.3 (41 to 50)	47.1
L_{eq} (night) , in dB(A)	35.1 (31 to 42)	36.9
L_{eq} (daily-24 hr), in dB(A)	43.2	

Table 7.5 Day & Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements in Alaca Settlement (weekday) near proposed PT4 Site

	Measurements based on Turkish NCR (day; 06:00-22:00) (night; 22:00-06:00)	**Measurements based on World Bank Criteria. (day; 07:00-22:00) (night; 22:00-07:00)**
L_{eq} (day) , in dB(A)	50.5 (43 to 59)	50.0
L_{eq} (night) , in dB(A)	42.1 (32 to 62)	43.9
L_{eq} (daily-24 hr), in dB(A)	47.7	

Table 7.6 Day & Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements in Alaca Settlement (weekend) near proposed PT4 Site

	Measurements based on Turkish NCR (day; 06:00-22:00) (night; 22:00-06:00)	**Measurements based on World Bank Criteria. (day; 07:00-22:00) (night; 22:00-07:00)**
L_{eq} (day) , in dB(A)	51.6 (46 to 60)	51.5
L_{eq} (night) , in dB(A)	51.5 (46 to 62)	51.7
L_{eq} (daily-24 hr), in dB(A)	51.5	

Table 7.7 Day & Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements in Geben Settlement (weekday) near proposed IPT1 Site

	Measurements based on Turkish NCR (day; 06:00-22:00) (night; 22:00-06:00)	**Measurements based on World Bank Criteria. (day; 07:00-22:00) (night; 22:00-07:00)**
L_{eq} (day) , in dB(A)	55.5 (40 to 78)	56.0
L_{eq} (night) , in dB(A)	43.9 (37 to 58)	44.4
L_{eq} (daily-24 hr), in dB(A)	51.7	

Table 7.8 Day & Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements in Geben Settlement (weekend) near proposed IPT1 Site

	Measurements based on Turkish NCR (day; 06:00-22:00) (night; 22:00-06:00)	**Measurements based on World Bank Criteria. (day; 07:00-22:00) (night; 22:00-07:00)**
L_{eq} (day) , in dB(A)	53.7 (41 to 78)	54.3
L_{eq} (night) , in dB(A)	43.0 (37 to 47)	43.1
L_{eq} (daily-24 hr), in dB(A)	50.1	

Figures in brackets are the range of hourly noise levels excluding extraneous events.

7.9.2.1 Operational noise assessment at pump stations

Operational noise emissions associated with the four pump stations are discussed below. Noise sources, mitigation measures incorporated into pump station design, and the results of preliminary noise modelling are described.

The respective pump drivers, which will be located within the pump house, constitute the main noise emission source at the pump stations. In addition to the station buildings, there is also a guesthouse and several housing compounds. The pump motors will be operated 24 hours a day, and as a result noise limits for night-time operation will be applicable.

At PT1 and PT3, there will be five reciprocating engines. These engines will be located within the pump house at these pump stations. The building itself will be a concrete structure and the walls and ceiling will be made of mass concrete elements. For noise abatement, the ceiling and the upper parts of the walls will be covered with noise absorbing material. With the intended building construction, noise emissions will only occur from the inside to the outside through openings in the walls (doors, exhaust pipe ducts, ventilation pipes, etc).

In the pump house of PT2 and PT4, there will be four reciprocating engines. All other design features are similar to PT1 and PT3. As with PT1 and PT3, the ceiling and the upper parts of the walls will be covered with noise absorbing material for noise abatement.

7.9.3 Noise levels at the source

7.9.3.1 In-door source

The airborne sound power level of each pump driving unit will be $L_{w,A}$ = 123.7 dB. The noise emission will reach its maximum at a frequency of 500 Hz.

The inside noise level was calculated using the following formula:

$L_I = L_W - 10\log A + 6 + 10\log n = L_W + 14 + 10\log RT/V + 10\log(n)$
L_w: sound power level (dBA)
L_I: sound pressure level (dBA)
n: Number of Engines
A: Equivalent Absorber Area = 0,163 * V / RT
V: Inside Volume of the Pump House
RT: Reverberation Time
pump house with concrete cover: RT_0 = 6,84 sec

pump house with absorber cover: $RT_1 = 1{,}38$ sec
Reduction $\Delta L = 10\lg RT_o / RT_1 = 6{,}95$ dB

The calculated L_I can be further decreased with the aid of noise reduction methods at the source and the surroundings (eg ceilings). As a result of noise absorbing material being used to cover the ceiling and the upper part of the building, the noise level will be reduced by 6 dB. By adopting additional measures such as a partial encapsulation of the engines, a further reduction of approximately 5 dB can be achieved. Thus the inside noise level can be decreased to less than 100 dB.

Based on the above, inside noise levels have been predicted as given below:

- PT1 and PT3: $L_A = 99.8$ dB
- PT2 and PT4: $L_A = 98.9$ dB

These inside noise level will also be decreased through transmission to the outside of the pump house due to noise barriers (eg walls of the pump house) and insulation (ie covering the reflecting surface of the wall with a sound absorber material). The following describes the insulation and barriers affecting noise transmission from the pump houses:

- **Wall construction:**

  Reinforced concrete: d = 30cm
  Brick work: d = 20cm
  According to DIN 4109, $R'_W = 64$ dB

  Insulation: d = 10cm
  According to DIN 4109, $R'_W = 12$ dB

  Total sound insulation factor: $R'_W \geq 75$ dB

- **Roof construction:** The roof will not have air insulation. The ceiling, which will be made of reinforced concrete, will have a thickness of 20 cm and 20 cm insulation on top.

  Sound insulation factor: $R'_W \geq 65$dB

- **Doors:** The doors will be composed of interior noise insulation, covered by steel sheets on both sides and a sealing incorporated in the doorframe.

  $R'_W = 20$dB

7.9.3.2 Outdoor sources

The outdoor noise sources are as follows:

- **Ventilation:** Ventilation air will be supplied to the pump house by mechanical devices and will evaporate through openings on top of the building. The openings will be equipped with silencers with an insertion attenuation of 20 dB at a frequency of 500 Hz.

  Airborne sound power level for each Silencer: $L_W = 79$ dB/m²

- **Ventilation – Intake Air**: The intake air is drawn from the outside and will be conveyed into the pump house by pipes, the openings of which are located right above the foundation slab.

  Airborne sound power level for each silencer: L_W = 91dB

- **Heating:** The noise emission level of the heating plant, which is located close to the pump house, is equal to 75 dB (L_W).

- **Exhaust Pipes:** The exhaust pipes of the pump motors are to be placed outside the building. A silencer (or silencers) will be part of the exhaust system.

  Airborne sound power level for each exhaust pipe: L_W = 86 dB

  The wall openings for the exhaust pipes will be closed with sound absorbing materials and as a consequence the residual emissions can be ignored.

- **Cooling:** The motors are cooled by fin-fan coolers.

  Airborne sound power level for each exhaust pipe: L_W = 91 dB

7.9.4 Noise modelling

Noise modelling is based on a 3-D topographical database. This model also includes buildings, covering the main dimensions (length, width, height). Noise levels are to be considered against the standards described above. The computation is based on VDI (Verein Deutscher Ingenieure) 2714 and VDI 2720 (ie identical to ISO 9613).

The calculation of the noise level inside the pump house was based on the following items:

- state-of-the-art computer model for acoustics;
- noise emissions according to vendor data, compared and checked in line with regulations and based upon experience;
- data of noise absorbing material based on vendor information.

The calculation focuses on residential buildings (1.5m above ground level). All results are depicted on noise maps (ie equal loudness contours around the facilities).

Figure 7.16 to Figure 7.19 indicate predicted noise contours around the four pump stations based upon the modelling described above. As can be seen from these figures, the predicted noise values from the modelling studies are below World Bank standards for night-time noise at the nearest residential areas which are the housing compounds within the pump station boundaries (ie 30-40 dBA). Based on the significance criteria for assessing potential noise impacts (see Section 3.8.8.3) it can therefore be concluded that the nearest private residential areas, which are further away, will be subject to potential minor impacts during the operational phase of the pump stations due to noise emissions.

7.9.5 Health and safety of staff

Given the noise abatement measures described above (noise absorbing materials, partly encapsulation of engine), the noise level inside the pump house will be below 100 dB. Due to health and safety considerations, staff working hours in the pump house will have to be limited. The limits will depend on the actual noise level. EU regulations require hearing protection to be mandatory above 85dB. Hearing protection will be mandatory within the pump house even for very short visits.

7.9.6 Conclusion

By using noise absorbing materials, encapsulating noise sources, and designing structures in a way that reduces noise emissions to a minimum level, the limits stipulated in both World Bank Standards and Turkish Noise Control Regulations will be complied with at the nearest residential receptors which will be the housing compounds within the station boundaries. Private residential properties are located over 1km from the pump houses and will be subjected to potential minor noise impacts due to operation of the pump stations.

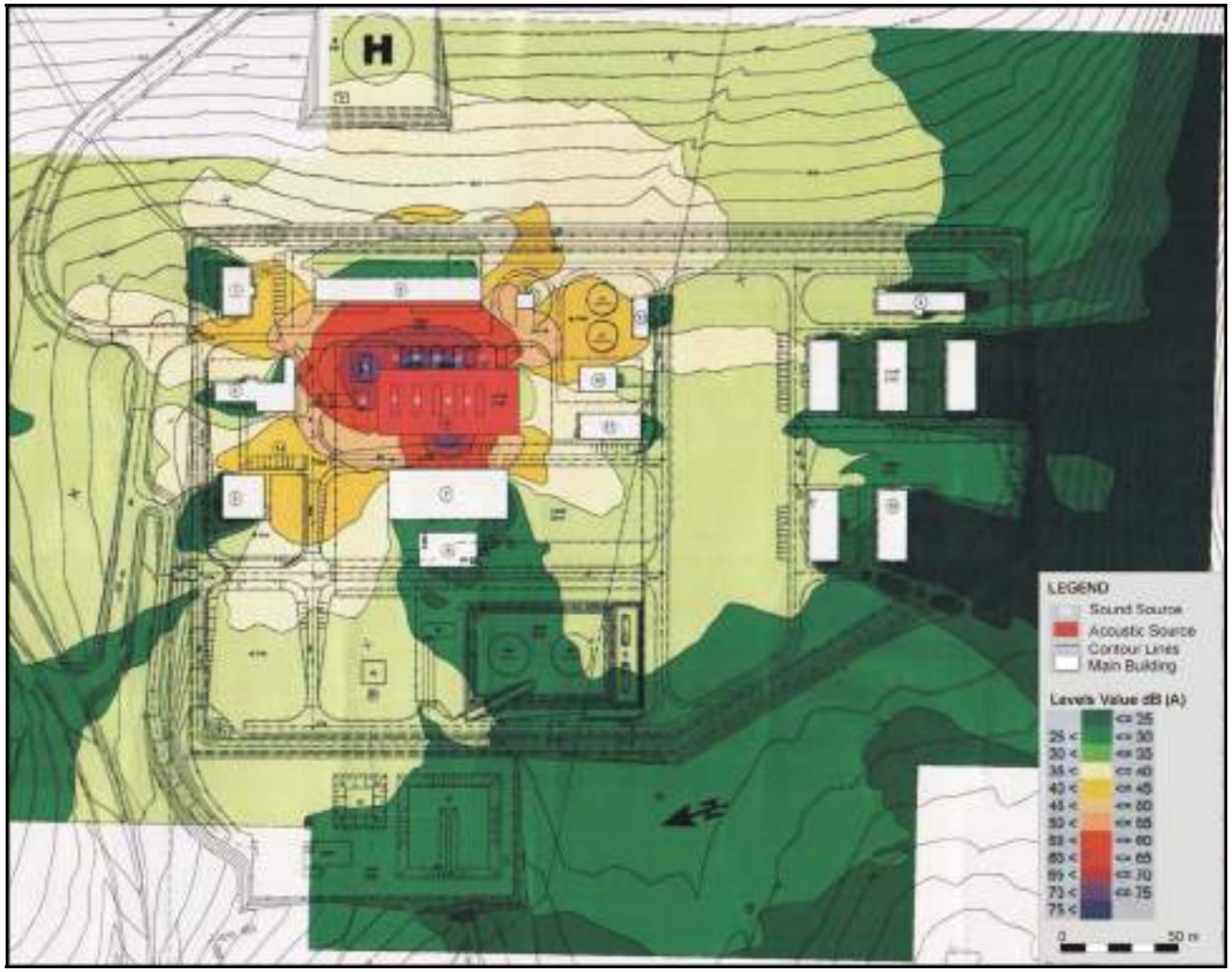


Figure 7.16 Noise Map of PT1

Figure 7.17 Noise Map of PT2

Figure 7.18 Noise Map of PT3

Figure 7.19 Noise Map of PT4

7.10 TRAFFIC AND TRANSPORT

Potential impacts, mitigation measures and assessment measures in relation to traffic and transport are described in Section 6 and detailed in the Traffic Management Plan (Appendix C5).

There will be minimal traffic associated with the AGIs during operation of the pipeline. A daily patrol of the pipeline will occur, requiring one vehicle per each 200km section of pipeline (approximately). Further traffic flows will be generated when maintenance of the AGIs is required. No operational traffic-related impacts are anticipated.

7.11 CULTURAL HERITAGE

Cultural heritage management for the Project started in the earliest stages of route development, with different phases of management being carried out, refer to Section 5.8. Phase 1 and Phase 2 have been completed for the period of EIA preparation. The future management activities, primarily associated with the pre-construction and construction phases have been addressed in the Cultural Heritage Management Plan (see Appendix C7).

Archaeological investigation undertaken to identify known and potential archaeological sites along the pipeline route included investigation of the PT1, PT4 and the former IPT1 sites and the surrounding area. No archaeological sites or potential sites were identified at or in the vicinity of these AGI sites.

No known archaeological sites have been identified in the vicinity of the PT2, PT3 or IPT1 sites however, as these sites have only recently been selected as the preferred location for these pump stations, baseline archaeological field investigations undertaken in relation to the BTC Project have not specifically covered these sites. Additional site specific archaeological investigation at these sites will be undertaken during summer 2002, prior to the commencement of construction activities.

It is anticipated that any previously unrecorded archaeological features revealed during the pre-construction and construction phases, will be managed in accordance with the provisions of the CHMP, prior to the onset of operation. There are, therefore, unlikely to be operational impacts predicted in relation to archaeology or cultural heritage.

7.12 BLOCK VALVE STATION (BVS) IMPACT

Locations for 52 block valve stations (BVSs) have been selected based on the findings of a risk assessment study (see Section 8). These locations are shown on the route maps contained in Section 6. A description of the block valve stations is contained in Section 4.7.15.

While block valves provide environmental protection in a contingency event by allowing the isolation of pipeline sections, there are some potential impacts associated with the presence of block valve stations during normal operation. These are as follows:

- permanent land take associated with block valves and permanent access roads;
- potential impacts due to the presence and use of additional permanent access roads;
- potential visual impact due to permanent above ground structures.

A summary of the BVS locations and baseline environment relevant to these potential impacts (eg access road lengths, existing land use, habitat type, proximity to residential receptors) is presented in Table 7.12.

The area of permanent total land take associated with each block valve station is dependant on the length of the associated access road (see Table 7.12). The block valve station itself will result in a permanent land take of approximately 350m^2. At sites located within ESAs this will result in a corresponding loss of sensitive habitats. Further habitat surveys were conducted during summer 2002 at PT3 and at the 10 BVS locations sited in known ESAs. The study concluded that the construction of the AGIs presents a low risk to Red Data Book Species, however special attention is needed at locations PT3, BVS27, BVS28 and BVS36.

The mitigation measures described in Section 6 in relation to construction at these sites will be adopted to minimise the loss of habitat and sensitive species. Based on the identified mitigation measures and the small area of habitat affected, the potential ecological impacts will be moderate at BVS sites located within ESAs (see Table 7.12) and minor at other BVS sites. Loss of agricultural or other productive land will be compensated through the land acquisition process resulting in a minor potential impact.

The majority of permanent access roads to the BVS sites are relatively short as the sites have been located near to existing roads wherever possible. The longest new access road is approximately 370m and the majority of new roads will be less than 100m in length. Access to the BVSs will only be required for regular maintenance checks and during a contingency event. Consequently, there will be minimal traffic using these roads during operation and potential traffic impacts will be minor (see TMP, Appendix C5). The main potential impacts associated with the presence of these roads will be the associated land take and the potential visual impact. Given the location of BVSs close to existing access and the limited length of new access roads, providing access to previously inaccessible areas through the construction of new roads is not considered to be an issue.

Although the majority of BVS sites are located away from settlement areas nine of the BVS sites are located within 500m of a settlement area. During reinstatement of the pipeline re-vegetation in the vicinity of the pump stations will be utilised to screen the stations from nearby receptors, wherever possible. Given the relatively small size of these stations, potential visual impacts are anticipated to be minor at most sites and no more than moderate at the nine settlements located within 500m of the block valve sites.

Table 7.12 Summary of Block Valve Station Locations and Proximity to Settlement Areas

Block Valve	Approx KP	Approx Length of New Access Road (m)	Habitat Type	Located in ESA	Land use (Class I or II land)	Located within 500m of a settlement area
BVS1	6.8	35	Cultivated Land Deciduous Forest	-	Rain fed	350 m (Kayinli)
BVS2	15.3	360	Subalpine Meadow	-	Non-Agricultural	-
BVS3	19.3	80	Subalpine Meadow	-	Pasture	-
BVS4	36.4	370	Subalpine Meadow	-	Pasture	-
BVS5	48.2	25	Subalpine Meadow	-	Rain fed	-
BVS6	62.9	25	Subalpine Meadow	ESA 5	Rain fed	420 m (Ardahan Org. Ind. Zone)
BVS7	66.4	75	Subalpine Meadow	-	Pasture	-
BVS8	94.4	25	Subalpine Meadow	-	Pasture	-
BVS9	118.740	60	Subalpine Meadow	-	Pasture	-
BVS10	133.4	45	Subalpine Meadow	-	Rain fed	240 m (Tuygun)
BVS11	160.7	40	Subalpine Meadow	-	Pasture	-
BVS12	188.9	45	Plain Steppe	-	Pasture	-
BVS13	221.6	35	Plain Steppe	-	Pasture	-
BVS14	251.4	30	Cultivated Land	ESA 10	Irrigated	-
BVS15	265.1	35	Cultivated Land	-	Irrigated (Class I)	-
BVS16	298.9	50	Cultivated Land	-	Irrigated (Class I)	-
BVS17	321.0	35	Cultivated Land	-	Rain fed (Class I)	-
BVS18	343.0	65	Cultivated Land	-	Rain fed (Class I)	-
BVS19	345.3	45	Cultivated Land	-	Rain fed	-
BVS20	375.0	135	Plain Steppe	-	Rain fed	-
BVS21	407.9	40	Cultivated Land	-	Rain fed (Class I)	410 m (Yesilova)
BVS22	411.0	80	Cultivated Land	-	Irrigated (Class I)	-
BVS23	431.1	30	Cultivated Land	-	Irrigated (Class I)	-
BVS24	460.2		Montane Steppe	-	Pasture	-
BVS25	467.8	35	Montane Steppe	ESA 21	Rain fed	-
BVS26	478.7	35	Montane Steppe	ESA 22	Irrigated (Class II)	-
BVS27	486.5	45	Alpine Zone	ESA 24	Pasture	-
BVS28	497.7		Alpine Zone	ESA 24	Pasture	-
BVS29	518.8	35	Coniferous Zone	-	Rain fed	-
BVS30	530.0	50	Cultivated Land	-	Irrigated (Class I)	-
BVS31	545.0	25	Cultivated Land	-	Irrigated	-
BVS32	548.8	20	Plain Steppe	-	Pasture	310 m (Bekolar)
BVS33	591.6	275	Cultivated Land	-	Rain fed	-
BVS34	603.5	70	Cultivated Land	-	Rain fed (Class II)	310 m (Cukuryurt)
BVS35	622.9	40	Cultivated Land	-	Irrigated (Class I)	-
BVS36	658.8	25	Cultivated Land	ESA 28	Rain fed (Class I)	-
BVS37	675.8	75	Cultivated Land	-	Rain fed (Class II)	-
BVS38	700.1	35	Cultivated Land	-	Rain fed (Class II)	-
BVS39	711.5	35	Cultivated Land	-	Rain fed	-
BVS40	749.8	55	Cultivated Land	-	Rain fed (Class II)	190 m (Pasakoy)
BVS41	786.2	60	Cultivated Land	-	Rain fed	-
BVS42	794.8	45	Plain Steppe	-	Pasture	-
BVS43	822.6	20	Cultivated Land	-	Rain fed	-
BVS44	846.0	20	Cultivated Land	-	Pasture	210 m (Yukari Borandere)
BVS45	878.4	40	Cultivated Land	-	Pasture	310 m (Kurudere)
BVS46	902.8	30	Cultivated Land / Plain Steppe	ESA 41	Rain fed	-
BVS47	921.7	30	Cultivated Land	-	Irrigated (Class I)	-
BVS48	943.2	125	Non-Agricutural	-	Irrigated (Class II)	-
BVS49	975.5	35	Cultivated Land	ESA 46	Rain fed (Class II)	-
BVS50	992.6	45	Cultivated Land	ESA 47	Irrigated (Class II)	-
BVS51	1027.3	30	Cultivated Land	-	Rain fed (Class II)	-
BVS52	1059.0	50	Cultivated Land	-	Non-Agricultural	-

7.13 DEMOGRAPHICS AND MIGRATION

7.13.1 Community Relations

7.13.1.1 Impacts

Relationships developed between the Project and the local residents during construction of the pipeline and AGIs will establish the foundation for ongoing relationships during operation. The quality of these relationships is dependent upon successfully minimising Project impacts during the construction phase, optimising potential benefits to local residents and rapidly identifying and resolving potential problems through an effective Community Relations Programme.

Local residents alongside the pipeline are likely to be the first to identify any risks to the pipeline and associated facilities (eg resulting from unauthorised construction activities over the pipeline) and are also the ones who would be primarily affected in the event that such activities resulted in leaks from the pipeline.

The main interaction between the local residents and workers will take place close to the AGIs, but this will potentially be of relatively low impact.

7.13.1.2 Mitigation objectives

The objective of the Community Relations Programme (CRP) in the operational phase will be to:

- maintain constructive relationships between residents of local settlements and the pipeline operators, to assist in the operation of the pipeline;
- maintain awareness of safety issues among settlements along the pipeline route;
- ensure compliance with land use constraints among land owners along the pipeline route;
- monitor community attitudes to the pipeline and operating company.

7.13.1.3 Mitigation measures

BOTAŞ International will implement a Community Relations Programme during operation of the pipeline. The component activities of this programme will be developed during the construction phase based on the experience at this time. It is anticipated that they will consist of the following.

Pipeline and AGI patrol

Pipeline inspectors will be employed to patrol the pipeline route and AGIs, to ensure compliance with land use constraints. One option is to employ local people to patrol the route close to their settlements. This option will be further explored during construction.

The pipeline inspectors will also be responsible for:

- holding informal meetings with local residents to provide them with information about the pipeline as necessary;
- updating information on settlements (eg changes in leadership) for BOTAŞ International;
- reporting key findings on the route.

Community liaison near AGIs

An individual at each AGI will be responsible for community liaison activities near the AGI. Their responsibilities will include holding regular meetings with residents of local settlements, to identify any issues and concerns. They will also be responsible for identifying appropriate ways for the AGI station to be a good neighbour. This could include, for example, working with the camp to maximize local sourcing of goods and materials, having open days to explain how the AGI functions, providing briefings in schools, etc.

Complaints procedure

A freephone telephone number will be displayed in all settlements neighbouring the pipeline and AGIs to report grievances or concerns. It will also be provided to the Jandarma[2] and emergency services and posted at the entrance to all AGIs. In addition, any complaints raised with the pipeline patrol will be fed into a central complaints unit run by BOTAŞ International and dealt with according to a complaints procedure similar to the one used during construction.

Telephone calls will be answered in person. The caller will be informed of the likely response time and later, of the action taken. To accommodate those that do not have access to a telephone, the Complaints Procedure will address both written and verbal complaints (if delivered in person or by telephone). Responses will be provided in writing or verbally, depending on what is more appropriate (eg if the complainant is illiterate).

Reporting and availability of information

BOTAŞ International will develop short annual briefings that identify any issues arising from the BTC Project operation.

Prior to decommissioning

BOTAŞ International will carry out a decommissioning study during the three years prior to decommissioning of the pipeline to identify and mitigate any negative impacts of de-commissioning.

7.13.1.4 Residual impacts

Implementation of these mitigation measures will ensure pipeline security and effective community relations. As such, it is expected that there will be no significant residual impacts. Impacts associated with non-routine events such as oil spills are discussed in Section 8.

2 Local security forces

7.13.2 Management of construction workers

The number of workers during operation will be very limited (approximately 160 in total) and there will not be more than about 30 in any one location. The Project will look to maximise the use of local people in this workforce. In addition, the Project will seek to build good relationships with local residents. As in the construction phase, all employees will be required to adhere to a workerforce Code of Conduct. These measures should prevent any negative impacts.

7.13.3 In-migration

The likelihood of in-migration during operation is extremely low. There will be few opportunities for employment or for providing goods and services. Settlements near the AGIs are relatively remote and the settlements are currently experiencing out-migration, rather than in-migration. No additional mitigation measures are required.

7.13.4 Safety of neighbouring settlements

Under normal operations, traffic loads will be low and AGIs will be self contained. The greatest risk to safety is from accidental damage to the pipeline. Staff with responsibility for community relations will work with local residents to ensure an understanding of the importance of preventing activities that could damage the pipeline. Maintaining good relationships through the CRP will contribute to the security of the pipeline and therefore the safety of neighbouring settlements.

7.14 EMPLOYMENT, LIVELIHOODS AND SKILLS

7.14.1 Employment

7.14.1.1 Potential impacts

During operation, a total of approximately 150 workers will be employed. These staff will primarily be responsible for operation, surveillance and maintenance of the pipeline, pump stations and pressure reduction station. Of this total, it is anticipated that approximately 80% will be skilled and semi-skilled workers and 20% will be unskilled workers.

7.14.1.2 Optimisation objectives

The optimisation objective is to increase employment of country nationals, and in particular, maximise employment of local residents.

7.14.1.3 Optimisation measures

An Employment Strategy for operation will be developed during the construction phase. It will be based on the objective of increasing the proportion of local staff employed in BOTAŞ International in line with a long-term view of 100% Turkish operation, within which the number of people from local settlements will be maximised. Expatriate and non-local staff will be selected for their training and coaching skills as well as their proven ‘Health, Safety and Environment’ (HSE) and technical expertise and will be phased out as national staff demonstrate the required competence and skills.

A training programme will be developed for all national staff and will commence early enough to enable local staff to participate in site pre-commissioning and commissioning activities.

The Employment Strategy for operation will be made public through the Project web site and information on opportunities for permanent employment will made available in settlements close to permanent facilities.

7.14.1.4 Residual impacts

Expectations regarding employment are high among local residents. Given the low numbers of unskilled labour needed during the operation phase, the potential therefore exists for tensions to develop as a result of unmet expectations.

Measures to manage this residual impact include a communication strategy regarding the extent of employment opportunities and possible employment of local residents as semi-skilled labour following skills training during the construction phase.

7.15 LANDOWNERSHIP AND USE

Impact on land varies in significance between the different pipeline facilities. For the pipeline, which will be buried underground, on-going agricultural activities will be permitted (subject to certain constraints), therefore the operational impact is not considered to be significant. However, due to the structural nature of the AGIs, no such allowances for pump stations, the pressure reduction station or the block valve stations are possible, and the impacts of land take thus endure for the operational life of the Project. As a result, the impacts associated with land take are potentially more significant, depending on the specific location of the AGI.

The total area of land permanently required by the Project can be summarised as follows.

- the 8m pipeline corridor requires 856ha;
- the four pump stations and one pressure reduction station require approximately 70ha in total (PT1: 13.40ha; PT2: 16.94ha; PT3: 18.58ha; PT4: 18.68ha; and IPT1: 3.17ha);
- the permanent access roads for the four pump stations and one pressure reduction station require approximately 3ha;
- the 52 block valves (40 m x 40 m) require a total area of approximately 6.5ha;
- the permanent access roads for the 52 block valves require approximately 24ha.

The impacts of these land takes are discussed separately for each facility.

7.15.1 Pipeline

7.15.1.1 Impacts

All routine works will be carried out within the permanently expropriated corridor. Owners and users of expropriated land within the corridor will be able to use the land for agriculture and grazing purposes (subject to certain restrictions such as no planting of trees), although should any maintenance of the pipeline be required, they would risk losing any crop planted on that land.

7.15.1.2 Mitigation objectives

The objectives of the mitigation measures for land take during the operational phase are as follows:

- to ensure a fair and transparent land acquisition process;
- to ensure that additional land take is informed by an adequate understanding of the associated social and environmental impacts, prior to its authorisation.

7.15.1.3 Mitigation measures

Compensation for ongoing land impacts is considered in the land acquisition process, (see Appendix C9 for an overview of the land acquisition process). Any maintenance activities that require land outside of the permanently expropriated corridor will require an evaluation of the environmental and social impacts. Landowners and land users will be compensated for the temporary use of any additional land.

7.15.1.4 Residual impacts

No significant residual impacts are expected.

7.15.2 Pump stations and pressure reduction station

7.15.2.1 Impacts

Details regarding the proposed locations, including land use, for the pump stations (PT) and pressure reduction station (IPT1) are as follows:

- PT1: in Ardahan province, approximately 2-3km from Sogutlukaya settlement, near the Georgia/Turkey border at Posof. Located on communal pasture land and private land.
- PT2 in Erzurum province, within 4.5km of Alvar settlement in Pasinler District. Located on unused land.
- PT3: in Erzincan province, 1-1.5km from Baskoy settlement in Cayirli District. Located on uncultivated land.
- PT4: in Sivas province, between 2-5km from three settlements in Altinyayla and Ulas Districts, namely Bogazdere, Yazicik and Yesilyurt. Located on private land.
- IPTI: in Kahramanmaras province, 2.5km west-south-west from Geben settlement in Andirin District. Located on private agricultural land belonging to Geben settlement.

Of the proposed locations, only PT1 shows evidence of potential significant impacts. The impacts associated with PT1 are discussed in more detail below.

The proposed PT1 is located on land belonging to the rural settlement of Sogutlukaya in Ardahan province.

PT1 will require the permanent expropriation of 13.4ha of land and an additional 12 ha of land (over a 32 month period) for the temporary construction of a campsite. Approximately one hectare of land will also be permanently acquired for a gendarme station that will be located nearby PT1, on a site selected in consultation with local residents. These land parcels are comprised of both unregistered[3] communal land and unregistered private land, although all land affected by PT1[4], the camp and the gendarme station are used for communal grazing purposes, regardless of their ownership status.

A concern exists regarding the impact that this loss of grazing land will have on the livelihoods of local residents. Although residents have indicated that additional grazing land *is* available (three additional areas plus the summer grazing area were identified), there are no official figures detailing the total amount of grazing land available or the percentage that stands to be lost. This is because the land belonging to Sogutlukaya has not yet been registered and official figures are thus not available. So, while the assurances of local residents do assist in alleviating concerns regarding the impact of this land loss, some concerns do remain. This is due to the fact that animal husbandry is the dominant commercial activity in the settlement and the PT1 site is reportedly the most fertile and flat grazing area available. During construction (a 32 month period), the PT1 site and the construction camp will require approximately 80% of this flat grazing area, while during operation, PT1 and the gendarme station will require approximately 45% of this grazing area (actual percentages will be determined). In addition, the mountainous topography of the area would appear to place limitations on the amount of land available for the grazing of their livestock (current estimate of 600 head of cattle).

Due to weather restrictions (i.e. heavy snow falls), the site is only grazed for two to three months of the year, in May and August/September. In June and July, the cattle are moved to their summer grazing areas (referred to as yaylas), 4.5km south-east of Sogutlukaya. Although the PT1 site is only used for a relatively short period, these two to three monnths constitute more than half of the total grazing period per year.

Thus, although the figures detailing the extent and quality of additional grazing land are not available, residents have indicated there will be no significant loss of livelihood. The number of people/households affected by land expropriation for PT1 is currently unknown. This will be addressed as part of the land acquisition process. The mitigation measures for this potential impact are designed to address these uncertainties as well as provide safeguards against loss of livelihood.

Two other potential impacts were raised by local residents during consultation, namely, the potential impact on a small creek traversing the PT1 site and disrupted movement of cattle during the construction of the PT1 site.

The creek is a temporary water source and is used to provide drinking water for the cattle and to irrigate the grazing area. The mitigation measures will ensure continued access to this water source (see Section 7.15.2.3). Regarding disrupted movement, concerns were raised that the road along which the cattle are herded to their summer grazing area will be unsafe and unusable

3 Turkey's New Expropriation Law (No 2942, with amendment 4650) does not recognise the rights of users of public lands if they are not the owners of these lands. This applies especially to pastures and forests. Compensation is provided to the relevant public agencies but not to the individual or community users. The land acquisition process will however recognise and compensate for the loss of income or livelihood of users of public lands.

4 PT1 will result in the permanent loss of 4ha of communal land and 9.4ha of unregistered private land. The camp site will result in the temporary loss of approximately 7ha of communal and approximately 5ha of unregistered private land.

due to PT1 construction activities and movement of construction vehicles. Commitments have been made to ensure undisrupted and safe movement of cattle to their summer pastures (see Section 7.15.2.3).

7.15.2.2 Mitigation objectives

The mitigation objectives regarding permanent land take for PT1 are as follows:

- to ensure a fair and transparent land acquisition process;
- to ensure that the livelihoods of affected residents are maintained in the long term.

The mitigation objectives regarding impact to water sources and the movement of cattle are as follows:

- to ensure continued access to existing water sources;
- to ensure undisrupted and safe movement of cattle to their summer pastures.

7.15.2.3 Mitigation measures

The compensation package developed as part of the land acquisition process will consider financial and non-financial compensation and a monitoring programme to ensure that the compensation package is successful. The compensation package will furthermore be developed in close consultation with the residents and representatives of Sogutlukaya to ensure that it takes full consideration of available natural resources and other local limitations, as well as local opportunities and priorities. In this regard, the Project will submit a request to the District Agriculture Director to provide detailed information on the extent of alternative grazing land. The results of this report will be used to inform the content of the compensation package. The possibility of securing additional grazing land to compensate for this land take will also be investigated. An overview of the land acquisition process (OLAP) is provided in Appendix C9.

In addition, local residents will be prioritised for employment, as outlined in the Employment and Training Management Plan and associated Monitoring Plans (Appendix C8).

Regarding the potential impact to the creek, continued access to this water source will be secured, either by diverting the creek or by providing suitable alternatives. Local residents will be informed in advance of the timing of any disruptions and the measures to be taken. A minimum of three days warning will be provided.

Regarding disrupted movement of cattle, an alternative access route will be provided to ensure undisrupted and safe movement of cattle to the settlements summer pastures. In the weeks prior to construction, the community liaison team will also hold meetings with local residents. A priority topic will be safety, including both road safety and also an explanation of the hazards posed by construction activities.

7.15.2.4 Residual impacts

Local residents have indicated that alternative grazing land is available, and that the proposed mitigation measures do alleviate their concerns. However, due to concern raised by residents over the last six months, the potential impact on livelihoods in Sogutlukaya will be considered significant until figures on the extent (and quality) of alternative grazing land are known and the compensation package is available for evaluation.

7.15.3 Block valves

7.15.3.1 Impacts

There are 52 individual block valve stations situated along the pipeline. Each of these block valves will require a permanent land take of approximately 40m x 40m, plus additional land to facilitate the construction of/or upgrading of a permanent access road). Potential impacts on livelihoods as a result of this land take are not considered to be significant for any of the proposed locations.

7.15.3.2 Mitigation objectives

The mitigation objective regarding permanent land take for the required block valves is to ensure a fair and transparent land acquisition process.

7.15.3.3 Mitigation measures

Compensation for ongoing land impacts is considered in the land acquisition process (see Appendix C9 for an overview of this process). Should any maintenance activities require the use of land outside of the permanently expropriated land, an evaluation of environmental and social impacts should be undertaken. Landowners and land users will be compensated for the temporary use of any additional land.

7.15.3.4 Residual impacts

No significant residual impacts are expected.

7.15.4 Infrastructure and services

Operation of the pipeline and AGIs will not impact upon infrastructure. Use of utilities such as electricity and water will not impact upon the service provision to local settlements. Any maintenance activities that may impact upon infrastructure and services will require an evaluation of the environmental and social impacts. Mitigation objectives and standards applied to any such works will be the same level as for construction activities.

BIBLIOGRAPHY

Ref 1 US EPA (1995), SCREEN3 Model User's Guide, EPA-454/B-95-004, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Research Triangle Park, N.C., September 1995.

Ref 2 World Bank (1998), Pollution Prevention and Abatement Handbook, Airshed Models, p. 84, Washington D.C.

Ref 3 US EPA (1992), Screening Procedures for Estimating the Air Quality Impacts of Stationary Sources, EPA-454/R-92-019, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, N.C., October 1992.

Ref 4 ILF-TNO-EPL-GEN-001-Rev B, 2002. Technical Note on Thermal Behaviour of Turkish Section of BTC Pipeline

8 BTC PIPELINE - ACCIDENTAL OPERATIONAL EVENTS AND INCIDENTS

8.1 INTRODUCTION

This section of the Report describes the process undertaken and presents the results of the Environmental Risk Assessment (ERA) of potential impacts arising from accidental events associated with the Turkish section of the BTC Pipeline, including the Above Ground Installations (AGIs). It specifically excludes the assessment of accidental events associated with the BTC Marine Terminal, which is presented in Section 14.

8.2 OBJECTIVES

This assessment has set out to meet the following objectives:

- align the approach adopted for the assessment of environmental risk across all three countries (Turkey, Georgia and Azerbaijan) for BTC as well as the approach between BTC and South Caucasus Gas Pipeline (SCP);
- consult with other practitioners to ensure that the approach is consistent with (and as robust as) that used on other similar projects;
- calculate oil spill release volumes under different scenarios;
- identify environmental sensitivity along the route;
- determine risks and potential environmental consequences;
- use the results to input into the Design Process (such as valve locations assessment, mitigation measures), thereby maximising the potential to ensure the integrity of the pipeline under all practicable circumstances.

8.3 OVERVIEW OF RISK ASSESSMENT APPROACH

8.3.1 Overall approach

Risk combines the probability of an event (such as an oil spill) with the severity, or consequence, of the event (related to the magnitude of the spill and the sensitivity of the resources affected). This risk assessment has combined the assessment of oil spill probabilities, spill magnitude, and environmental sensitivities to develop a composite assessment of risk at each location along the BTC Pipeline length. A schematic overview of the approach is illustrated in Figure 8.1.

In addition to its application to the environmental assessment process, the results of this risk analysis have been used in an iterative process to refine the placement of pipeline valves and to consider other project design refinements to reduce the environmental risk associated with the Project.

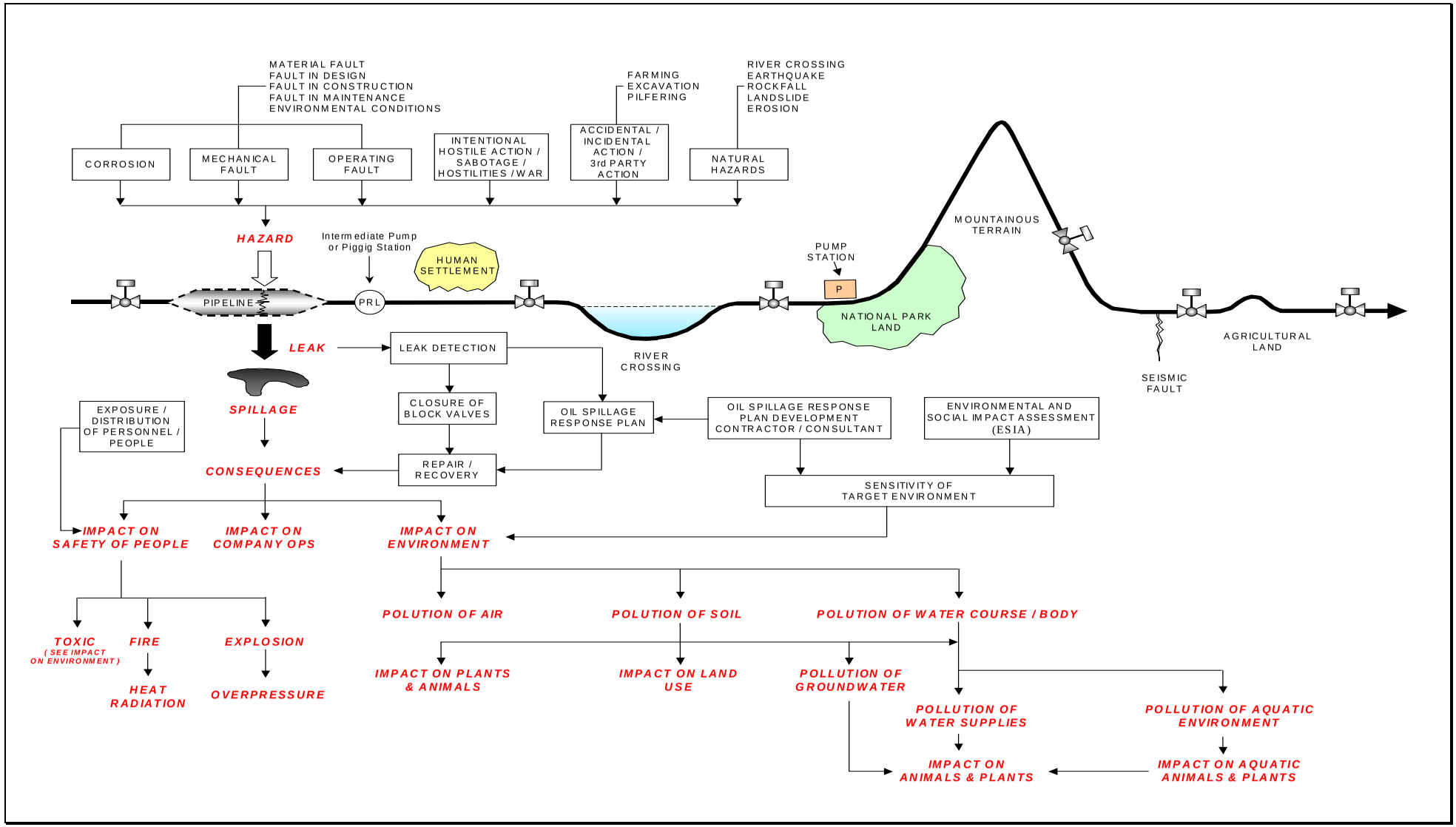


Figure 8.1 Schematic of Risk Assessment Approach for BTC

The analysis is based on a review of the engineering details of the proposed BTC Project and an evaluation of past performance of similar pipelines in Western Europe. It has been conducted to provide background information useful to the environmental review of the proposed project. This information was developed as part of the Design Phase of the project engineering effort, and is being used as input data in the detailed design effort. Overall, this effort is intended to allow the consideration of project design features that will reduce the environmental risks associated with the operation of the proposed pipeline system.

This document focuses on risks associated with the pipeline itself and the AGIs, namely the four pipeline pump stations (PT1/2/3/4) and the pressure reduction station (IPT1).

The risk analysis approach used in this assessment follows standard methodology for such work and is consistent with Ref 2 and Ref 3, which provide the framework for this work in the context of the Turkish section of the BTC Pipeline.

8.3.2 Definition of risk

The calculation of risk combines the probability of a hazardous event occurring and the consequence of that event causing an undesirable outcome, whether this is a serious injury or fatality or damage to the environment. Risk is normally defined as the numerical product of the frequency of a hazardous event and the consequences of the hazard expressed in a suitable form, such as damage to the environment. This analysis focuses on environmental risk.

Environmental Risk is defined as the risk to the environment as a whole, that is air, water, land, plants and animals, including direct or indirect impact on people. The environmental risk value described in this report and used in the assessment of the relative risk along the pipeline has been calculated as:

> Environmental Risk = Frequency of Failure Event x Consequences of Event (which relates to Volume of Oil Spillage and Environmental Sensitivity)

The major steps in the risk assessment process are:

- hazard/failure mode identification (categories of spill causes);
- failure frequency analysis;
- evaluation of potential spill sizes;
- determination of environmental sensitivity;
- quantification of environmental risk by combining spill frequency, spill magnitude and sensitivity of affected environmental features.

Assessment of environmental sensitivity requires consideration of both the susceptibility of the environmental resource (ie the availability of a pathway for the oil spill to interact with the sensitive target) and the importance or value of the environmental resource.

8.3.3 Hazard scenarios modelled for risk quantification

The hazard scenarios modelled in this study have included three leak sizes, identified leak detection times and various alternative valve locations. Block valve (BV) closure times have been agreed for each case based on the best information available at this time. The Pipeline is considered in detail in one kilometre long discrete sections. The anticipated leak volume and environmental sensitivity of each section have been determined. Location-specific leak frequencies due to potential localised natural hazards (such as land slides) are also taken into account for each kilometre.

8.3.4 Hazard sequences and event trees

Once a hazardous event is initiated, a number of sequences of progression are possible, depending on the circumstances of the situation under consideration. The normal method for defining and capturing these potential sequences in the risk calculation is in the form of Event Trees (ETs). A generic ET has been developed for this assessment and is presented in Figure 8.2. Each arm of the ET represents a different sequence of events, therefore it is possible to have as many sets of consequences as there are sequences. Subtree 1 on this ET represents the risk calculation (for environmental consequence only) for a sequence of events, and essentially defines the approach used in this study, which is that all leaks are detected and BVs are shut according to estimated detection and response time intervals.

Because of the large number of calculations required and the linear form of the subject area (ie the entire length of the pipeline), a spreadsheet was utilised to calculate the risk profile of the pipeline.

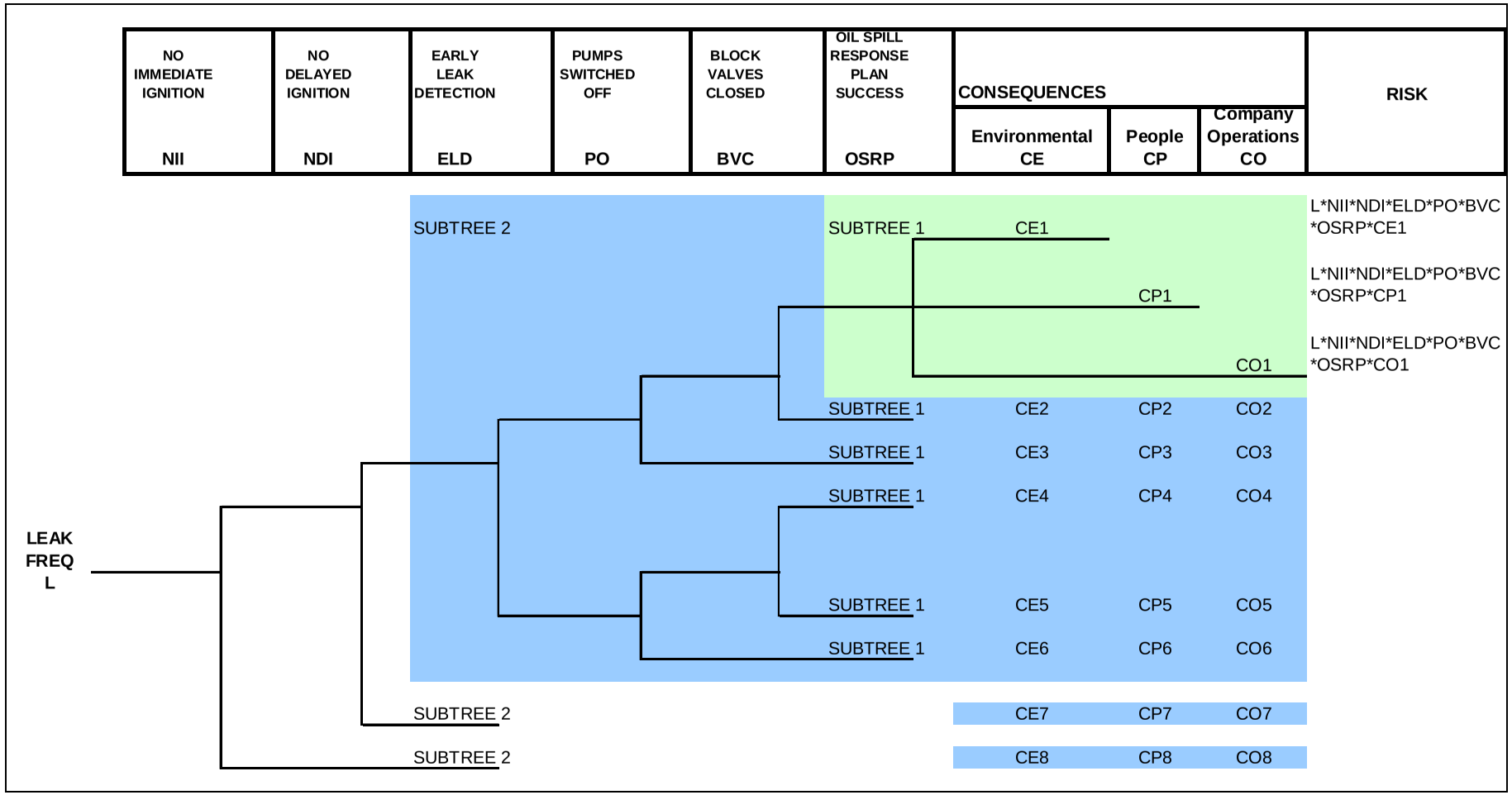


Figure 8.2 Fault Tree Analysis for BTC Pipeline

8.4 DETERMINING THE PROBABLE FREQUENCIES OF SPILL EVENTS

8.4.1 Historical data used to develop benchmark spill frequency estimates

The first task associated with this risk assessment requires determination of the likelihood (or frequency) of spill occurrence. This has involved consideration of historical data and site-specific conditions to estimate a predicted frequency of spill or leak event. Western European pipeline failure and leakage data compiled by CONCAWE [Ref 4] has been used to develop an initial estimate that has formed the spill frequency 'benchmark'. As indicated in Table 8.1, the historical record of pipeline spill events presents specific records of spill statistics associated with the following categories of failure:

- corrosion, both internal and external;
- mechanical faults, covering failure of the pipeline and fittings;
- operating faults, such as over-pressurisation;
- intentional hostile action against the pipeline, including sabotage and vandalism;
- accidental or incidental action against the pipeline, normally in the form of physical impact from mechanical tools;
- natural hazards, such as earthquakes, mud volcanoes, rockfalls, landslides, mudflows, ground subsidence or heave, erosion and river scour;
- man-made hazards, such as railways, roads, and adjacent pipelines or plant.

CONCAWE is a body sponsored by the oil industry to undertake research into issues affecting European oil companies. It compiles and publishes yearly data on oil spills that have occurred in Western Europe (excluding Turkey). Table 8.1 is the latest of such reports, covering 25 years of pipeline operation. This represents the largest failure data set of relevance and with enough specific detail for the purposes of risk assessment. As the CONCAWE data is derived from Western European experience, some of it is not fully representative of the hazards and experience in other geographical settings. This requires judicious adjustment of some aspects of this data set in its application in this study. Table 8.1 summarises the frequency data used as a benchmark for this study.

By combining frequency figures with the types of leaks attributable to the various causes, an appreciation of both frequency and volume is apparent. Figure 8.3 shows that, while a high frequency of failure is associated with mechanical failure, these tend to be in the small leak volume category. Third party damage is associated with the highest frequency of both 50mm leaks and full bore rupture.

Table 8.1 Historical Data (CONCAWE) used as Benchmark

Spill Cause	Frequency of Spillage (incidents/km/y)
Mechanical Failure	
- Line Pipe Failure	8.44 E-5
- Valves & Fittings	5.06 E-5
(Subtotal)	(1.35 E-4)
Operational Fault (system malfunction/human error)	4.78 E-5
Corrosion Related	
- External Corrosion	5.35 E-5
- Internal Corrosion	4.22 E-5
(Subtotal)	(9.56 E-5)
Natural Hazards	1.41 E-5
Third Party Damage	
- Accidental/Incidental	1.55 E-4
- Intentional/Malicious	1.41 E-5
(Subtotal)	(1.72 E-4)
TOTAL	**4.64 E-4**

Source: [Ref 6]

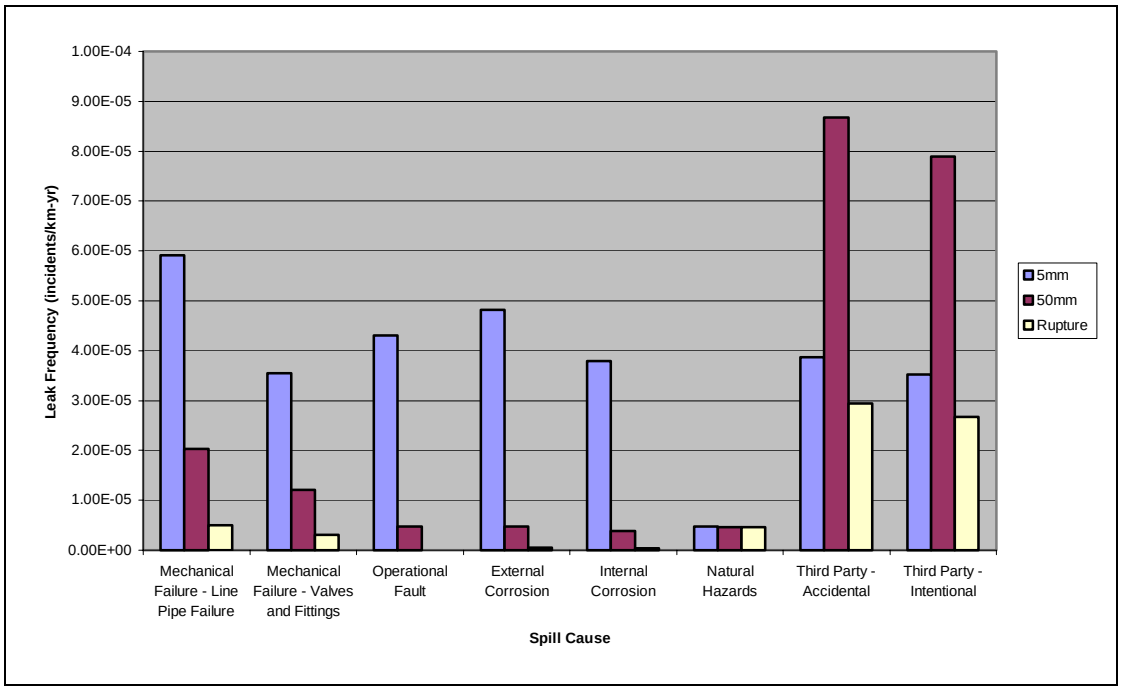


Figure 8.3 Leak frequency by hole size and fault category [Ref 4]

CONCAWE data indicates that in Western Europe, spills arising from accidental third party interventions, which include activities like farming and trenching, accounted for the majority of leaks. It could be argued, however, that such activities can be expected to be significantly less frequent in Azerbaijan, Georgia and Turkey. Population densities and the number of services being worked on are both significantly lower in the countries than in Western Europe and different farming practices apply. The use of CONCAWE data may therefore result in a conservative assessment of risk from this particular type of event. On the other hand, as noted above, there may be a potential increase in risk from intentional malicious damage from third party activities.

A limitation in the direct use of some of the CONCAWE analysis is that, because of the Western European origin of the data upon which it is based, care is required in its application outside of the Western European environment. There is some uncertainty in the extrapolation of this data, even in appropriately modified form to take account of obvious differences, to the territories of Azerbaijan, Georgia, and Turkey. There are many factors specific to these countries and their general geographical setting, which will apply to this pipeline project, that are either under-represented or absent from the Western European experience. Obvious examples are:

- earthquakes, which occur more frequently in the border region between Europe and Asia than in Western Europe;

- political instability in some areas, which can result in terrorist action against the assets of a state, such as pipelines;

- differences in weather and geographical features, such as the large number of seasonal rivers that can result in flash floods or high seasonal flowrates, with appreciably more energy than normal.

These considerations infer that a meaningful estimate of the probability and size of a leak in the BTC oil pipeline requires a more subjective approach than simple extrapolation of CONCAWE data; in particular, area-specific data using confirmed field survey information should be used wherever possible. In this regard, consultations with key stakeholders has highlighted the need for assessment of the risks at rivers and landslide areas to be given particular consideration.

8.4.2 Refinement of spill frequency estimates to reflect project-specific conditions

The spill frequency estimates developed from CONCAWE historical data have been modified to more specifically address project-specific conditions within the vicinity of the BTC Pipeline corridor. These modifications address site-specific natural hazards. This refinement has been developed by review of each kilometre length along the BTC Pipeline corridor, and appropriate site-specific spill frequencies have been in-put to the spill risk model. This location-specific analysis has been conducted to provide essential input to project engineers involved in design efforts intended to reduce spill risks.

8.4.2.1 Site-specific natural hazards

Natural hazards represent a variable risk for pipelines depending on their location. Refinement of historical risk frequencies requires the use of information from a geohazard review specific to the BTC Pipeline route. Specialist consultants are being engaged to analyse the failure data from landslides, fault crossings and river erosion hazards.

Seven known active fault crossings have been identified for specific consideration. Each of these faults will be evaluated to define a recurrence interval for fault displacement exceeding pipeline design specifications, and this will be used to define an annual probability of a design-level fault displacement. This information will then be used to develop a conservative estimate of the annual spill frequency (spills per kilometre-year) associated with pipeline segments directly exposed to each fault displacement.

Landslides have also been specifically addressed in this study. Specific investigations have been carried out to ensure that the residual risk from landslides is minimised. A potential impact in the vicinity of a landslide area near the settlement of Gulluce is part of an extensive geotechnical investigation, which is currently ongoing.

River crossings have been identified as another natural feature with the potential to affect spill frequencies. Design verification is ongoing, and once completed, the need for further assessment to determine whether there are rivers that justify special consideration in spill frequency calculations, will be made.

The above work is currently ongoing and once finalised will be used to update the ERA.

8.4.2.2 Project design features affecting spill frequencies

The oil spill frequency calculations have been reviewed by project design engineers to identify opportunities to reduce the potential occurrence of oil spills. In the course of this analysis it has become apparent that some design features intended to reduce the potential size of accidental oil spills also involve a slight increase in spill risk associated with these design features. Specifically, the installation of block valves and check valves required to isolate pipeline segments and reduce total spillage volumes actually represent additional potential oil leakage features that require evaluation.

The additional spill potential associated with pipeline valves has been addressed by adding valve leakage frequencies to the spill frequencies calculated using CONCAWE's historical data. Valve failure estimates presented in Ref 9 have been used in this analysis, which includes 1.6 E-4 leaks (5mm or less) per valve-year, and 4.0 E-4 holes (6mm to 50mm) per valve-year for actuated isolation valves. Though this may conservatively over-estimate the actual spill frequency, this approach has allowed pipeline engineers to evaluate the trade-off between increased leak frequency and reduced spill volumes associated with the addition of valves to the pipeline system.

Another design feature considered in the spill frequency analysis is the proximity of the Natural Gas Pipeline (NGP, see Section 4) to the BTC Pipeline, which it parallels for 331km through Turkey. It is not possible to quantify the hazard frequency from the NGP, as a risk assessment does not exist. Therefore, the hazard frequency used in Azerbaijan and Georgia, representing the presence of the South Caucasus Gas Pipeline (SCP, see Section 4.4.2) was added as an increased spill frequency in the spill occurrence model.

8.4.3 Overall spill frequency results

The analysis of potential oil spill frequencies using historical CONCAWE data and the specific refinements described above has enabled the determination of location-specific spill occurrence frequencies. This information has been used along with spill volume calculations and environmental sensitivity analyses to define the overall environmental risk associated with potential oil spills from the BTC Pipeline.

8.5 CALCULATING POTENTIAL SPILL VOLUMES

8.5.1 Overview of spill volume calculations

The magnitude of potential oil spills is an important element in the assessment of overall risk. The volume of oil spilled is influenced by several factors, including:

- size of the leak opening;
- pressure and flow rate at the leak site;
- time required to detect and respond to the leak;
- leak location and associated factors such as topography, static liquid head pressure, valve placement, and response access.

This evaluation of spill sizes begins with the separation of spill events into three categories based on the size of the leak opening. For convenience, these categories comprise pipe openings of 5mm or less ('leaks'), 6mm to 50mm ('holes'), and full pipe rupture. Records of each of the spill causes discussed in Section 8.4 have been reviewed to define the characteristic distribution of leak opening associated with each cause. Table 8.2 presents the proportion of leaks in each size group associated with each spill cause. This information has been used to define the frequency of occurrence of leak openings of each size category for each one-kilometre long segment of pipe along the entire pipeline length.

Table 8.2 Leak Size Distribution by Spill Cause

CAUSE	PROPORTION OF TOTAL LEAKS (%)		
	Leak (5 mm or less)	Hole (6 mm to 50 mm)	Rupture (full bore)
Mechanical Failure			
- Line Pipe Failure	70	24	6
- Valves & Fittings Failure	70	24	6
Operational Fault (System Malfunction/Human Error)	90	10	0
Corrosion-related Spills			
- External Corrosion	90	9	1
- Internal Corrosion	90	9	1
Natural Hazards	34	33	33
Third Party Damage			
Accidental and Incidental	25	56	19

Source: [Ref 6]

A characteristic spill volume associated with each spill size category has been calculated for each kilometre-point based on pipeline operating characteristics and location-specific data. This calculation addresses three distinct phases of oil release associated with each spill event.

- The first phase involves the calculation of leak volume, V_1, from the initial leak occurrence until leak detection and initiation of pump shutdown and valve-closure response to the leak event. Spillage during this first phase involves leakage at full operation of the pipeline system.

- The second phase spill release volume, V_2, is a calculation of leak volume during the depressurisation of the pipeline section. This phase begins immediately following controlled closure of pipeline valves, and continues until free flow from the leak opening associated with gravity drainage and siphon effects.

- The third phase (V_3) continues until response crews arrive at the leak site to contain the release.

Table 8.3 indicates the leak detection and response times and other details estimated to develop the spill volume calculations used in this study.

Table 8.3 Assumed Response Times in Calculation of Spill Volumes

ACTIVITY	Hole Diam 5 mm (LEAK)	Hole Diam 50 mm (HOLE)	Hole Diam Full Bore (RUPTURE)
Time to detect and confirm leak (T1).	48 hours	1 hour	1 minute
V1: Time to shutdown pumps (T2).	10 min	10 min	10 min
V2: Time to close Block valves in affected section (T3).	10 min	10 min	10 min
V3: Time to mobilise Spill Response Team and contain/control leak (T4).	24 hours	24 hours	24 – 72 hours to mobilise team and equipment sufficient to deal with catastrophic spill.
Total spill/leak duration (T1 + T2 + T3 + T4)	72 hours	25 hr 20 min	Time for affected section to drain down.

8.5.2 Spill volume inputs to the risk model

The total volume of oil spilled in any one kilometre section of the pipeline arising from each of the three leak categories considered has been calculated using the computer program AUMEX developed by ILF, the design contractor for the Turkish section of the BTC. A comparison of the outputs from this model has been made with the detailed Bechtel hydraulic analysis model for the entire BTC Pipeline to confirm the validity of the model. A further check of the outputs from the model has been made with information available on pipeline leaks in Central Texas Ref 12. As a result of these comparisons a number of refinements have been made to the spill size calculation methods used in the model for BTC.

Once spillage of oil is detected, action can be taken to minimise the consequences of this. The Oil Spill Recovery Plan will be initiated and measures for collection of spilt oil implemented. This is taken into consideration in the risk model as the final Environmental Risk is based on net

volume of the oil spilt, rather than the original or gross volume predicted by the leak model. Allowance for success of clean-up operations is made by specifying a 50% reduction of the gross spill volume predicted by the model. This is an approximation and represents all types of spills.

With the completion of this element of the analysis, an understanding of the magnitude of potential oil spills is available to supplement the estimate of spill occurrence frequencies. Taken together, these two elements of the risk study provide an understanding of the most likely spill volumes at specific locations along the pipeline route.

8.6 CONSIDERATION OF ENVIRONMENTAL SENSITIVITY

Environmental sensitivity has been determined based on the potential ease with which spilled oil could reach environmental receptors combined with the degree of sensitivity of those receptors. This evaluation has been undertaken for each one kilometre-long segment of the pipeline, and has focused on the following categories of environmental receptors:

- terrestrial ecological resources;
- land use resources;
- proximity to downslope known archaeological resources;
- surface water resources;
- groundwater resources.

Each of these environmental resource categories has been reviewed for each one kilometre pipeline segment, and a ranking of environmental sensitivity has been developed for each resource category.

Table 8.4 and Table 8.5 present the evaluation criteria used to define the sensitivity level for each environmental resource at each one-kilometre segment. Determining environmental sensitivity for terrestrial ecological resources, land use and archaeological resources has been determined via a single step for each category utilising the criteria listed in Table 8.4, whereas determining environmental sensitivity for surface water and groundwater has comprised three discrete steps, as indicated by Tables 8.5(a)-8.5(d) within Table 8.5.

Table 8.4 Determining Environmental Sensitivity for Ecology, Landuse and Archaeology

Aspect Rating Criteria	Proximity to Terrestrial Ecological Resources	Land Use	Proximity to downhill known Archaeology
Not Sensitive	No ecological resources of value	Unused	Greater than 1km
Low	500m to 1000m	Extensive rough grazing	500m to 1000m
Medium	100m to 500m	Intensive grazing, no local populations	100m to 500m
High	Right of Way (RoW) to 100m	Horticultural/Arable Agricultural Use +/o national reserves, local populations	RoW to 100m
Very High	0m/RoW	Horticultural/Arable Agricultural Use +/o reserve of international importance, local populations	0m/RoW

Table 8.5 Determining Environmental Sensitivity for Groundwater and Surface Water

Table 8.5a Step 1: Assess the Receptor Value

Rating	Surface Water	Ground Water
Very high	River crossing national borders, discharging into Mediterranean Sea, water supply reservoir, river supplying city or numerous small communities, to industrial complex, to industrial agriculture, or to a recognised (listed) wetland	Water supply to city or collection of small communities, to industrial complex, or to industrial agriculture.
High	Water supply to communities less numerous than above, to regional irrigation, to recreation, or to a wetland less important than above	Water supply to communities less numerous than above or to regional irrigation
Medium	Water supply to a single small community, to livestock, or to small-scale irrigation	Water supply to a single small community, to livestock, or to small-scale irrigation
Low	Water supply not meeting the criteria of medium	Water supply not meeting the criteria of medium
Not sensitive	not applicable	not applicable

Table 8.5b Step 2: Assess Potential for Pollution Contact

Rating	Criteria	
	Surface water	**Ground water**
Very high	Direct: RVX-1	Very high contact potential: pipeline located within unconfined aquifer
High	Indirect*: RVX-2, perennial stream	High Contact Potential: pipeline located on critical recharge pathway (river or subsurface)
Moderate	Indirect: RVX-3, perennial stream	Moderate contact potential: pipeline located over confined aquifer.
Low	Intermittent or ephemeral RVX-3 as above	Low contact potential: pipeline located adjacent to major aquifer areas.
Not sensitive	No stream	No pathway
* Pollution becomes indirect if it passes via a channel before reaching the target receptor.		

Table 8.5c Groundwater Resources Sensitivity

		STEP 1. RECEPTOR VALUE				
		VH	**H**	**M**	**L**	**NS**
STEP 2. CONTACT POTENTIAL	**VH**	VH	H	M	L	NS
	H	VH	H	M	L	NS
	M	M	M	M	L	NS
	L	L	L	L	L	NS
	NS	NS	NS	NS	NS	NS

Table 8.5d Surface Water Resource Sensitivity

		STEP 1. RECEPTOR VALUE				
		VH	**H**	**M**	**L**	**NS**
STEP 2. CONTACT POTENTIAL	**VH**	VH	VH	M	L	NS
	H	VH	H	M	L	NS
	M	H	H	M	L	NS
	L	L	L	L	L	NS
	NS	NS	NS	NS	NS	NS

For each of groundwater and surface water, the environmental sensitivity is a combination of receptor value and potential for contact with spilled oil as set out in Table 8.5c and 8.5d. A cautious approach has been used so that there is a bias towards high risk scores.

These sensitivity levels were assigned numeric values from 1 (not sensitive) to 5 (very high sensitivity). Each of the sensitivity categories were also weighted to reflect the assessment of potential severity of spill impacts considering the nature of the effort required and degree of recovery expected following restoration of affected resources. A combination of sensitivity determinations based on the approach described above, and weighting factors was used to define the most sensitive environmental feature associated with each one-kilometre long pipeline segment. This feature was then used to characterise that entire pipeline segment without 'averaging' results for other environmental parameters. For example: a segment judged very highly sensitive for potential groundwater effects due to very high soil permeability and very high groundwater sensitivity would be given an overall sensitivity rating of 5 even if all other environmental features exhibit little or no sensitivity. Each one-kilometre long pipe segment

was reviewed in this manner, and each was assigned an overall sensitivity ranking between 1 and 5 for use in this risk analysis.

With the assessment of environmental sensitivity completed, all three components of environmental risk are sufficiently documented to enable the overall environmental risk profile of the Turkish section of the BTC Pipeline to be evaluated.

8.7 RISK ANALYSIS RESULTS FOR THE PIPELINE

8.7.1 Risk modelling as an iterative process

The previous sections describe how frequency of spill, spill volumes and environmental sensitivity have been determined. The risk analysis model combines these three elements and enables a computation of the relative environmental risk along the pipeline on a kilometre by kilometre basis.

The relative environmental risk is not uniform and can vary significantly dependent on location. The results of the computation of relative environmental risks along the pipeline enable the Project to evaluate where additional mitigation measures should be considered and the impact of such additional mitigation measures on the risk profile. The application of the model is an iterative process and allows multiple iterations of the model to evaluate the benefit of changing various design features on the relative environmental risk profile.

8.7.2 Changes to the base case design as a result of the risk assessment process

The BTC Project design engineers have reviewed the model results and as a consequence have been able to identify further opportunities to reduce the frequency and size of oil spills. This has enabled an evaluation of benefit of increasing the number of block valves to reduce the volume of potential oil spilt versus the slight increase in spill frequency associated with the inclusion of additional valves. The following model iterations outline the impact of changing the configuration of the block valves on the environmental risk profile.

- Model 1: Base case assumes no Block Valves.

- Model 2: Block Valve Spacing is set at 30km distances. This has the effect of reducing the average risk value by 64 % from the Base Case Model.

- Model 3: Block Valve Spacing were set to minimise spill volumes. Following a number of iterations to optimise the block valve spacing and number, the average risk value was reduced by 90 % from the Base Case Model.

The model iterations have allowed the engineers to review the risk profile and adjust Block Valve locations accordingly, to reduce environmental risk. Figure 8.4 demonstrates the refinement process that compares two Model 3 revisions. The profile in red, is the difference between the two model results. A negative deflection from zero, indicates an improvement in the risk profile. A positive deflection of the red profile from zero, indicates an increase in risk, and requires further iterations to address the peak.

For example, the positive peak between KP300 and KP320 was caused by the proposed removal of a Block Valve in the Erzurum Plain. The resultant shift in the risk profile lead to the Block Valve being replaced and further model iterations.

The residual risk after changing the block valves is not a uniform profile and there are still areas which present relatively more environmental risk than others. The design engineers have used this data to determine what additional design mitigations can be applied to lower the environmental risk. For example, mitigation measures at aquifer and river crossings have been formulated in order to further reduce the remaining risk. These measures are described in Sections 8.7.3 and 8.7.4.

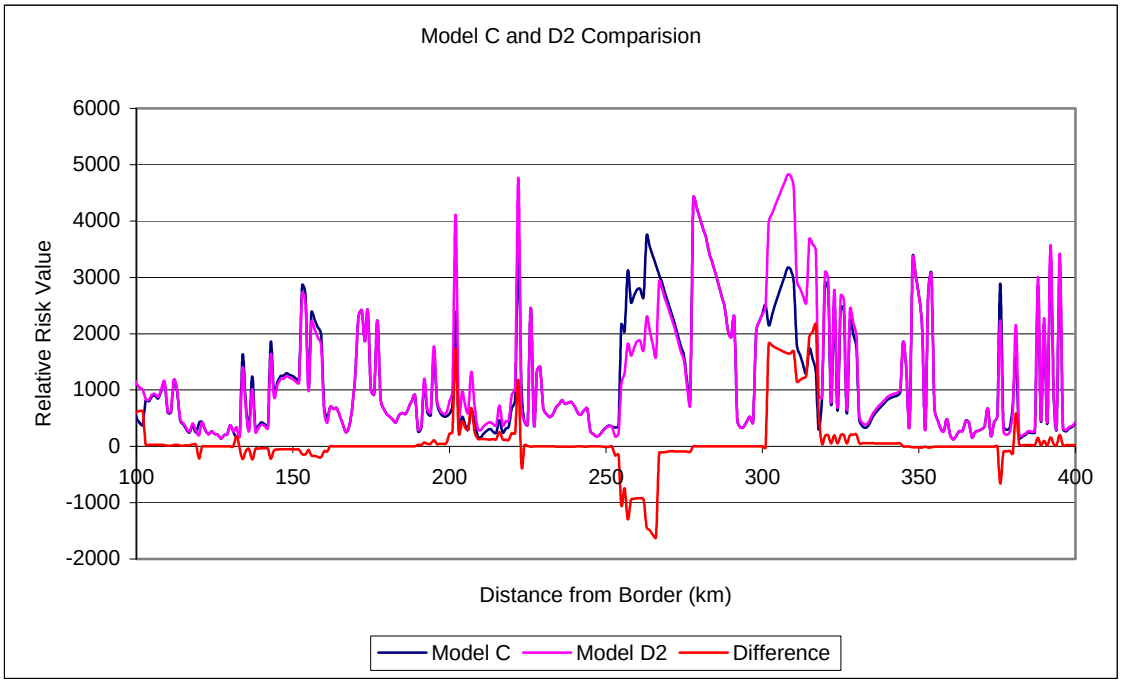


Figure 8.4 Relative Risk Profile Comparison between two Model Iterations

8.7.3 Aquifer mitigation measures

The following mitigation measures have been applied at aquifer crossings to lower environmental risk.

- In areas where groundwater sensitivity has been classed as 'high' or 'very high' sensitivity, the pipe wall thickness will be increased above the hydraulic design requirements.
- Both 'high' and 'very high' sensitive areas will have an increased depth of burial of 1.2m below ground level.
- In certain areas, for buoyancy control, the pipe will be concrete coated.
- Other mitigation measures include cathodic protection, below ground warning tape, aerial/pipeline marker and Block Valve Stations.

8.7.4 River crossing mitigation measures

The following mitigation measures have been applied at river crossings to reduce environmental risk.

- Wall pipe thickness will be increased to 0.6 design factor.

- Depth of burial would be 1.5m below the calculated scour depth.
- The pipe will be concrete coated.

8.8 ENVIRONMENTAL RISK AT ABOVE GROUND INSTALLATIONS

8.8.1 Overall approach

A complementary approach to that presented in Sections 8.4-8.7 for the assessment of the pipeline risks has been adopted for assessment of risks of oil spillages associated with the four Pump Stations PT1-PT4 and the Pressure Reduction Station IPT1. These five AGIs are sited in discrete and carefully considered locations and environmental considerations have played a significant part in site selection. Field investigations are currently ongoing at each site to more fully determine local geotechnical, hydrological and hydrogeological characteristics and as these become available they will be used to update the ERA. This will facilitate the design of site specific mitigation measures, based on the environmental risk presented from accidental events which takes full account of the local environmental setting for each site.

8.8.2 Frequency and spill volume estimation

The calculated release frequency and quantity of material released, for different categories of failure, are presented in Table 8.6.

For the purposes of the risk assessment, Pump Stations PT1 and PT3 have similar equipment, configurations and designs, and therefore these two facilities are associated with a similar engineering risk profile[1]. The only difference being that PT1 includes a metering station that results in a slightly higher risk of small (25mm hole size) leaks.

Pump Stations PT2 and PT4 also have similar equipment but have different scraper launcher/receiver operational frequencies. PT3 has the highest seismic risk due to the proximity to faults.

The Pressure Reduction Station IPT1, has only one relief tank and significantly simpler piping and process equipment than any of the four pump stations. It therefore exhibits a distinct engineering risk profile that is lower than PT1 and PT3 regarding potential tank spillages and is significantly lower than all four pump stations as regards failure of piping and other equipment.

The four engineering risk profiles, ie PT1, PT2 and PT4 (near identical), PT3 and IPT4 are illustrated in Figure 8.5. This illustrates the following:

- The anticipated likelihood of spills smaller than 490 tonnes is significantly less for the Pressure Reduction Station than it is for any of the four Pump Stations, but that the likelihood of a catastrophic tank failure, which conservatively could lead to a spill of the same volume as the tank itself, is similar for each of the AGIs except PT3 where the risk is exacerbated by the location close to seismic faults. It should be noted that the risk is somewhat overstated as the relief tanks should be empty for the majority of the time.
- The risk profile for PT2 is masked by PT4, which has a near identical profile for releases from failure of pumps and equipment.

[1] For clarity, a distinction is made between engineering risk and environmental risk. The former excludes consideration of the sensitivity of the local environmental setting.

- The four Pump Stations will be permanently manned and they will be fitted with a high level of containment (such as bunding, paving, surface drainage and two effluent holding ponds), interlocks and controls. The Pressure Reduction Station will contain similar facilities but will not be permanently manned; it will however be subject to continuous remote monitoring, control and (if necessary) isolation, via the Pipeline's central control system.

Table 8.6 Frequency and Quantity of Release Summary

Hazard Source	Type of Failure	Code (see Figure 8.6)	Failure Frequency (per year)	Quantity Spilt (tonnes)
Pump Station 1 – Releases for Relief Tanks (seismic events) **Note 1**	50 mm	PT1 50mm #1	7.6×10^{-5}	58
	Rupture	PT1 Rupt #1	9.0×10^{-6}	1,500
Pump Station 1 – Releases for pumps and associated equipment **Notes 2, 3**	25 mm	PT1 25mm #2	1.9×10^{-2}	150
	50mm	PT1 50mm #2	6.6×10^{-3}	325
	100 mm	PT1 100mm #2	2.3×10^{-3}	490
	Rupture	PT1 Rupt #2	2.3×10^{-3}	1290
Pump Station 2 – Releases for relief tanks (seismic events) **Note 1**	50mm	PT2 50mm #1	7.6×10^{-5}	58
	Rupture	PT2 Rupt #1	9.0×10^{-6}	3,300
Pump Station 2 – Releases for pumps and associated equipment **Note 2**	25 mm	PT2 25mm #2	1.4×10^{-2}	150
	50mm	PT2 50mm #2	7.5×10^{-3}	325
	100 mm	PT2 100mm #2	3.1×10^{-3}	490
	Rupture	PT2 Rupt #2	2.4×10^{-3}	1290
Pump Station 3 – Releases for Relief Tanks (seismic events) **Note 1**	50 mm	PT3 50mm #1	1.5×10^{-4}	58
	Rupture	PT3 Rupt#1	1.8×10^{-5}	2,700
Pump Station 3 – Releases for pumps and associated equipment **Note 2**	25 mm	PT3 25mm #2	1.8×10^{-2}	150
	50mm	PT3 50mm #2	7.3×10^{-3}	325
	100 mm	PT3 100mm #2	2.6×10^{-3}	490
	Rupture	PT3 Rupt #2	2.6×10^{-3}	1290
Pump Station 4 – Releases for relief tanks (seismic events) **Note 1**	50mm	PT4 50mm #1	7.6×10^{-5}	58
	Rupture	PT4 Rupt #1	9.0×10^{-6}	4,600
Pump Station 4 – Releases for pumps and associated equipment **Note 2**	25 mm	PT4 25mm #2	1.4×10^{-2}	150
	50mm	PT4 50mm #2	7.5×10^{-3}	325
	100 mm	PT4 100mm #2	3.1×10^{-3}	490
	Rupture	PT4 Rupt #2	2.4×10^{-3}	1,290
Pressure Reduction Station – Releases for Relief Tank (seismic events) **Note 1**	50 mm Leak	IPT1 50mm #1	1.5×10^{-4}	58
	Rupture	IPT1 Rupt #1	1.8×10^{-5}	2,800
Pressure Reduction Station – Releases for pumps and associated equipment **Note 2**	25 mm	IPT1 25mm #2	6.2×10^{-3}	85
	50mm	IPT1 50mm #2	1.9×10^{-3}	205
	100 mm	IPT1 100mm #2	7.8×10^{-4}	300
	Rupture	IPT1 Rupt #2	6.9×10^{-4}	1,280

Note 1: It has conservatively been assumed that the full volume of one relief tank will be released and that the bund wall will simultaneously fail in the event of a catastrophic tank failure due to a seismic event.
Note 2: Includes consideration of seismic events, but excludes seismic events leading to tank failure (which is covered by Note 1).
Note 3: Pump Station 1 includes metering facilities.

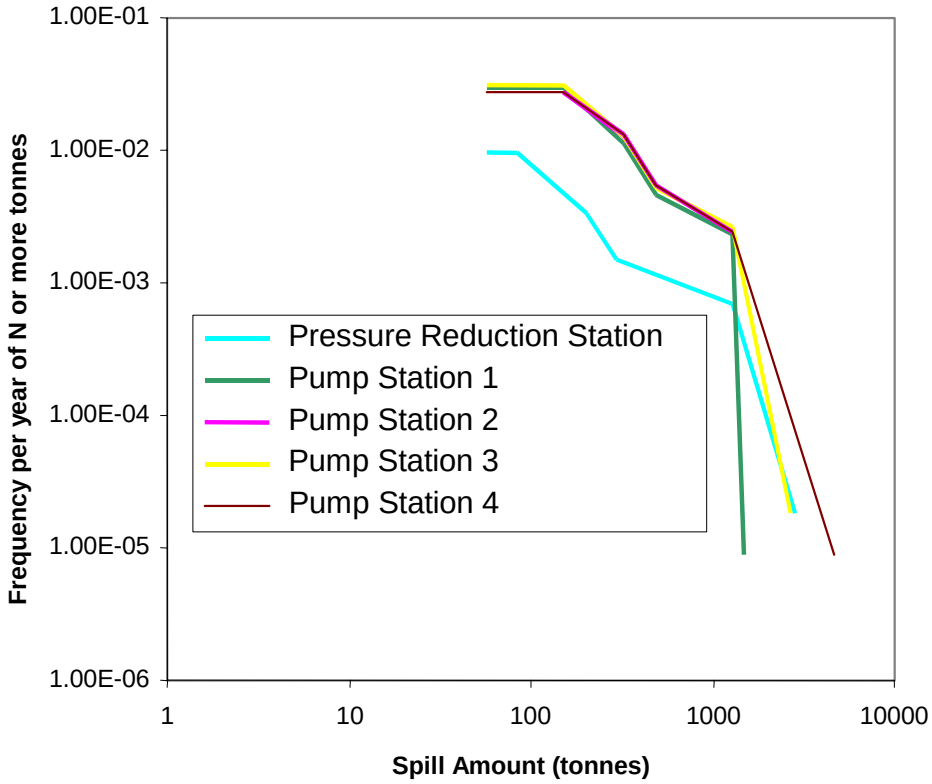


Figure 8.5 Cumulative Frequency vs. Spill Size for Releases from the Pump Stations and Pressure Reduction Station

8.8.3 Environmental consequence assessment

The approach adopted for characterising environmental sensitivity along the pipeline (see Section 8.6) has also been adopted for the AGIs. The results are presented in Table 8.7.

Table 8.7 Summary of AGI Environmental Sensitivities

Location	Surface Water Resource Sensitivity	Groundwater Resource Sensitivity	Terrestrial Ecological Resources	Land Use	Proximity to Downhill Known Archaeology
PT1 (Map 2)	Moderate	Not Sensitive	Very High	High	Not Sensitive
PT2 (Map 15)	Moderate	Moderate	Not Sensitive	High	Not Sensitive
PT3 (Map 24)	Not Sensitive	Not Sensitive	Very High	Moderate	Not Sensitive
PT4 (Map 38)	Not Sensitive	Not Sensitive	Not Sensitive	High	Not Sensitive
IPT1 (Map 51)	Moderate	Not Sensitive	Not Sensitive	Not Sensitive	Not Sensitive

The terrestrial ecological resources for PT1 are classed as ‘very high’ due to the location of the site within the Posof Wildlife Reserve. The reserve has been designated for the protection of the Caucasian Black Grouse, a bird of coniferous forest and forest edge habitats. However, vegetation at the proposed site is composed of sub-alpine meadow and is distant from forest areas. The site does not fall within an ecologically sensitive area.

The results of the risk assessment will inform the detailed specification and design of the various on-site containment measures at each site to minimise the risk of an uncontrolled release of oil from the site following a leak or catastrophic failure or other unplanned event.

Further, the identification of environmental risk at the five AGIs will enable the Oil Spill Response Plan to take specific cognisance of the potential response required at each of these facilities.

8.8.4 Environmental risk

In a manner analogous to that undertaken for the pipeline (see Section 8.6), these sensitivity ratings have been scored numerically for the five sensitivity categories considered. These scores have been combined with spill frequency and associated spill volume to rank the five AGIs for environmental risk. Figure 8.6 illustrates the relative environmental risk as each station for the different scenarios presented in Section 8.8.2.

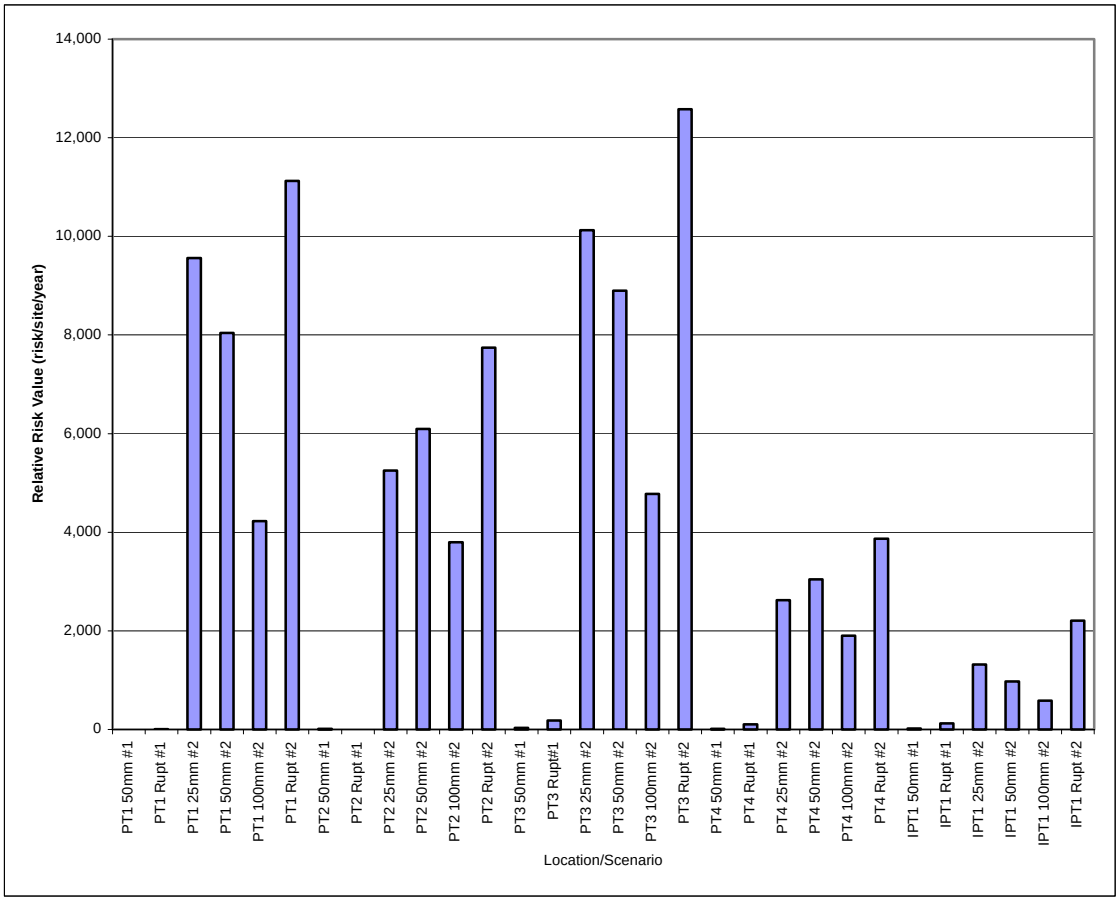


Figure 8.6 Relative Risk Profile between AGIs

Figure 8.6 illustrates generally higher environmental risk at PT1 and PT3. This is primarily due to their proximity to terrestrial ecological resources. The slightly lower risk at PT2 is primarily due to its proximity to water resources.

It is pertinent to note that while Table 8.6 and Figure 8.5 indicate potentially significant consequences for failure of the Relief tanks due to seismic events, the anticipated failure

frequency is so low that the associated environmental risk is negligible (ie does not register in Figure 8.6) relative to that for other types of failures.

These results can be used in a number of ways:

- to input into the pipeline ERA profile, to account for the presence of AGIs;
- to inform the Oil Spill Response Plan (see Appendix C6) regarding the relative risk of environmental damage from each AGI with respect to the five sensitivity characteristics considered (this will be particularly useful in planning AGI-specific response requirements).

8.9 APPLICATION OF ERA TO OIL SPILL CONTINGENCY PLANNING

The outputs from the risk assessment will be very useful in enabling the oil spill response planners to define the appropriate resources that should be employed for the BTC Pipeline and the individual AGIs. In particular the outputs from the risk assessment will be used to determine what 'Tier 2' resources will be employed. The outputs from the risk assessment will enable consideration to be given to having different response strategies dependent not only on the probable leak size but also on the sensitivity of the environment in the leak location. In this way, the response plan will take cognisance of the site-specific characteristics and environmental sensitivities of individual AGIs.

BIBLIOGRAPHY

Ref 1 BTC Report 24630-000-U7R-0000-00002: Pipeline Block Valve Spacing Study; Rev 0

Ref 2 ASME B31.4: Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols

Ref 3 ASME B31.8: Gas Transmission and Distribution Piping Systems

Ref 4 CONCAWE Report No. 98: Western European Cross-Country Oil Pipelines 25 Year Performance Statistics

Ref 5 BTC Pipeline Project Doc. No. 24630-010-3PS-JN01-00001 Rev 0: Leak Detection Philosophy; 27/09/2001

Ref 6 Environmental and Social Impact Assessment Shah Deniz Midstream Gas Pipeline Azerbaijan – Second Draft, June 2001

Ref 7 Environmental and Social Impact Assessment for Shah Deniz Gas Export System in Georgia – Second Draft, June 2001

Ref 8 Kvaerner Report No. 410088/00/L/SA/RP/004 Rev B1: Shah Deniz Gas Export Project Pipeline Quantified Risk Assessment

Ref 9 BTC Project Quantified Risk assessment: Overview of Methodology for An Integrated Approach to QRA; Rev. 5; H.J. Reid

Ref 10 Kvaerner Report No. 410088/00/L/SA/PH/011 Rev B1: AGT Pipelines Project method Statement and Key assumptions for Risk Assessment; 31/10/01; F Salimi

Ref 11 BTC Project Framework Environmental Risk Assessment Georgia; Issue 2; H.J. Reid

Ref 12 Paper: Pipeline Oil Spills and the Edwards Aquifers, Central Texas; Peter R. Rose

Ref 13 Paper presented in journal Pipes & Pipelines International September-October 1996: An Approach to Risk Assessment for Gasoline Pipelines; B. Morgan, D. Little, M. Beard

Ref 14 Spills Paper in journal Pipes & Pipelines International July-August 1988: Spills from large crude-oil-carrying transmission pipelines – an analysis by cause, frequency, and consequence; Dr. S.M. Hall

Ref 15 ILF Report 2181MD0028/Rev. 0; 12/10/01: BTC Crude Oil Pipeline Project Leak Flow Calculations for Pipelines (Report for program AUMEX 1.5)

Ref 16 ERM Report ERM-REP-SEC-TRG-001-Revision March 2002 Environmental Risk Assessment – Ceyhan Marine Terminal

1. ENVIRONMENTAL AND SOCIAL IMPACT TABLES

1.1. INTRODUCTION

This Supplement to Volume 2 of the EIA provides an assessment of the site-specific environmental and social impacts associated with the BTC Pipeline Project along the route of the pipeline. It is not the intention of the tables to repeat the detailed **generic** baseline or impacts information presented earlier but to identify **site-specific** features and activities and their associated impacts and mitigations measures. The assessment is presented in the following series of **environmental** and **social impact tables** linked to 1:50,000 schematic maps of the route (see Supplement 2, Volume 2). These tables summarise the following for each section of the route covered by the relevant map:

- **Baseline:** environmental and social resources and receptors in the vicinity of the pipeline route.
- **Impacts:** potential **site-specific** impacts above and beyond the **generic** measures outlined earlier in Section 6.
- **Mitigation***:* the **site-specific** mitigation measures that will be adopted by the Project to avoid, reduce, repair or compensate for potential impacts.
- **Residual impact:** the significance of the residual impact that is predicted to occur following the implementation of the specified mitigation measures.

In addition, the social impact tables provide a brief description of the pipeline route including **project specific** information (eg the presence of a pump station) and **socio-economic highlights**.

The environmental and social base maps contained within Supplement 2 (Volume 2) have been produced specifically for the purposes of the BTC Pipeline Project and have been approved by the General Command of Mapping for this purpose.

1.2 BASELINE FEATURES ASSESSED IN THE TABLES

The environmental and social impact tables address impacts to those resources and receptors along the pipeline route that are viewed with particular concern because:

- they are of particular value;
- they are of particular sensitivity or susceptibility in the context of the intended activities and potential impacts;
- concern has been raised about them by regulators, stakeholders and local residents.

Clearly there are features crossed by the route that are not included in the tables. These include minor creeks/streams crossings and all infrastructure crossings (available as a support document at BOTAŞ). Potential impacts and mitigation measures for these resources are generic along the whole of the pipeline route. Additionally, detailed Water Crossing Impact Tables for the majority of river and creek crossings are also available at BOTAŞ.

1.3 TYPES OF POTENTIAL IMPACT ADDRESSED

The following types of impact, as they relate to the pipeline component of the project, are presented in the **environmental** and **social impact tables**:

- impacts associated with the construction of the pipeline and the Above Ground Installations (AGIs);
- impacts associated with the permanent landtake during construction of the AGIs;
- impacts associated with the physical presence of the buried pipeline and reinstatement corridor.

These impacts are outlined in more detail in Box 1.1.

Although construction is a temporary activity, some of the impacts or changes to the existing physical or social environment listed above may occur over a longer period of time than the actual period of construction. This applies in particular to visual changes to the landscape and impacts on habitats, flora and fauna (and associated social activities) because of the time required for complete recovery of soils and reinstated areas to take place.

Operational impacts are addressed in Section 7.

Box 1.1 Types of Potential Impacts Addressed within the Environmental and Social Impact Tables

Impacts associated with the construction of the pipeline and the AGIs:

- temporary landtake;
- temporary emissions to air;
- temporary discharges to water and physical impacts on watercourses;
- temporary noise emissions;
- changes to, and disturbance of, soils;
- changes to, and disturbance of, habitats, flora and fauna;
- disturbance to communities;
- changes to, and disturbance of, soils;
- changes to, and disturbance of, land and associated impacts upon existing landuse and users;
- changes to, and disturbance of, other existing features including infrastructure, archaeology and cultural heritage resources;
- visual changes to the landscape.

Impacts associated with permanent landtake during construction of the AGIs:

- Landtake that precludes all other landuses – this will occur at the permanent AGIs such as the pumping stations, pressure reduction station and block valve stations.
- Landtake that precludes some other landuses – this will occur along the length of the pipeline within the 8m wide permanent easement where certain activities that may affect the integrity of the pipeline will not be allowed.

Impacts associated with the physical presence of the buried pipeline and reinstatement corridor:

- impacts to groundwater movement;
- limitations on agricultural and development activities;
- changes in ecology and landscape resulting from pipeline construction and reinstatement.

1.4 PURPOSE OF THE TABLES AND MAPS

The BTC Pipeline Project will cross or pass in close proximity to a wide variety of landscapes, habitats and settlements. The nature and significance of potential impacts associated with the project vary depending on the nature of the physical and social environment through which the pipeline will pass. The table and map format presented in this Supplement to Volume 2 has been adopted to facilitate the consideration of impacts and mitigation measures on a geographical basis, allowing a convenient consideration of site-specific impacts and mitigation at a province-by-province level.

This approach has been adopted for two reasons:

- to enable local settlements to identify features or resources that may be affected by the Project in their area and to identify the mitigation measures that will be adopted;

- to enable the results of the EIA to feed directly into the Environmental Management and Monitoring Plan (EMMP), (see Appendix C1), and the Social Management and Monitoring Plan (SMMP) (see Appendix C8), on a location-specific basis.

1.5 LAYOUT OF THE TABLES

The remainder of this Supplement comprises a series of 59 **environmental** and **social impact tables**. Each environmental impact table relates to two maps, (Map 'A' details general environmental constraints and Map 'B' details ecological constraints), and each social impact table relates to one map (Map 'C' details social constraints). The tables should therefore be read in conjunction with the appropriate maps.

Where the same feature occurs on two or more maps, it is generally only described once and a reference back to this description is noted on the appropriate table at subsequent occurrences. Reference is made to the accompanying map, Section 5 and/or the relevant technical appendix when more detailed information on a particular baseline feature or resource is required.

Similarly, the mitigation measures to be adopted are listed in note form in the **environmental** and **social impact tables,** with and reference made to Section 6 and to the management plans in Appendix C for a more detailed discussion of the implementation of the various mitigation measures described.

Several important points to note in the environmental impact tables in terms of key supporting documents, where mitigation and management measures are given in full, include the following:

- *Soils* and *Landscape and Visual:* the environmental specifications that will be used to minimise the extent to which soils and landscape are adversely affected during pipeline construction, and which will be included in method statements and working practices as appropriate, are fully described in the Reinstatement Plan (RP) (see Appendix C2).

- *Surface Waters:* detailed baseline features/potential impacts and mitigation measures for major rivers and for those medium/minor rivers and creeks that have been damaged during construction of the East Anatolian Natural Gas Pipeline (NGP) have largely been taken from information contained within the Water Crossings Impact Tables (see Section 1.1) and additional interpretation of baseline studies (see Section 5).

- *Ecology:* seasonal ecological sensitivities identified along the route in each map are summarised in the EMMP, with specific reinstatement measures that will be applied within Ecologically Sensitive Areas (ESAs) detailed in the RP.

Potential indirect positive impacts associated with the two-phase approach to reinstatement to be adopted in the vicinity of the NGP, which will comprise reinstatement of 'Special Areas,' are also discussed in the **environmental impact tables** in terms of benefits to soils, landscape and visual and surface waters. Phase 1 will entail the NGP Construction Contractor undertaking remedial reinstatement measures prior to BTC pipeline construction to resolve existing problems. Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in areas impacted, or potentially impacted, by the presence and/or proximity of the NGP. Special areas identified as requiring specific reinstatement measures prior to, or during, reinstatement of the BTC Pipeline are as follows:

- General Reinstatement;
- Adjacent Agricultural Land, for example, in areas of poor topsoil management;
- Hill Slope Reinstatement, for example, installation of slope breakers across entire parallel corridors;
- Erosion, for example, in areas of rill and gully development;
- River Crossings, for example, bank and bed erosion.

Responsibilities between the NGP and BTC Contractors are fully described in the RP (see Appendix C2).

Although each of the maps (A, B and C) have an separate and self explanatory legend cross- referencing key features on the map, for the sake of clarity, Box 1.2 provides brief explanations for several general terms used on the maps.

Box 1.2 Explanation of Terms used on Map Legends

BTC Pipeline Route – this is the route that is now being disclosed as part of the EIA.

100m and 500m Corridors – these are the current 100m and 500m corridors around the BTC Pipeline Route.

Previous Route – this was the route subjected to original surveys and is provided as a point of reference for how the route has changed in the latter part of the EIA Process.

Environmental Impact Table 1 (Maps 1A and 1B) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soils up to the Posof River crossing comprise: • Mesic Coarse-loamy Dystrandepts over tuff; • Mesic Clayey-skeletal to Loamy skeletal Xerochrepts on basaltic landscapes near hill crests; • Mesic Coarse-loamy to Coarse-silty Ustorthents or Xerochrepts on alluvial plains; • Mesic Fine- to Coarse-loamy Haplloxeralfs or Rhodoxeralfs as minor inclusions on stable, gently sloping terrain; • Mesic Loamy Typic Xerorthents on stable colluvium; • Mesic Coarse-silty Xerofluvents on fluvial landscapes tributary to the Posof River; • Loamy-skeletal Typic Xerochrepts developed from weathering of basalt; • Loamy Typic Xerorthents on stable colluvium.	Main potential impacts are soil erosion and reduced soil productivity. Other potential impacts include altered drainage.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Bio-restoration. • Channel stabilisation - see typical drawings. • Sediment interception and sediment settling ponds where required by the landowner/occupier.	**MAJOR IMPACT** In areas where the corridor overlies tuff, soils are difficult to reinstate due to lack of depth of topsoil, leaving a whitish tuff exposed and mixed with the original topsoil. Therefore, potential impacts are long-term as soils developed from tuff are unlikely to respond to standard reinstatement and exposed tuff and its effects on reducing soil productivity will continue throughout the duration of the Project. However, a number of additional site-specific mitigation measures will further be employed in tuff areas to manage the above impact, including: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement;

Environmental Impact Table 1 (Maps 1A and 1B) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			• post-reinstatement monitoring.
Landscape and Visual			
From entry point south of the Georgian border, landscape is unremarkable comprising gently rolling hills with market gardens and some grazing land. Field boundaries are well marked with mature hedges and wooden fences and some drystone walls. Scattered areas of woodland. Terrain shows a steady increase of elevation from the Georgian border (elevation 1,232m) to base of mountain ridge c. 10km south-west (elevation 1,900m). It rises through steeply dissected ridges before becoming more undulating. Landscape sensitivity increases as the land rises into rolling, forested hills interspersed by sub-alpine meadow clearings north and west of Posof. Rainfed agriculture is practised on flat to undulating lands with grazing and conservation forestry elsewhere. Further south, the land falls steeply through forest and upland grassland to the Posof River - a wide, fast-flowing, river with shingle shoals passing through a steep valley clad with mixed broad-leaved and coniferous forests. It is considered of high landscape sensitivity. Block valve stations 1 and 2 (BVS-001 and BVS-002) will be located at KP 6.8 and KP 15.5, respectively. The BVS-001 site is located within cultivated land and deciduous habitat and BVS-002 is located in subalpine meadow. Approximately 350m^2 of permanent landtake required for each station. New access roads will be constructed to the sites of c. 35m in length for BVS-001 and c. 360m for BVS-002. Kayinli settlement lies c. 350m away from BVS-001.	Long-term/permanent visual impact where pipeline exposes whitish tuff parent material. Construction will open a linear avenue through dense forest near Posof and in forest around Posof River, which will be visible from the Ardahan-Posof roadway. Some minor loss of scattered trees and bushes, especially from hedgerows. Short-term construction modifications of landscape. Potential for short-term visual impact during construction for villagers in Kayinli during construction of BVS-001.	• The pipeline has been re-routed to avoid dense broadleaf forest. This re-route is to the west of the current alignment through an area of sparser, patchy forest • Reinstatement of pipeline RoW. • Implement fertiliser trials using NPK + micro-nutrients using reinstatement species. • Reduced working width. • Minimise removal of trees and mature shrubs. • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Bio-restoration. • Reforestation and replanting program, using species appropriate and characteristic of the area. • Particular attention will be paid to the control of dust, noise and traffic during construction at BVS-001.	**MAJOR IMPACT** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies tuff, it will retain its whitish colour and show as a white line across the landscape. This will be particularly evident in the hills around Posof. The additional site-specific mitigation measures described above under 'Soils' will also be applied to manage landscape impacts. **MODERATE IMPACT** Landscape impacts due to tree loss but substantially less than impact of previous alignment through forest. **MINOR IMPACT** Given the relatively small size of the block valve station and the temporary nature of construction activities, visual impacts are anticipated to be minor, subject to implementation of the

Environmental Impact Table 1 (Maps 1A and 1B) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			specified mitigation measures.
Surface Waters			
The pipeline route passes through Aras Watershed and crosses the Posof River. Posof River is an important watercourse for aquatic life and crosses over the Georgian border approximately 8km downstream of the pipeline crossing point. River channel is sinuous with mid-channel bars and a planimetric cross-section. Width of crossing is 30m, although floodplain is some 150m wide and high flow rates submerge the dominant channel. Bed consists of gravel and cobbles, and the flow is of a pool and riffle type. Bank-side vegetation is natural and water quality samples taken at the crossing point indicate that this is a Class IV river.	Direct disturbance to bank and bed morphology through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in already poor water quality. Therefore, potential for short-term sedimentation and turbidity. Potential impacts on downstream ecology and water abstraction for human use.	Apply standard mitigation measures in Section 6.4 and the Reinstatement Plan (RP), (see Appendix C2), for the protection of surface waters, including: • use of appropriate sediment filters or trapping devices; • construction techniques to divert/separate flow from open trench; • bank and bed stabilisation downstream of crossing point. Assess need for alternative water supply for downstream communities and provide where necessary if sedimentation and turbidity persist for more than 3 days at the community.	**MINOR IMPACT** Disturbance will be short-term and limited to the immediate working area. Sedimentation of Posof River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Ecology			
Protected Areas The route crosses the Posof Wildlife Protection Area, established primarily for the Caucasian Black Grouse (*Tetrao mlokosiewiczi*), a globally-threatened species classified as Data Deficient and also a restricted range species. The pipeline route crosses through this area between KP 0 to KP 25.3 (see Environmental Impact Table 2 and Map 2B). The forests here also support various mammals, the most important of which are Eurasian Brown Bear (*Ursus arctos*) and Roe Deer (*Capreolus capreolus*).	See Potential Impacts below.	The pipeline has been re-routed to avoid dense forest and now passes through lower quality sparse and patchy forested areas. The RoW will be narrowed to 8m for c. 300m of the route in Posof Wildlife Protection Area. Elsewhere the RoW will be between 15 and 28m wide.	See Residual Impacts below. Application of the specified mitigation measures described below will ensure that there is no degradation of the protection status of the Posof Wildlife Protection Area.

Environmental Impact Table 1 (Maps 1A and 1B) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		The RoW will be 15m wide for a length of c. 75m, 22m wide for c. 540m and 28m for c.300m of the route. In line with the requirements of the Ministry of Forestry, the following mitigation will be adopted: "*As a result of the review, it was seen that the proposed project will traverse the Posof Wildlife Protection Area. The proposed pipeline will be considered convenient by the Ministry of Forestry, General Directorate of National Parks and Game-Wildlife on the following stipulations:* • *avoid disturbing the areas found within the site, where the wild animals drink water, during the excavation works and if disturbed provide new areas for drinking water close to the site.* • *transport the soil excavated during trenching along the route to a place which will not harm wild animals* • *ensure that the noise and the pollution affect on the wild animals will be minimum during the activities".* See additional Mitigation Measures below.	
Important Ecological Factors			**MODERATE IMPACTS**

Environmental Impact Table 1 (Maps 1A and 1B) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Ecologically Sensitive Area (ESA) 1 is identified between KP 10.3 to KP 15.3 for three globally-threatened plant species (*Gypsophila simulatrix, Lathyrus karsianus, Allium sosnowskyanum*) and one nationally-threatened (*Acer divergens*). The IUCN status for these species are given in Table 5.20, Section 5. The Posof Wildlife Protection Area and the surrounding meadows are important for large mammals including Wild Goat (globally-threatened), Brown Bear, Grey Wolf, Eurasian Lynx and Roe Deer. Smaller mammals include Bechstein's Bat, Mediterranean Horseshoe Bat (both globally-threatened), Common Pipistrelle, Greater Mouse-eared Bat, Weasel, European Pine Marten, Beech Marten and Eurasian Badger. The protection status for all species identified in the Posof Wildlife Protection Area is given in Table 5.21, Section 5. The mixture of Scot's Pine forest, forest edge and sub-alpine meadow with Rhododendron is the critical habitat for Caucasian Black Grouse, which breeds between April and July inclusive. A pair was located in this forest on the current centreline of the pipeline near KP 11.6. The forest also holds Turkey's other restricted range species, Mountain Chiffchaff, and another warbler present only in the extreme north-east of Turkey, Green Warbler. Totals counted on 29.06.2001 include – Sparrowhawk 1; Caucasian Black Grouse 1 pair; Mountain Chiffchaff 3; Green Warbler 6. A single Marsh Harrier (nationally threatened) was recorded c. 300m from the start of the pipeline route; a breeding pair of Caucasian Black Grouse, both a globally-threatened and restricted-range species, and 2 Mountain Chiffchaff, a restricted-range species, were observed at KP 11.6; 3 Mountain Chiffchaff were observed at KP 13.9; and a total of 4 (1 adult, 3 juveniles) Dipper (nationally-threatened) was observed at Posof River crossing (KP 16.6). Four globally-threatened amphibian species are located within the Posof Wildlife Protection Area: Caucasian Salamander and the Caucasian	Habitat destruction of forest and subalpine meadow may result in the loss of individuals from populations of globally-threatened plants. Minor temporary disturbance to globally-threatened mammals during seasonal sensitivities (see the Environmental Management and Monitoring Plan (EMMP), Appendix C1): • hibernation and peak spring feeding periods for brown bears between November to April and March to June, respectively. • breeding season for wild goats between October and December and during birthing between March and April; • breeding and hibernation periods for globally-threatened bat species, from September to May and for the Common Pipistrelle bat between October and July.	The pipeline has been re-routed to avoid dense forest and now passes along the edge of this dense forested area, through lower quality sparse and patchy forested areas. Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 1. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the (EMMP, see Appendix C1): • narrow the RoW to 8m in areas of dense forest (for c. 300m length). In addition, the pipe will be pushed or pulled through these areas; • remove and keep topsoil and subsoil separate, protect topsoil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during reinstatement since it has an	The pipeline has been re-routed to avoid dense forest and significant habitat fragmentation will be avoided. However, there will be some short-term disturbance to internationally important flora. Impacts to the nationally-threatened plant species will be **MINOR** and short-term (over one generation or less). Furthermore, within ESA 1, the Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). Field investigations carried out in mid-2002 of the short length of re-route outside of the 500m Corridor, determined that the re-route is a continuation of ESA 1. As such the mitigation measures outlined for ESA 1 will be equally applied to this section of rerouting. **MINOR IMPACTS** at most to mammals during the construction period where the

Environmental Impact Table 1 (Maps 1A and 1B) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Parsley Frog (both of which are limited to the temperate mixed broadleaf forests of the north-east), Southern Crested Newt and the Tree Frog. These are listed in the IUCN 2000 Red List and their protection status is given in Table 5.21, Section 5.	In severe weather, bears hibernate in underground dens or caves. During this hibernation period, the females give birth to one or two cubs (rarely three) in January or February. Following hibernation, bears enter a period of peak feeding in order to recover weight lost during the winter months. During such periods they are known to wander over wide areas and are most likely to come into conflict with human habitation, particularly in remote areas. Females with cubs are at their most aggressive at this time. Direct disturbance to birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). This would be most important for Caucasian Black Grouse in the forests and Dipper, particularly along the Posof River. Caucasian Black	during reinstatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 1. The RoW within Posof Wildlife Protection Area will NOT be fenced off temporarily during construction to ensure free passage of large mammals. If any significant length of trench, in terms of interrupting normal paths or passage used by the various species, needs to be left open for more than a few days (72 hours), points of passage will be provided across it at regular intervals (500m). Specific requirements have been established in relation to human interaction with the Eurasian Brown Bear – see Section 4.14 of the Mammals Species Dossier (Appendix B1). In the late summer/early autumn, in areas from which bears have been recorded, preconstruction ground surveys will be undertaken to establish the presence of potential hibernation places. If found, construction activity will be restricted to periods outside the hibernation season. Furthermore, in areas where the presence of bears has been	specified mitigation measures are applied for the seasonal sensitivities identified for each species. **MINOR IMPACTS** at most for breeding birds, except the Caucasian Black Grouse, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. However, this impact will be **MAJOR** for the Caucasian Black Grouse as avoidance of the breeding season between April and July is critical due to the potential for young to still be present on the ground during July. **MINOR IMPACTS** only to globally-threatened amphibians, if the construction period avoids the seasonal sensitivity.

Environmental Impact Table 1 (Maps 1A and 1B) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	Grouse breeding behaviour begins in April with male displays. The breeding period continues through to July when young may still be present on the ground. Temporary local disturbance to globally-threatened amphibian species during the spawning season between May and June inclusive.	confirmed by these surveys, the specific requirements outlined in Section 4.14.5 of Appendix B1 shall be implemented, including education of workers to be alert and aware of the potential for human/bear interactions. Such education will include refuse management on sites (particularly where construction camps are located) and awareness of sensitive periods of the year described previously. The hunting of bears or any other wildlife by the BTC Project personnel or contractors will be strictly forbidden. The preconstruction survey will establish the presence and local distribution of Wild Goats in the areas from which they have been recorded. Depending on the outcome of these surveys, actions may range from avoidance of construction activity during sensitive periods at specific locations to worker training regarding non-disturbance of nearby herds. Preconstruction bat surveys during the summer months will aim to establish the presence and abundance of the species and seek to identify summer colonies and potential winter hibernation roosts.	

Environmental Impact Table 1 (Maps 1A and 1B) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Hollow trees within the Right of Way (RoW) of the pipeline route will be removed during the late summer months, under the close supervision of an ecologist approved by BOTAŞ, to prevent their use as winter roosting sites and to allow construction to continue during the autumn, winter and early spring periods. Caves, ruins or underground cavities, that have been identified as hibernation roosts (particularly those close to camps and works sites), will be secured and placed out of bounds to avoid their disturbance by workers. Specifically for the Common Pipistrelle, preconstruction surveys in the vicinity of the Posof River crossings will aim to identify the location and level of occupation of maternity colonies, summer roosts and potential mating/winter hibernation roosts. Preconstruction bird surveys within Posof Wildlife Protection Area, particularly within ESA 1, to establish the location and population densities of sensitive species. Construction scheduling to be determined on the basis of the results of survey. As a minimum, construction is to be avoided within	

Environmental Impact Table 1 (Maps 1A and 1B) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		the Wildlife Protection Area between April and July, particularly for the Caucasian Black Grouse. Preconstruction walkover amphibian surveys will establish the presence of appropriate spawning locations, such as small pools and ponds, within the RoW of the route. Translocation of species will be carried out in those parts of the route where construction is scheduled to occur between May and June.	
Noise			
Hourly measurements were taken from a representative sample of settlements in this section of the route with L_{eq} values of 46.3 dBA at Armutveren, 53.5 dBA at Kayinli and 54.5 dBA at Dogrular. Cakirkoc settlement is located c. 152m of the centreline of the pipeline, and around 500m from the crossing of the Posof River. Kayinli settlement is located c. 224m from the centreline.	Noise impacts are expected to occur at: • Cakirkoc during sheet-piling works at the crossing of the Posof River, and during soil stripping; and welding/lowering activities; and • Kayinli during soil stripping.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile	**MINOR IMPACT** Short-term noise impacts are expected to occur during soil stripping at Armutveren and Kayinli settlements. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days. With the application of the described mitigation measures, no significant noise impacts are expected to occur at Cakirkoc during welding/lowering or piling

Environmental Impact Table 1 (Maps 1A and 1B) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		measures, such as the use of mobile noise barriers and limited hours of operation, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the Pollution Prevention Plan (PPP), see Appendix C4.	activities.
Archaeology and Cultural Heritage			
Mere Castle (a Medieval Settlement) is a 1st Degree Site* and the only known archaeological site in this section of the route that may be potentially impacted during pipeline construction. Its construction date is unknown and the eastern and southern parts of the castle are largely destroyed. Parts of the outer walls of the Mere Castle, which date back to the Medieval Ottoman Period, are still standing. The basilica and church also still stand. Graves within the castle have been excavated and looted. The route crosses the northeastern and southeastern corners. * This site has not yet been registered by the Ministry of Culture (MoC) and is provisionally assigned this classification. This site has been proposed for Registration by the regional council of preservation	Mere Castle will potentially experience structural damage during pipeline construction. Other potential impacts will include vibration. In addition, indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	Mere Castle will be delineated to avoid accidental damage during construction. The site will also be fenced throughout the construction period. If blasting is required, then it will be conducted in such a way that it does not pose a threat to the integrity of the site. To avoid vibration impacts, percussive piling will not be allowed within 100m of Mere Castle. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to temporary disturbance of the site setting and peripheral features. However, Mere Castle also offers potential positive benefits in terms of opportunities to work with the local community to promote the site as a tourist interest.

Ardahan Socio-Economic Overview

Demographics:
Ardahan, originally a district of Kars, was established as a province in 1994. It is the smallest Turkish province along the pipeline route in terms of population (128,000), but the third most densely populated of the surveyed provinces. Ardahan has the third highest population living in the pipeline corridor (16%) and includes two provincial / district centres - Ardahan Merkez and Posof Merkez. The surveyed settlements are generally situated in remote, high altitude valleys. The average household size (six) is high, mirroring the survey average. This can be explained by traditional, patri-local* family structures and the tendency for numerous children. The province has experienced out-migration from rural to urban areas, particularly to metropolitan cities (notably Istanbul, Ankara and Izmir) due to high unemployment. Minor in-migration is experienced in urban areas. The majority of surveyed inhabitants are Sunni Muslims, although 18% are Alevi. A small proportion of surveyed settlements speak Kurdish, Azeri, Meskethian and/or Karakalpaks.

Land:
The province is characterized by highland grazing and valley bottom horticulture. The climate is characterised by hot dry summers and harsh winters (allowing only one crop), with the exception of Posof district centre where irrigation allows greater diversification and vegetable production. There is a predominance of private 'petty' landownership due to land fragmentation. Only half of the local landowners have land titles for their first or second main land plot, 52% and 49% respectively. Communal landownership is the second most common form of land ownership. Subsistence agriculture dominates, with limited crop variety (wheat and barley). In general irrigation systems are rare. Just over 20% of households have adequate water for irrigation purposes.

Livelihoods:
Ardahan is ranked fifth of the surveyed pipeline provinces, on the basis of average surveyed household income, and third on overall wealth levels (income and assets), benefiting from border trade. However, it remains one of the least developed provinces of Turkey. Households are generally poor, relying on agriculture for subsistence, and unemployment is relatively high at just under 6%. Living standards have deteriorated over the past five years. The economy is dependent on animal husbandry and agriculture, although there has been a recent and steady growth in the service sector and increasing importance of bee keeping. According to the State Institute for Statistics (SIS), honey is the second most common output after milk and ahead of meat.

Infrastructure & Services:
There is an inadequate supply of electricity, a shortage of drinking water systems and limited access to national telecommunication and irrigation networks. Auxiliary roads are generally of poor quality gravel or sand with the exception of those at Turkozu, Dagci and Besiktas settlements. Roads are often closed and inaccessible during winter months. Average literacy rates for surveyed settlements are high (89%). There are insufficient public services, particularly health and education, although 46% of the surveyed respondents have primary education, 32% secondary education and 4% have a university level education.

Key Problems:
The main settlement problems identified by residents are high unemployment and low income levels, poor infrastructure (particularly water and sewerage), insufficient health, education and public transportation services, very low quality roads within the settlements, high cost of heating (coal), insufficient housing and social facilities and recent restrictions in border trade.

Project Attitude:
There is widespread confusion between the BTC and the NGP Projects. Respondents are generally positive towards the Project; believing there to be benefits on the macro scale, and opportunities for employment and expropriation payments during construction. However, previous experience (eg the Ardahan industrial estate) has raised concern over damage to agricultural lands, impacts on animal husbandry and pastureland, and the timely payment of expropriation payments particularly for land used without land titles.

Source: Household and Settlement Survey (2001)

*Patri-local: a situation where the wife moves to live with the husband's family group

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

MAP 1: PROJECT INFORMATION
Pump station 1 (PT1) is located near the southern portion of the map, within 5 km of Asmakonagi and Kirkoy. There are also two block valve stations located in the area.
MAP 1: MAP HIGHLIGHTS
• Primary land uses are rain-fed agriculture on flat/undulating land and grazing. • Irrigation occurs only in the northern most portions around Turkgozu, Armutveren and Kayinli; and in southern portions around Posof and Asmakonagi. • Posof and Turkgozu are surrounded by forest therefore conservation forestry is practiced. • Mere Castle (adjacent to Cakirkoc and the pipeline) is the only known archaeological site in this section. • Entire section within the Posof Wildlife Reserve. • The pipeline crosses the provincial highway and also traverses parallel to the Posof-Ardahan provincial highway. • The pipeline also crosses the Posof River.
MAP 1: IMPACTED & SURVEYED SETTLEMENTS
• ***Impacted:*** nine settlements on this map will be directly impacted by the pipeline project (Turkgozu, Armutveren, Incedere (Taşkiran Koyu), Kayinli, Posof, Dogrular, Cakirkoc, Asmakonagi and Kirkoy). All of these settlements with the exception of Asmakonagi have land intersected by the proposed pipeline (L). Two are within 5km of a pump station (P) (Asmakonagi and Kirkoy); none are within 5km of a construction camp (C). Five are within 500m of the pipeline route (D) (Turkgozu, Armutveren, Dogrular, Cakirkoc and Kirkoy), and six are within 2km of a block valve station (B) (Incedere, Kalkankaya, Kayinli, Posof, Cakirkoc and Dogrular). Settlements impacted by traffic routes have not been identified. No settlements are downstream of a river (R). • ***Surveyed:*** three settlements (Turkgozu, Posof and Asmakonagi) were surveyed in the field (S) and six settlements surveyed by telephone (T). Asmakonagi was also surveyed during pump station consultation (P). • ***Not surveyed:*** Kumlukoz (392 inhabitants: 715m from pipeline); Kalkankaya (159 inhabitants: 819m); Cayircimen (110 inhabitants: 966m) and Ugurca (195 inhabitants; 1.95km) are within 2km of the pipeline but have no land intersected by the pipeline. • ***Disclosure Meeting Location:*** Cakirkoc, Turkgozu

SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Turkgozu (L) (D) (S)			
• ***Demographic:*** 380 inhabitants with 110 households. Out-migration (due to high unemployment) to urban areas has resulted in a decreasing population. • ***Safety:*** 500m from pipeline to settlement centre, 200m to nearest house in settlement from pipeline.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be** held in schools prior to construction commencing. **Community liaison meetings** held prior to and	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

• ***Disputes:*** none • ***Project attitude:*** the majority of households surveyed (10 of 11) would accept a construction camp nearby. No major hostility. 36% feel they will benefit from land compensation, 27% from direct employment and 9% think that the project will damage social harmony. • ***Landownership & Use*****:** 85% of land is privately owned by local residents and 15% is settlement pasture land. Concern over who would benefit from compensation paid for communal pasture land. Landowners do not have title deeds. A diverse range of crops (barley, wheat, legumes and fruits) compared to other settlements. Crops are harvested in May and there was concern that this would be impacted by construction. Cattle graze year round with the exception of winter. Irrigation is used, mainly for vegetable and fruit production, although previous land expropriation forced settlements to block some irrigation channels. • ***Settlement livelihood:*** production of fodder, cattle and poultry breeding and a little bee keeping are the primary activities. 80% of working adults are long term unemployed and 15% involved in unpaid family work. The settlement is relatively prosperous. Bee keeping is becoming increasingly important as an income generating activity and is supported by the sub-governorship. • ***Availability & skills:*** no previous pipeline experience, seven of the 24 possible construction skills eg heavy machinery operators/ drivers, food services, repairmen, woodcutters, drivers, security personnel and welders are available. 91% of respondents would accept a temporary job. According to inhabitants there is a local sand quarry, although this could be the bed of the local creek. • ***Accessibility:*** 99km to Ardahan provincial centre and 12km to Posof district capital. No new roads have been constructed in the past five years. The roads are constructed from sand and deemed insufficient, although they are not closed in winter. Since the border opening, the auxiliary road connecting the settlement to the main road, which is the Posof road, has been reinstated with high quality asphalt.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Potential contamination of flow from spills or an increase in sedimentation. ***Bees*** Disturbance of any stationary	during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Beekeeping: stationary**	safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts**

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

• ***Information provision:*** 90% literacy rates. The Muhtar is the main source of local information and TV for national information • ***Services:*** public telephone and transport. There is a primary school with two teachers. There are no health facilities. • ***Infrastructure:*** piped water is available, although irregular. There is electricity infrastructure, no sewerage system or formal waste collection. • ***Settlement problems:*** lack of water, bad roads, dust, insufficient health conditions, poor sewerage systems. Poverty and unemployment have been on the increase in the last five years. Agriculture and animal breeding sectors are experiencing problems and local residents find it hard to meet subsistence needs. • ***Other:*** local residents want a juice factory established in the settlement. Recent land expropriation experience has raised concerns, because payment was deemed insufficient.	hives located within 300m of the route.	**hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Skills and Resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and	**Potential positive benefits** to local settlements.

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

		supplies within Project constraints.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Armutveren (L) (D) (T)			
• ***Demographic:*** total population of 155. 9% of the population migrates on a seasonal basis. • ***Safety:*** the centre of the settlement is 450m from the pipeline and the pipeline is 375m from the nearest house. • ***Project attitude:*** the Muhtar would welcome a camp and had no major concerns regarding the pipeline. • ***Landownership & use:*** 35% of land is communally owned. There is no seasonal grazing of livestock. Irrigation channels are used. • ***Settlement livelihood:*** 80% of inhabitants are farmers, 20% are family labourers. The main economic activities are agriculture, bee keeping, education, local government, construction and transport. Bee keeping is carried out in the settlement by six families and is one of a number of income sources for each household. • ***Availability & skills:*** local residents have no previous pipeline experience. • ***Accessibility:*** 11km to Posof district capital. The settlement is accessible throughout the year • ***Information provision:*** 90% of inhabitants are literate. TV and telephone are the main sources of local information and TV for national information • ***Infrastructure:*** there is regular piped water, and no alternative sources are needed. There is no sewerage system. • ***Settlement problems:*** watering canals may have to be rearranged if the pipeline affects access to water or sewage infrastructure.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contamination of	**Road safety training will be** held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. Contractor will **consult** with authorities to determine maximum acceptable time	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **If irrigation water is disrupted** longer than time considered acceptable by

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

the pipeline affects access to water or causes infrastructure problems.	flow from spills or increases in sedimentation.	for disruption.	authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Incedere (Taskiran Koyu) (L) (T)			
• ***Demographic:*** 269 inhabitants with 33% experiencing seasonal migration. • ***Project attitude:*** *the* Muhtar raised no major concerns over the pipeline and suggested that the local residents would generally welcome a construction camp.	***Accessibility to recruitment*** Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment	**No residual impact expected.**

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

welcome a construction camp. • ***Landownership & use:*** 60% of the land privately owned and used. No seasonal grazing of livestock. No irrigation is used. • ***Settlement livelihood:*** all local residents are farmers (although may be employed elsewhere). Main settlement economic activities are agriculture, bee keeping, trade, local government, construction and transport. Three families keep beehives, although honey is only one of a number of main income sources for these households. • ***Availability & skills:*** no previous pipeline experience. • ***Accessibility:*** Settlement roads are open throughout the year. • ***Information provision:*** 99% literacy rates. TV and radio are the main information sources for local issues and TV for national issues. • ***Environmental & cultural sites:*** the Muhtar indicated that the local forest is an important resource. • ***Infrastructure:*** regular provision of piped water although local residents also use the settlement fountain. • ***Settlement problems:*** inadequate access to water.		strategy. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kayinli (L) (D) (B) (T)			
• ***Demographics:*** 53 inhabitants. 99% of the population is involved in seasonal migration suggesting that the entire settlement moves during winter months. • ***Safety:*** the settlement centre is 800m from the pipeline. The nearest house is 700m. • ***Project attitude:*** according to the Muhtar, local residents would welcome a construction camp. The main project concern is land expropriation. • ***Landownership & use:*** local residents privately own 95% of the land. Seasonal grazing does not take place. The local residents use irrigation. • ***Settlement livelihood:*** main economic activities are agriculture, bee keeping, forestry, hunting, trade, local government and construction.	***Forestry*** Loss of a resource used by settlements. Increased expenditure on other fuel sources. ***Accessibility to***	If a significant number of trees on forestry land are to be cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure. Winter road closures,	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement. **No residual impact**

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

Six households are involved in bee keeping, although it is one of many sources of income for these households. • ***Availability & skills:*** 100% of inhabitants are farmers. No previous pipeline experience. • ***Accessibility:*** the settlement is 8km from the district capital of Posof. • ***Information provision:*** 100% of local residents are literate. TV and family are the main sources of local information and a range of sources including TV, family for national level information. • ***Environmental & cultural sites:*** none • ***Infrastructure:*** piped water is available, but irregular. The main alternative source is from the settlement fountain. • ***Settlement problems:*** an animal market should be established in the settlement, inadequate health care and insufficient food.	***recruitment*** Decreased access to recruitment process. ***Construction hazard: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Hunting***	seasonal migration and poor transport need to be **taken into account** in the recruitment strategy. **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** to be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. Project to **establish level of**	**expected.** **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

	Temporary reduction in game due to disturbance during construction.	**hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	Significance cannot be established at this time.
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive Crops (Bees) Dust may affect yields of crops essential for subsistence or commercial livelihoods.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

	Irrigation Potential loss of flow from planned/ accidental disruption. Potential contamination of flow from spills or an increase in sedimentation. ***Block Valve Station*** See Environmental Impact Tables and the Overview of the Land Acquisition Process in Appendix C9	before and during construction. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Posof (L) (D) (B) (S) (NB information has been provided by two different Muhtars responsible for different areas of Posof)			
• ***Demographic:*** 1,841 inhabitants and 430 households. Population has increased in the past five years due to: (1) the opening of the border gate (increasing trade opportunities) and encouraging economic migrants; and (2) the return of individuals subsequent to the 1999 earthquake. Posof also has experienced out-migration to metropolitan cities in Turkey and international migration to European countries.	***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Livestock crossings** to be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

• ***Safety:*** The centre of the settlement is 1km from the pipeline. The nearest house is 700m from the pipeline. • ***Project attitude:*** respondents from all 55 households surveyed stated that they would welcome a camp. There was no major hostility towards the pipeline. • ***Landownership & use:*** in one area of Posof, 80% of land is communally owned and 20% privately owned by local residents and in the second area, 60% is privately owned by local residents and 40% communally owned. Landowners generally have title deeds and grow cereals, vegetables, fruits and legumes. Seasonal grazing of livestock takes place in summer/spring to a minor extent. In one area of Posof, irrigation is used (although channels are moved each season), whereas there is no irrigation in the second area of Posof. • ***Settlement livelihood:*** the most important source of income is agriculture. Bee keeping and timber sales are increasingly important. Trade, local government, agriculture and tourism are additional activities. Animal breeding is not as common compared with the surrounding settlements (there are a small number of sheep, goats and cows). A factory producing dairy products is in operation. 70% of inhabitants are long term unemployed, 10% are pensioners and 5% are self-employed craftsmen. Immigrant worker remittances are an important source of income, and in summer migrants return and help revive the economy. *Arcilik* (bee keeping) can be a leading sector if receives investment. Bee keeping is one of the most important sources of income – the Caucasian Gene Centre for Bee Species is located in Posof. Forestry is also an important sector – and there are a number of timber merchants are present. • ***Availability & skills:*** long-term unemployment levels range from 70-80% of inhabitants depending on the area of Posof. Residents do not have previous pipeline experience, but have nine of 24 construction skills. Possible construction engineers, heavy machinery operators, drivers, food services, repairmen, woodcutters, drivers, security personnel and welders are all available. 31% would accept a temporary job, (lower than more rural settlements).	***Land*** Potential complications in expropriation process. ***Forestry*** Loss of a resource used by settlements. Increased expenditure on other fuel sources. ***Irrigation*** Loss of flow from planned/ accidental disruption. Contamination of flow from spills or increases in sedimentation. ***Skills and Resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**See Overview of the Land Acquisition Process in Appendix C9.** If a significant number of trees on forestry land are to be cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**See Overview of the Land Acquisition Process in Appendix C9.** **Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Potential positive benefits** to local settlements.

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

• ***Accessibility:*** 78km to Ardahan provincial centre. The roads in Posof are of sand and viewed as 'insufficient' by inhabitants. The road connecting Posof to Ardahan has been reinstated using high quality asphalt. Roads are not closed during winter – with the exception of the occasional day in January and February. • ***Information provision:*** The Muhtar is the main source of local information and TV for national information. Literacy rates range from 90-98% depending on the area of Posof. • ***Environmental & cultural sites:*** there is a municipal sand quarry potentially associated with the nearby river. There is a cultural site (Mere Castle). • ***Services:*** a post office, coffee houses, shops, library, bank, police, transport and agricultural support services. There are primary schools and high schools. Doctors, midwifes and health centres are present in Posof. The number of specialist doctors and technical equipment is insufficient for the population • ***Infrastructure:*** regular piped water is available and is the only water source. There is a sewerage system, electricity infrastructure and a waste disposal system operated by the municipality. • ***Settlement problems:*** unemployment and possible restrictions on the border. Although the bordering opening has promoted trade opportunities, the deterioration of agricultural activities due to economic reasons, has resulted in land tracts being left vacant and incomes decreasing.	***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.**

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Block Valve Station*** See Environmental Impact Tables and the Overview of the Land Acquisition Process in Appendix C9	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Dogrular (L) (D) (B) (T)			
• ***Demographic:*** 263 inhabitants all of whom migrate seasonally. • ***Safety:*** centre of settlement is 450m from the pipeline; the nearest house is 325m from pipeline. • ***Project attitude:*** Muhtar raised no major concerns over the pipeline and indicated that local residents would welcome a construction camp. • ***Landownership & use:*** 50% privately owned by local residents. Seasonal grazing of animals does not take place. Irrigation is not used. • ***Settlement livelihood:*** agriculture, bee keeping, trade, local government, construction and transport are the main economic activities in the settlement. Bee keeping is important for one household, for their own consumption. • ***Availability & skills:*** 95% of inhabitants are employed in farming. Local residents do not have previous pipeline experience	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500m of construction work.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will**

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

Local residents do not have previous pipeline experience. • ***Settlement accessibility:*** 2km from the district centre of Posof. • ***Information provision:*** 95% of the local residents are literate. TV and telephone are the main sources of local information and TV for national information. • ***Environmental & cultural sites:*** none • ***Infrastructure:*** no piped water is available in the settlement. Local residents use the local fountain. • ***Settlement problems:*** inadequate access to water and low income levels.	compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Accessibility to recruitment*** Decreased access to recruitment process. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Community liaison meetings** during and immediately following construction to identify any land that has been affected. Consider erecting protective barrier fencing. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings	**be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No residual impact expected.** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

	Drinking water Potential for disruption or contamination of drinking water during construction ***Block Valve Station*** See Environmental Impact Tables and the Overview of the Land Acquisition Process in Appendix C9.	before and during construction. The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the project.	**No residual impact.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Cakirkoc (L) (D) (P) (B) (T)			
• ***Demographic:*** 52 inhabitants (the population remains stable throughout the year). • ***Safety:*** the centre of the settlement is 300m from the pipeline, and approximately 4km from the pump station. The nearest house is situated 200m from the pipeline. • ***Project attitude:*** The Muhtar had no major concerns over the pipeline project. He felt that local residents would welcome a construction camp. • ***Land ownership & Use:*** 75% of land is privately owned by local residents. Seasonal livestock grazing is not carried out. All land is rain fed – no irrigation is used. • ***Settlement livelihood:*** 95% of inhabitants of working age are farmers, 3% are family labourers. Agriculture and local government are the main economic activities.	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9. **PUMP STATION CONSTRUCTION CAMP IMPACTS:**		

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

• ***Availability & skills:*** local residents do not have previous pipeline experience. • ***Accessibility:*** 5km to the district capital of Posof. • ***Information provision:*** 100% of local residents are literate. TV and the Muhtar are the two main information sources for both national and local. • ***Environmental & cultural sites:*** the Posof River runs north-east of the settlement. The Muhtar stated that a 'nursery' was present in the settlement and referred to a castle. • ***Infrastructure:*** regular piped water is available and no alternative sources are used. • ***Settlement problems:*** poor drinking water quality.	The settlement will be a primary receptor of impacts resulting from construction workers **PIPELINE IMPACTS:** ***Construction hazard: humans*** Working areas pose safety hazard to residents, particularly small children	**Monthly community liaison** meetings will be held**.** **Preferential employment opportunities** will be given to the settlement. **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.** **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Block Valve Station*** See Environmental Impact Tables and the Overview of the Land Acquisition Process in Appendix C9.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Additional damage to be compensated for.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Asmakonagi (P) (D) (S)			
• ***Demographic:*** 110 inhabitants and 14 households. • ***Safety:*** the settlement centre is 850m from the pipeline and 4km from the pump station (visible). The nearest house is 600m from the pipeline. • ***Project attitude:*** according to the Muhtar, local residents are generally positive. Perceived benefits include employment opportunities and increased incomes, problems include concerns that construction will impact cattle movement. It is important that safe crossing points be provided for animals and vehicles. Also, settlement drinking water is sourced at the pump station site. It is important that this is not damaged or contaminated. • ***Land ownership and Use:*** communal pasture land, which is in active use from April to October. In terms of general land use, 60% of land is communally owned and 25% is privately owned and leased by settlements. A diverse range of animals is kept, particularly cattle and poultry. • ***Settlement livelihood:*** the main economic activity is animal husbandry (cattle) as land is limited. In addition agriculture (cereals	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9. ***Water Source*** Potential for disruption or contamination of water source	The need for an alternative source of water will be evaluated prior to construction, and if necessary, will be provided by the Project.	**No residual impact**

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

husbandry (cattle) as land is limited. In addition agriculture (cereals production for subsistence only), bee keeping, agriculture, hunting and forestry are undertaken. • ***Availability & skills:*** no previous experience, three of the 14 skills available. Acceptance rates are not known. • ***Accessibility:*** 5km from Posof district centre. • ***Information provision:*** All local residents are literate. • ***Environmental and cultural sites:*** yes • ***Services:*** a formal sewerage system is in place. Domestic waste is disposed of in local fields. There is a primary school in the settlement. Only traditional medicine is available • ***Infrastructure:*** regular piped water is available. No other sources are used. The drinking water system is intersected by the pump station location. • ***Settlement problems:*** low levels of animal prices	***Pump Station Construction hazards: animals*** Site poses safety hazard for livestock. **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers	Consider erecting **stock proof fencing.** **Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **See Overview of the Land Acquisition Process in Appendix C9.**

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

	PIPELINE IMPACTS:		
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison**	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

		meetings: issue to be discussed at meetings before and during construction.	
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**Significance cannot be established at this time.**
	Irrigation Potential loss of flow from planned/ accidental disruption. Potential for contamination of flow from spills or an increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Forestry Loss of a resource used by settlements. Increased expenditure on other fuel sources.	If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.
	Construction hazards: humans		

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

	Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	complaints procedure. **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kirkoy (L) (P) (D) (B) (T)			
• ***Demographic:*** 57 local residents, 22% of which migrate seasonally. There is a winter population of 101 with 19 households. • ***Safety:*** the pipeline is 400m from the centre of the settlement and 3km from the pump station. The nearest house in the settlement is 250m from the pipeline. • ***Project attitude:*** the Muhtar raised no major concerns relating to the pipeline and stated that local residents would welcome a construction camp. Perceived benefits are employment opportunities and increased incomes. Perceived problems include concerns that	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in		

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

increased incomes. Perceived problems include concerns that construction will impact cattle movement. It is important that safe crossing points be provided for animals and vehicles. Also, settlement drinking water is sourced near the pump station site. It is important that this is not damaged or contaminated. • ***Land ownership and Use:*** communal pasture land, which is in active use from April to October. 65% of land is communally owned. Irrigation is not used. The settlement is not involved in seasonal grazing of livestock. • ***Settlement livelihood:*** 100% of local residents are farmers. Other economic activities are agriculture, bee keeping, local government activities and hunting. One household is involved in bee keeping, using honey for their own production. • ***Availability & skills:*** no previous pipeline experience • ***Accessibility:*** 7km from Posof district capital. • ***Information provision:*** 98% of the local residents are literate. TV and the telephone are the main information sources for local issues and TV for national issues. • ***Infrastructure:*** no regular piped water. The main water source is the settlement fountain. • ***Settlement problems:*** inadequate access to water, inadequate access to land, and the settlement has no imam.	Appendix C9. ***Water Supply*** Potential for disruption or contamination of water source **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers	The need for an alternative source of water will be evaluated prior to construction, and if necessary, will be provided by the project. **Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.**	No residual impact **Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **See Overview of the Land Acquisition Process in**

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

	PIPELINE IMPACTS:		**Appendix C9.**
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects	**Significance cannot be established at this time.** **No residual impact.**

Social Impact Table 1 (Map 1C) (KPs 0 – 18.9): Georgian/Turkish border to South of Posof River, Ardahan Province

		complaints procedure.	
	Drinking water Potential for disruption or contamination of drinking water during construction	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Environmental Impact Table 2 (Maps 2A and 2B) (KPs 18.9 – 33.9): Yalnizcam Mountains, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Up to KP 30.6 soils comprise: • Mesic Coarse-silty Xerofluvents on fluvial landscapes tributary to the Posof River. • Mesic Loamy-skeletal Xerochrepts on sloping lands. • Cryic Typic or Lithic Sandy-skeletal Cryochrepts on summits above 2,200m. • Sandy-skeletal Cryochrepts on tuff. • Stony outcrops near hill crests where slopes exceed 30%.	Main potential impacts are soil erosion, particularly at the temporary camp for PT1, and altered drainage. Other potential impacts include: • reduced soil productivity.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. Particular attention will be given to erosion control measures during reinstatement of the temporary construction camp once construction of PT1 is completed, due to the location of this site in an area of relatively steep terrain. • Bio-restoration. • Crushed rock. • Channel stabilisation - see typical drawings. • Sediment interception and sediment settling ponds where required by the landowner/occupier. Areas with high water table on weak soils will require moveable pads for heavy equipment.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
From KP 30.6 the soil temperature regime is cryic, becoming mesic at elevations less than c. 2,200m. • Sandy-skeletal Cryochrepts, which are generally Typic but may become Lithic on hilltops overlying hard rock. • Clayey-skeletal to Loamy-skeletal Typic Xerochrepts on non-tuff, mesic soils. • Coarse-loamy Dystrandepts on tuff (area unknown).	Reduced soil productivity on both tuff-derived soils and water-logged soils. Other potential impacts include: • soil erosion; • sediment yield;	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Bio-restoration. • Use moveable equipment mats. Fill in depressions. • Permanent erosion control devices.	**MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction. Furthermore, water is predicted to remain in surface depressions for less than 3 months after construction is

Environmental Impact Table 2 (Maps 2A and 2B) (KPs 18.9 – 33.9): Yalnizcam Mountains, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	• altered drainage; • reduced soil productivity from non-tuff soils.	• Sediment interception and sediment settling ponds where required by the landowner/occupier. • Channel stabilisation - see typical drawings.	completed.
Landscape and Visual			
High sensitivity landscapes predominate throughout this section. From the Posof River the land rises through steeply dissected terrain broken by intermittent hilly lands into the southern part of the Yalnizcam Mountains. Elevation rises above the treeline to about 2,400m, where the terrain becomes rolling between KP 25 and KP 30. High rounded mountains with sub-alpine meadows carpeted with wildflowers in spring and summer. Scattered trees, particularly in the valleys, provide magnificent autumn colour. Higher, more rugged, and mostly snow-capped mountains form spectacular backdrops to the area. Southwards from KP 30 the land comprises gradually descending rolling terrain (elevation 2,445 – 2,000m), where springs, streams, and small rivers proliferate in the vicinity of small settlements which add further character. Hilltop crests are gently rounded. Grazing dominates land use with small fields of rainfed cereals in the vicinity of settlements. PT1 will be located at KP 22.1 and will occupy c. 13.4ha on a broad, mid-slope bench on otherwise steeply dissected terrain c. 3km south of the Posof River and 150m west of the Ardahan-Posof road. The PT1 site is located in the region of some of the most spectacular scenery along the pipeline route – an area of high mountains rich in springtime flowers and deep valleys with light forests providing autumn colour; backed by distant jagged, snow-capped mountains. There are some existing visually intrusive factors along the valley, which detract from views, notably a series of high-tension electricity transmission cables and pylons, and the Ardahan-Posof road. In some places, over-grazing by sheep has reduced the sub-alpine	Formation of conspicuous whitish line across landscape where pale-coloured tuff soils or parent material exposed. Some minor loss of scattered trees and bushes. Landscape impact from potentially waterlogged sites. The main visual receptors to construction at PT1 will be travellers, predominantly those journeying towards Posof, and to visitors using the Posof Wildlife Area for recreational purposes. There are no residential receptors that will have views of the facility.	• See soil reinstatement above. • Implement fertiliser trials using NPK + micro-nutrients in combination with reinstatement species • Soil protection involving moveable pads to support heavy equipment, (see soil reinstatement measures). • Grade out depressions and revisit to monitor for settlement and ponding. Repair as required. • PT1 has been located within the rural environment to minimise its impact on residential properties. In addition, because of the mountainous terrain, views of the PT1 will be relatively limited in extent and receptor points will be largely remote and little visited. Mitigation measures in Section 6.3, such as minimising the removal of mature trees prior to construction, will also be applied.	**MAJOR IMPACTS** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies tuff, it will retain its whitish colour and show as a white line across the landscape. However, a number of additional site-specific mitigation measures will further be employed in tuff areas to manage this impact, including: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement; • post-reinstatement monitoring.

Environmental Impact Table 2 (Maps 2A and 2B) (KPs 18.9 – 33.9): Yalnizcam Mountains, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
meadow to close-cropped turf or even eroded areas of exposed soil.			**MODERATE IMPACTS** Depressions continue to store surface water after passage of construction. **MODERATE IMPACTS** Moderate landscape and visual impacts on recreational users in the vicinity of PT1. However, this impact will occur for a limited period during construction (see Section 7.2.2 for an assessment of operational landscape and visual impacts).
Ecology			
Protected Areas The route continues to cross the Posof Wildlife Protection Area (see Environmental Impact Table 1 and Map 1B for details). PT1 will be located within this area and will require a permit of 13.4ha. In addition, there will be a temporary campsite during the construction period, which will be approximately 11.9ha. Vegetation at the proposed site is composed of subalpine meadow and is distant from forest areas important for the Caucasian Black Grouse. The PT1 site does not fall within an ecologically sensitive area.	Approximately, 13.4ha of subalpine meadow will be impacted by construction activities at PT1. Some additional areas may also be affected during offsite construction activities, including the temporary landtake for the construction camp. As the route continues to pass through the Wildlife Protection Area up to KP 25, potential impacts described in Environmental	Since the vegetation at the proposed PT1site and its associated temporary construction camp is composed of sub-alpine meadow and is distant from forest areas, the Caucasian Black Grouse will not be adversely affected by the location of this pump station. The pump station site is not considered to contain any ecologically sensitive features. Apply standard mitigation measures as described in Section 6.6, including: • full reinstatement, using species appropriate to the surrounding	**MINOR IMPACT** Based on the mitigation measures described, the limited area of habitat affected and the absence of ecologically sensitive features, it is predicted that only minor impacts on the biological environment will occur as a result construction activities at PT1. As the route continues to pass through the Wildlife Protection Area up to KP 25, residual impacts described in Environmental Impact Table 1

Environmental Impact Table 2 (Maps 2A and 2B) (KPs 18.9 – 33.9): Yalnizcam Mountains, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	Impact Table 1 are also applicable along this length.	appropriate to the surrounding habitat or landuse, of all areas of non-permanent landtake, such as the temporary construction camp. As the route continues to pass through the Wildlife Protection Area up to KP 25, preconstruction surveys and specific mitigation measures described in Environmental Impact Table 1 are also applicable along this length.	are also applicable along this length.
Important Ecological Factors ESAs 2 to 4 are identified for the following globally-threatened plant species, *Allium sosnowskyanum* recorded within ESA 2 and *Scrophularia versicolor* within ESAs 3 and 4. ESA 2 occurs between KPs 19.0 and KP 19.4, ESA 3 between KP 26.4 and KP 26.8 and ESA 4 between KP 29.7 and KP 30.1. The IUCN status for these species are given in Table 5.20, Section 5. BVS-003 will be located at KP 19.5 within subalpine meadow habitat on the edge of ESA 2 and will require approximately 350m^2 of permanent landtake. A new access road will be constructed to the site of c. 80m in length.	Habitat destruction of sub-alpine meadow may result in the loss of individuals from populations of globally-threatened plants. Permanent loss of 350m^2 of subalpine meadow habitat at BVS-003.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 2-4. Since *Scrophularia versicolor* occurs within both ESAs 3 and 4, diligence will be exercised in searching for it between these two areas. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and	**MODERATE IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACT** Given the relatively small size of the block valve station and the temporary nature of construction activities, impacts are anticipated to be minor subject to implementation of the specified mitigation measures.

Environmental Impact Table 2 (Maps 2A and 2B) (KPs 18.9 – 33.9): Yalnizcam Mountains, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		replace correctly. • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during re-instatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESAs 2 - 4. Apply standard mitigation measures as described in Section 6.6 to minimise loss of subalpine meadow habitat. However, as BVS-003 is not located within an ecological sensitive area and there are no known rare or threatened plants at the proposed site, there will therefore be no loss of globally-threatened plants.	

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

MAP 2: PROJECT INFORMATION

A pump station (PT1) is located between the KP 20 to KP 30 (c. 21km along the pipeline). The proposed site is 13.4ha in mountainous terrain with an elevation of 2,000m. Due to the terrain the pump station would need to be divided into three levels. Adjacent to the pump station is its temporary construction camp (11.88ha). There is also a block valve station in the area.

MAP 2: MAP HIGHLIGHTS

- The main land use is pastureland.
- Fluvial landscape near the Posof River rapidly changes into steeply dissected terrain broken by hilly land.
- There is a high water table bordering the watercourses.

MAP 2: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** four settlements on this map will be directly impacted by the pipeline project. Two (Sogutlukaya, Asikzilali) have land intersected by the proposed pipeline (L) and three settlements are within 5km of a pump station (P) (Sogutlukaya, Subasi and Askuzeyir). Two settlements are within 2km of the block valve station (B) (Subasi and Sogutlukaya), and one of the settlements (Subasi) is also within 500m of the pipeline route (D). Settlements impacted by traffic have not yet been identified. No settlements are downstream of a river (R).

- ***Surveyed:*** three settlements (Sogutlukaya, Subasi, Asikuzeyir) were surveyed in the field during pump station consultation (s). One further settlement (Asikzulali) was surveyed by telephone (t).
- ***Not surveyed:*** Camyazi (2.5km); and Bosdere (1.8km).

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Sogutlukaya (L) (P) (B) (D) (S)			
• ***Demographics:*** there is a summer population of 250 people in 40 households and a winter population of 230 people in 35 households. No population change experienced over the past five years. • ***Safety:*** the centre of settlement is situated 1.5km from the pipeline and the nearest house is 1.3km from the pipeline. The pump station is 3km from the settlement and within 2km of the houses used during winter. • ***Health:*** the lack of a sewerage system has health implications. • ***Project attitude:*** generally inhabitants are positive towards the pipeline and would welcome the pump station. They perceive employment opportunities and increased incomes. • ***Land ownership at actual pump station site:*** the proposed site will	**PUMP STATION (PT1) IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See the Overview of the Land Acquisition Process in Appendix C9. ***Land***		

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

occupy 12% (4ha) of the communal pasture lands used by the settlement (rented from the state). The total pasture land used by the settlement is 34ha. The site is also on, or close to a spring that is the main source of general household water for the settlement. It is used for watering livestock but not used for drinking water. Local residents report that they have constructed pipes (approximately 30-40cm below the surface) to transport this water to the settlement. This water flow will not be impacted by the project. • ***Land ownership at pump station construction campsite:*** the campsite is immediately adjacent to the pump station. It will be 11.88ha in size, all of which is unregistered private pasture land used by Sogutlukaya local residents. • ***Land ownership at jandarma security station within construction campsite:*** 1ha • ***Perceived problems of pipeline and pump station:*** an additional consultation meeting was held in April 2002 to assure the settlement that their earlier concerns regarding water and land use at the pump site have been taken into consideration. In the meeting, inhabitants appeared to be satisfied with the measures being undertaken to ensure their water supply would not be affected. Some inhabitants continue to be concerned about the use of their pasture land. • ***General land ownership & use:*** the state is the primary landowner (40% of land), although this land is rented by local residents. 35% is privately owned by the local residents themselves. Few local residents have title deeds. Cattle and poultry graze on settlement pasture lands (except in winter months). Bee keeping is undertaken, although it is not a main agricultural product. There is no irrigation. • ***Settlement livelihood:*** the settlement economy is based predominantly on animal husbandry (cattle) and also on subsistence agriculture. • ***Availability & Skills:*** no previous pipeline experience, but experience in 7 of the 24 skills useful for construction. • ***Accessibility:*** the settlement is 7km from the district centre. • ***Information provision:*** 99% literacy levels. • ***Environmental & cultural resources:*** Kazankaya Creek runs east of the settlement. There is also a cultural site (a castle) on the north	Permanent land expropriation of 13.4ha will occur. Possible impacts due to loss of 12% of settlement communal pasture land. ***Livelihoods*** Decreased land resources may result in decreased livelihood opportunities. ***Water Supply*** Potential for disruption or contamination of water source. ***Pump Station Construction hazards: humans*** Working areas pose safety hazards to residents, particularly small children.	Evaluate the possibility of assigning unused state owned pasture land. **See Overview of the Land Acquisition Process in Appendix C9.** **See Overview of the Land Acquisition Process in Appendix C9.** **See Overview of the Land Acquisition Process in Appendix C9.** Site to be selected in consultation with local residents Continued access to the water source through diversion of the water or supply of an alternative source of water to be evaluated prior to construction, and if necessary, will be provided by the Project. **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will	A compensation package is in the process of being developed. Until the compensation package is available for evaluation, the impact on Sogutlukaya is considered to be significant. **See Overview of the Land Acquisition Process in Appendix C9.** **No residual impact** **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from awareness raising.

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

the settlement. There is also a cultural site ie castles on the north-west of the settlement. • ***Infrastructure:*** piped water is not available. The local spring in the settlement pasture is one of various sources used. Electricity and communication systems are present, but there is no sewerage or waste disposal system. • ***Services:*** there is no health centre, but there is a primary school. • ***Settlement problems:*** unemployment, waste, and the fact that a pump station is to be built on pasture land.		include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	
	Pump Station Construction hazards: animals Site poses safety hazard for livestock.	**Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Pump Station Construction Accessibility to Grazing Lands Site poses potential for disruption of access for cattle.	**An alternative access route** will be provided to ensure undisrupted and safe movement of cattle to summer pasture lands.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	PUMP STATION CONSTRUCTION CAMP IMPACTS: The settlement will be a primary receptor of impacts resulting from construction workers.	**Monthly community liaison** meetings to be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities.	

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

		BTC Company to look at opportunities to cooperate in providing **health awareness training.**	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.**
	Land Temporary land expropriation (11.88ha) will occur.	Evaluate the possibility of assigning unused state owned pasture and. **See Overview of the Land Acquisition Process in Appendix C9.**	**Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities.
	PIPELINE IMPACTS: ***Land*** Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary.	**See Overview of the Land Acquisition Process in Appendix C9.**

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

		Community liaison meetings: issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Drinking water Potential for disruption or contamination of drinking water during construction	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the project.	**No residual impact.**
	Construction hazards: humans Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from awareness raising.
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected.	**Additional damage to be compensated for.**
	Construction hazards:		

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

	animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Asikuzeyir (P) **(S)**			
• ***Demographics:*** there is a summer population of 150 people in 20 households and a winter population of 110 inhabitants in 20 households. The population has been decreasing over the past five years. • ***Safety:*** settlement centre is 1.8km from the pipeline and 3km from the pump station by the settlement road (not visible). The nearest house is situated 1.6km from the pipeline. • ***Project attitude:*** local residents are generally positive. • ***Perceived benefits of the pipeline and pump station***: include employment opportunities and increased incomes. ***Perceived problems*** include concerns that the drinking water supply not be damaged, and that construction of the pipeline allows for cattle crossing points. There is also concern over potential health and safety risks during construction. • ***Land ownership at actual pump station site:*** communal pasture land, which is in active use from April to October. • ***General land ownership and use:*** the state is the primary land owner. Local residents keep a diverse range of livestock. There is communal pasture land. Grain is most commonly grown. There is no irrigation. • ***Settlement livelihood:*** the settlement economy depends on animal husbandry (250 cattle). There is little land therefore cereals are cultivated for subsistence only. Bee keeping is also carried out. • ***Availability and Skills:*** previous pipeline experience, although a lower availability of potential construction skills (2 out of 14).	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9. ***Water Supply*** Potential for disruption or contamination of water source **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts	The need for an alternative source of water will be evaluated prior to construction, and if necessary, will be provided by the project. **Monthly community liaison** meetings will be held**.**	No residual impact **Low likelihood of significant impacts.**

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

• ***Accessibility:*** The settlement has been built on the side of the valley with just one connection point to the highway. The access road is poor quality. Transportation is a problem for the local residents who have to travel to nearby Asikzulali settlement for most goods & services or the markets in Posof district centre. • ***Infrastructure:*** no piped water. Local springs are used (probably from close to the proposed location of pump station 1). No other infrastructure except electricity and telephone. • ***Services:*** the local primary school is closed and there is no health care centre. • ***Settlement problems:*** transportation, missing health centre and schooling problem and the settlement is very poor.	resulting from construction workers **PIPELINE IMPACTS:** ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Drinking water*** Potential for disruption or	**Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Owners to look at opportunities to cooperate in providing **health awareness training.** **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. The need for an **alternative source of water** will be	Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **See Overview of the Land Acquisition Process in Appendix C9.** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **No residual impact.**

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

	contamination of drinking water during construction ***Accessibility to recruitment*** Decreased access to recruitment process. ***Block Valve Station*** See EIA tables and Overview of the Land Acquisition Process in Appendix C9	evaluated prior to construction, and if necessary will be provided by the Project. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Subasi (P) (D) (B) (S)			
• ***Demographics:*** 100 inhabitants in 19 households. The population does not change throughout the year. • ***Safety:*** the centre of the settlement is 750m from the pipeline and approximately 3km from the proposed pump station. The nearest house is located 650m from the pipeline. • ***Land Ownership and Use:*** 50% is communally owned and 40% privately owned by settlements. Grain and herbs are mainly grown and a diverse range of livestock is kept. Hunting is an economic activity. Irrigation is not used. • ***Availability & Skills:*** no previous pipeline experience. Five of the 14 possible construction skills are available in the settlement. • ***Accessibility:*** the settlement is 9km from the nearest district centre. • ***Information provision:*** 100% literacy rate of respondents. • ***Infrastructure:*** no piped water is available. Local springs are used (from close to the location of the pump station)	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9. ***Water Supply*** Potential for disruption or contamination of water	The need for an alternative source of water will be	No residual impact

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

(from close to the location of the pump station). • ***Services:*** there is no primary school. • ***Settlement problems:*** unemployment, water, and insufficient resources.	source **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers **PIPELINE IMPACTS:** ***Construction hazards: humans*** Working areas pose safety hazard to residents,	evaluated prior to construction, and if necessary, will be provided by the project. **Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.** **Road safety training will be held** in schools prior to	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **See Overview of the Land Acquisition Process in Appendix C9.** **Continued attention** to mitigation measures will be

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

	particularly small children	construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	critical to prevent injury. **Benefits** from health and safety awareness raising.
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and	**Significance cannot be established at this time.**

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

		compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	
	Drinking water Potential for disruption or contamination of drinking water during construction.	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	**No residual impact.**
	Block Valve Station See EIA tables and Overview of the Land Acquisition Process in Appendix C9.		
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Asikzilali (L) **(T)**			
• ***Demographics:*** 580 inhabitants with only 6% involved in seasonal migration. • ***Safety:*** the pipeline is located 5.2km from the centre of the settlement and 4.9km from the nearest house. • ***Project attitude:*** the Muhtar stated that the local residents would welcome a construction camp. Local residents are generally aware of the proposed pipeline. • ***Land Ownership and Use:*** 60% of local residents privately own land. Seasonal grazing does not take place. • ***Settlement Livelihood:*** 90% of local residents are farmers and 5% family labourers. Inhabitants are involved in agriculture, bee keeping, trade, local government and education. Five households are involved in fishing for their own consumption. Eight households are involved in bee keeping as one of various income sources. Land is not irrigated	***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, if and habitat restoration measures are implemented in full.

Social Impact Table 2 (Maps 2C) (KPs 18.9-33.9): Yalnizcam Mountains, Ardahan Province

bee keeping as one of various income sources. Land is not irrigated. • ***Availability & Skills:*** no previous pipeline experience. • ***Information Provision:*** All local residents are literate. TV and radio are the main local and national sources of information. • ***Environmental & cultural sites:*** the local forest • ***Infrastructure:*** regular piped water is available. No alternatives are used. • ***Services:*** there is no primary school. • ***Settlement problems:*** there is no place for the cemeteries, barns are needed on the plateau and there are infrastructure problems	***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Environmental Impact Table 3 (Maps 3A and 3B) (KPs 33.9 – 48.7): East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soil temperature regime opens with cryic but becomes mesic at elevations less than about 2,200m. • Sandy-skeletal Cryochrepts, which are generally Typic but may become Lithic on hilltops overlying hard rock. • Clayey-skeletal to Loamy-skeletal Typic Xerochrepts on non-tuff, mesic soils. • Coarse-loamy Dystrandepts on tuff (area unknown).	Main potential impacts: • reduced soil productivity (on tuff-derived soils; water-logged soils; non-tuff soils); • soil erosion; • erosion causing mobilisation of sediments; • altered drainage.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Bio-restoration. • Use moveable equipment mats on water-logged soils. Fill in depressions. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Channel stabilisation – see typical drawings.	**MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed. Furthermore, soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
• Mesic Clayey-skeletal to Loamy-skeletal Typic Xerochrepts on slopes. • Mesic Coarse-silty Typic Xerofluvents near channels merging to Xerochrepts along edges of floodplains.	Main potential impacts: • reduced soil productivity; • soil erosion; • erosion causing mobilisation of sediments; • altered drainage.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Bio-restoration. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Channel stabilisation – see typical drawings. • Crushed rock. • Ustifluvents will require careful reinstatement of micro-topography to restore original	**MAJOR IMPACT** Potential for long-term impacts as waterlogged Ustifluvents may require more than one year to reinstate and will require monitoring and possible additional remedial works in the first year after reinstatement.

Environmental Impact Table 3 (Maps 3A and 3B) (KPs 33.9 – 48.7): East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		land drainage patters and minimise waterlogging.	
Landscape and Visual			
This route section comprises gradually descending rolling terrain (elevation 2,445 to 2,000m), where springs, streams, and small rivers proliferate in the vicinity of small settlements. Hilltop crests are gently rounded. Grazing dominates land use with small fields of rainfed cereals in the vicinity of settlements. In other places the land descends more steeply to the plateau of Ardahan, whose undulating landscape is dissected by steep river gorges above which cling small settlements whose occupants depend upon cattle-grazing. The sweeping open treeless steppe, dotted with small occasionally farmed plots, is backed intermittently by distant rounded mountains. The landscape is striking in its scale and diversity but becomes less notable south of KP 40. BVS-004 and BVS-005 will be located within sub-alpine meadow habitat at KP 36.8 and KP 48.6, respectively. Approximately 350m^2 of permanent landtake required for each station. New access roads will be constructed to these sites of c. 370m in length for BVS-004 and 25m for BVS-005.	Formation of conspicuous whitish line across landscape where pale-coloured tuff soils or parent material exposed. Some minor loss of scattered trees and bushes. Potential for minor impacts as a result of water-logging along corridor. Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	• Apply 'Soil' reinstatement specifications above. • Soil reinstatement involving moveable pads to support heavy equipment. • Implement fertiliser trials using NPK + micro-nutrients using reinstatement species.	**MAJOR IMPACTS** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies tuff, it will retain its whitish colour and show as a white line across the landscape. The scale of impact declines south of KP 40. However, a number of additional site-specific mitigation measures will further be employed in tuff areas to manage this impact, including: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement; • post-reinstatement monitoring.
Noise			
Cimlicayir settlement is located c.166m from the centreline of the Pipeline.	Short-term noise impacts are	The following mitigation measures	**MINOR IMPACT**

Environmental Impact Table 3 (Maps 3A and 3B) (KPs 33.9 – 48.7): East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	expected to occur at Cimlicayir during soil stripping and welding/lowering activities.	will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	Short-term noise impacts are expected to occur during soil stripping at Cimlicayir. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. This will be short-term in nature, lasting only for a few days.
Archaeology and Cultural Heritage			
The abandoned seasonal (summer) settlement of Yusufkoy is a 3rd Degree Site* and the only archaeological site potentially affected by pipeline construction in this section. Surface remains of various buildings have been found in this site. The site dates back to the Ottoman Period and lies west	Potential for ground disturbance at this site during pipeline construction.	The pipeline has been re-routed to avoid this site. Construction will be carried out	**MINOR IMPACT** Impacts will be limited to the temporary disturbance of the site setting and peripheral

Environmental Impact Table 3 (Maps 3A and 3B) (KPs 33.9 – 48.7): East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
of the route. * This site has not yet been registered by the MoC and is provisionally assigned this classification. . It is proposed for registration by the regional preservations council. Taslipnar – has been proposed for registration by the regional preservations council	In addition, indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	under the supervision of an archaeologist authorised by BOTAŞ.	features.

Social Impact Table 3 (Maps 3C) (KPs 33.9 – 48.7):
East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

MAP 3: PROJECT INFORMATION

There is no construction camp or pump station in the area. There are two block valve stations.

MAP 3: MAP HIGHLIGHTS

- Grazing dominates land use, with small fields of rain-fed cereals in the vicinity of settlements.
- Burmadere dam is adjacent to Burmadere settlement.
- There are numerous springs, streams and small rivers in the vicinity of the settlements.

MAP 3: SURVEYED AND IMPACTED SETTLEMENTS

- ***Impacted:*** four settlements on this map will be directly impacted by the pipeline project (Burmadere, Cimlicayir, Koyunpinar, Avcilar). All have land intersected by the proposed pipeline (L) and Climlicayir is also within 500m of the pipeline (D). No settlements are within 5km of a construction camp or pump station. One settlement is within 2km of the block valve station (B) (Avcilar). Settlements impacted by traffic have not yet been identified. No settlements are downstream of a river (R).

- ***Surveyed:*** two settlements (Burmadere and Koyunpinar) were surveyed in the field (S). Four further settlements (Cimlicayir, Derekoy Avcilar and Otagli) were surveyed by telephone (T).
- ***Not surveyed:*** Cavdarli was not surveyed and is 1.6km from the pipeline.
- ***Disclosure Meeting Location:*** Cimlicayir

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Otagli (T)			
• ***Demographics:*** 660 inhabitants (permanent population) • ***Safety:*** the pipeline is situated 2.2km from the centre of the settlement, the nearest house is 1.5km from the pipeline. • ***Project attitude:*** the Muhtar suggested that a construction camp would generally be welcomed and that local residents, who are generally informed of the project, have few major concerns. • ***Landownership & Use:*** 70% of land is privately owned by the local residents. No seasonal grazing of livestock is carried out in the settlement. Agriculture is rain fed. • ***Settlement Livelihood:*** 59% of local residents are farmers. Economic activities carried out in the settlements include agriculture, bee keeping, trade, local government and construction. Three families are involved in bee keeping, although it is one of various income sources		***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

Social Impact Table 3 (Maps 3C) (KPs 33.9 – 48.7):
East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

• ***Availability & skills:*** no previous pipeline experience. • ***Settlement accessibility:*** the settlement is accessible all year round. It is 4km from the district centre. • ***Information provision:*** 95% of the population is literate. TV and telephone are the main local information sources and TV is the main national source. • ***Environmental and cultural sites:*** there is a mausoleum. • ***Infrastructure:*** there is piped water, but not a regular supply. The main alternative source is the settlement fountain • ***Settlement problems:*** *'settlement is no good', 'water canals must be arranged*', housing problems and low income.			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Burmadere (L) (S)			
• ***Demographics:*** 1,250 inhabitants with approximately 250 households. Population decreasing (typical of rural settlements) due to unemployment. • ***Safety:*** the settlement centre is situated 1.7km from the pipeline and the nearest house is 1.4km from the pipeline. • ***Health:*** health implications from use of poor quality / polluted water and lack of sewerage disposal. • ***Disputes*****:** there are disputes over natural resources and economic issues. Conflicts over water and unemployment are usually resolved by the settlement Muhtar / settlement elders in a community meeting. • ***Project attitude:*** there is general approval, although a number of households are not in support of the pipeline for fear of losing their already small tracts of land. 45% of respondents feel that there will be no benefits from the project and 27% have expectations of employment. Seven of 11 surveyed households would welcome a construction camp • ***Land ownership and Use:*** 50% of the land is communally owned (above average) and used as pasture; 40% is privately owned and used by local residents, and 10% leased from others. Some land is not registered with the special provincial administration and no title	***Conflicts over land boundaries*** Exacerbation of existing conflicts. ***Accessibility of recruitment*** Decreased access to recruitment process. ***Land*** Potential complications in expropriation process. **Skills and Resources** Increased opportunity to provide skilled or semi-	**Land boundaries to remain clearly demarcated** at all times. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **See Overview of the Land Acquisition Process in Appendix C9.** **Information is highlighted to contractor** so that they	**No significant residual impacts.** **No residual impact expected.** **See Overview of the Land Acquisition Process in Appendix C9.** **Potential positive benefits** to local settlements.

Social Impact Table 3 (Maps 3C) (KPs 33.9 – 48.7):
East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

deeds are available, causing concern over expropriation payments. Wheat, barley and rye are grown for subsistence purposes, although there is concern over the impact on crops. Cattle are the main form of livestock and animal breeding provides the basic source of income with the production of fodder, cattle/ horse breeding the main activities. Seasonal livestock grazing takes place between May and November. Irrigation is not used. Trade is reported as a main economic activity and no respondents have a regular (paid) job • ***Availability and skills:*** no previous pipeline experience. Nine of the 24 possible construction skills eg engineers, heavy machine operators/ drivers, repairmen, woodcutters, drivers, security personnel and welders are available. 80% of settlements surveyed state that they are unemployed and 73% of respondents would accept a temporary job. There is a sand quarry. • ***Accessibility:*** poor – auxiliary roads from sand are closed in winter. The settlement is 8km from the district centre. • ***Information provision*****:** Muhtar is the key source of local information and the TV is the key source of national information. 95% of inhabitants are literate. • ***Environmental and cultural sites:*** the local dam. • ***Infrastructure:*** no access to piped water – local springs are the main source and a settlement fountain (proving insufficient) yet adjacent to the Burmadere Dam. Electricity infrastructure is available, and there is sewerage. Waste is disposed of through burning or mixing with fertilizer. • ***Services:*** the settlement has a health centre, and access to traditional medicine and there is a primary school with three teachers. There is a coffee house and transport services. • ***Settlement problems:*** significant water problem (quantity and quality), poor roads, dust, difficulty in transportation, lack of food, housing, heating, nutrition, and unemployment. Income and living standards have decreased. Settlements state that investment in animal breeding would allow for leather ware and dairy businesses to be established. • ***Other:*** engineers carrying out detailed engineering works reportedly	skilled labour or to source goods or materials. ***Drinking Water*** Potential for disruption or contamination of drinking water during construction ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Special Sites:*** Refer to the Environmental Impact Tables.	can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the project. **Livestock crossings will be established** at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**No residual impact** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 3 (Maps 3C) (KPs 33.9 – 48.7):
East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

told local residents *'after the construction of the pipeline, this region will look like Paris'.* The settlement is the poorest settlement of Ardahan and Kars.			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Derekoy **(T)**			
• ***Demographics:*** 235 inhabitants, none of whom migrate seasonally • ***Safety:*** seasonal grazing of livestock does not take place. The centre of the settlement is 2500m from the pipeline. The nearest house is located 2100m from the pipeline. • ***Project attitude:*** according to the Muhtar, local residents would welcome a construction camp. Local residents are generally aware of the pipeline. According to the Muhtar, there are no major concerns. • ***Landownership & Use:*** 90% of land is privately owned by local residents. All land is rain-fed. • ***Settlement Livelihood:*** bee keeping is carried out by one household, although it is one of many sources of livelihood. • ***Accessibility:*** all year round accessibility. • ***Information provision:*** 95% of local residents are literate. TV and telephone are the main sources of local information and TV the main source of national information. • ***Environmental and cultural sites:*** both a castle and a forest. • Infrastructure: no piped water. Local springs are one of a number of water sources. • ***Settlement problems:*** inadequate access to water.	***Drinking water*** Potential for disruption or contamination of drinking water during construction. ***Special site*** Refer to Environmental Impact Tables.	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	**No residual impact**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Cimlicayir (L) (D) (T)			
• ***Demographics:*** 194 inhabitants, none of whom migrate seasonally. • ***Safety:*** the settlement centre is situated 337m from the pipeline. • ***Project attitude:*** the Muhtar suggests that settlements will welcome a	***Construction hazards: humans*** Working areas pose safety	**Road safety training will be held** in schools prior to	**Continued attention** to mitigation measures will be

Social Impact Table 3 (Maps 3C) (KPs 33.9 – 48.7):
East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

construction camp. Local residents are generally aware of the pipeline, and there is concern that land will be damaged. • ***Landownership & Use:*** 80% of land is privately owned by local residents. There is seasonal grazing. No land is irrigated. • ***Settlement livelihood:*** 80% of working adults are farmers and 5% are family labourers. Agriculture, bee keeping, trade, local government, construction and manual labour are all settlement activities. Bee keeping is carried out by four households and honey is consumed by the families • ***Availability & skills:*** no previous pipeline experience. • ***Accessibility:*** the settlement is accessible all year round. It is 9km to the nearest district centre. • ***Information provision:*** 95% of local residents are literate. Telephone and TV are the two main sources of local and national information. • ***Environmental & cultural site:*** according to the Muhtar, there is a 'tower'. • ***Infrastructure:*** piped water is not available in the settlement. A settlement fountain is the main source. • ***Settlement problems:*** inadequate access to water, low incomes and unemployment.	hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Beekeeping: stationary hives. Inform owner of need to move hives** to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Livestock crossings** will be established at locations	critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 3 (Maps 3C) (KPs 33.9 – 48.7):
East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

		agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	
	Drinking water Potential for contamination of drinking water by sediment or accidental spills.	**Alternative sources of water** will be provided during construction to settlements that use water channels for drinking that are crossed by the construction activities.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary.	**No residual impact.**
		Community liaison meetings: issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Koyunpinar (L) (S)			
• ***Demographics:*** 1,414 inhabitants with 234 households. Population is decreasing. • ***Safety:*** the pipeline is located 2.5km from the settlement centre and the nearest house is 2km from the pipeline. • ***Health:*** the lack of a sewerage disposal system has health implications. • ***Disputes:*** there is tension due to insufficient drinking water. • ***Project attitude:*** there is no hostility to the pipeline and local residents are generally positive. 72% of local residents have	***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 3 (Maps 3C) (KPs 33.9 – 48.7):
East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

residents are generally positive. 72% of local residents have expectations of direct employment and 9% expectations of land compensation. Approximately 40% of respondents raised a number of concerns. The majority of surveyed households would welcome a construction camp. • ***Land ownership & Use:*** 80% privately owned by the settlement, 20% communally owned and used by the settlement. Seasonal grazing of a diverse range of animals is carried out between spring and October. Animal breeding is the main source of income. Wheat and barley are grown primarily for household subsistence and animal feed. There is concern that crops will be damaged by passing officials. • ***Settlement livelihood:*** bee keeping is a minor activity but of potential importance in the future (if investment made).		***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
• ***Availability & Skills:*** no previous pipeline experience, seven of the 24 potential skills useful for construction (food services, heavy machinery drivers, repairmen, woodcutters, drivers, security personnel and welders) are available. 75% have been unemployed for more than one year. 82% of respondents would accept a temporary job. • ***Accessibility:*** auxiliary and settlement roads are constructed from sand, and the latter inadequate for the local residents needs. Roads are only closed in February. The settlement is 32km from the provincial centre.	***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
• ***Information provision:*** The Muhtar is the most important source of local information and the TV the most important source of national information. 90% of local residents are literate. • ***Infrastructure:*** there is no piped water, therefore a range of sources including local springs, settlement fountain and wells are used. Water is taken from a local Cotsuyu creek by donkey. There is electricity, but no sewerage, waste disposal – and only 15% have mobile phones. There is a telecommunications system, but this is not adequately functioning. • ***Services:*** there is a primary school with seven teachers, there are midwifes, doctors and a health centre are present. As well as a coffee house and transport services • ***Settlement problems:*** unemployment, and poor water quality. Poverty and unemployment have been on the decrease.	***Drinking water*** Potential for contamination of drinking water by sediment or accidental spills. ***Accessibility to recruitment*** Decreased access to recruitment process.	**Alternative sources of water** will be provided during construction to settlements that use water channels for drinking that are crossed by the construction activities. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact.** **No residual impact expected.**

Social Impact Table 3 (Maps 3C) (KPs 33.9 – 48.7):
East of Asagi Aydere Settlement to East of Koyunpinar Settlement, Ardahan Province

Poverty and unemployment have been on the decrease. • ***Other:*** no respondents have a regular paid job, although main economic activities include construction and trade. Inhabitants are confident that if there is investment in agriculture, animal breeding and bees these sectors will develop.	***Skills and resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**Potential positive benefits** to local settlements.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Avcilar (L) (B) (T)			
• ***Demographics:*** 685 permanent inhabitants. • ***Safety:*** the settlement centre is 1.2km from the pipeline and the nearest house is 1.1km from the pipeline. Local residents carry out seasonal grazing. • ***Project attitude:*** the Muhtar feels that local residents would welcome a construction camp. Local residents are generally aware of the pipeline but there is concern that they have not been given sufficient information. • ***Land ownership & use:*** 60% of land is privately owned by the local residents. Land is not irrigated. • ***Settlement livelihood:*** 80% of working adults are farmers, and 18% are family labourers. Local residents are involved in agriculture, bee keeping, trade, local government work, construction, transportation and education. 14 households are involved in bee keeping although are dependent on a number of incomes • ***Availability & Skills:*** no previous pipeline experience • ***Accessibility:*** the settlement is 2km from the district centre. • ***Information provision:*** TV and telephone are the main sources of local information and TV is the main national source. • ***Environmental & Cultural Sites:*** there is a mausoleum and Barsak creek running parallel with the pipeline from the Burmadere dam runs through the northern part of the settlement.	***Special sites*** Refer to Environmental Impact Assessment Tables. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Block Valve Station*** See EIA tables and Overview of the Land Acquisition Process in Appendix C9.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Environmental Impact Table 4 (Maps 4A and 4B) (KPs 48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Clayey-skeletal to Loamy-skeletal Typic Xerochrepts on slopes. • Mesic Coarse-silty Typic Xerofluvents near channels merging to Xerochrepts along edges of floodplains. • Mesic to Meso-Cryic Clayey-skeletal to Loamy-skeletal Xerochrepts on undulating and rolling terrain. • As above, but lithic on steep and moderately steep slopes. • Possible Coarse-silty Typic Xerofluvents on floodplains, which merge with channel sands and gravel.	Main potential impacts: • reduced soil productivity; • soil erosion; • sediment yield; • altered drainage. Potential transboundary impacts as the Kura River crosses border between Turkey and Georgia, with consequences for suspended sediment and other forms of pollution.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MODERATE IMPACT** Productivity losses are predicted to last less than one year after construction, (but more than 3 months for arable land, more than 6 months in grazing pasture), but up to 2 years in upland areas with no formal land use. Soil erosion will occur over the medium short-term and is predicted to be visibly active, but no rill and gully formation evident.
Landscape and Visual			
Largely low sensitivity landscapes comprising gently-rolling plateau lands with grazing and non-intensive arable farming intermixed with sub-alpine grasslands. Local variations to this relief derive from: • minor areas of steep and moderately steep lands at some river and stream crossings; • small areas of flat lands on some floodplains; • small areas of flat lands on some uplands. Rivers also form prominent features in this landscape. The route crosses the fast-flowing Cotsuyu River north of KP 50, and the gentler Kura River north of KP 65. The former is edged by marshland, the latter is crossed at the lower reaches of a rocky gorge. Between the two, the route rises across upland and passes through an existing gap in the mature Scot's Pine forest near Ardahan. The area south of the Kura River and east of the route is extensive Scot's Pine forest but this will be untouched by the Pipeline.	Insensitive use of heavy plant will give rise to long-term/permanent impact on the marshland either side of the Cotsuyu River. Workers at the Ardahan Organised Industrial Zone to the north of BVS-006 will experience potential visual impacts during construction.	• Reinstatement of the RoW. • Near Cotsuyu River, protective and other measures to reduce the impact of heavy machinery will include route narrowing, and use of moveable equipment mats to spread vehicle weight and avoid deep rutting. • Construction will be undertaken at the driest time of the year (July to August). Removal / replacement of turfs will be necessary if schedules dictate work during wetter periods (April to June). • Particular attention will be paid to	**MINOR IMPACT** Landscape is resilient to change. Visual impacts will be generally short-term due to the temporary nature of construction activities. **MINOR IMPACT** As receptors to the block valve station construction activities are located in an existing industrial setting they are considered to have a low sensitivity and landscape value is considered low, only minor impacts are expected.

Environmental Impact Table 4 (Maps 4A and 4B) (KPs 48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Relatively large numbers of people are situated in close proximity to the route, including Hanak-Ardahan provincial highway over about 10km and residents of Kartalpinar and Ortagecit east of Ardahan. BVS-006 and BVS-007 will be located at KP 63.3 and KP 66.7, respectively. New access roads will be constructed to these sites of c. 25m in length for BVS-006 and c. 75m for BVS-007. BVS-006 will be c. 420m south of the Ardahan Organised Industrial Zone.		the control of dust, noise and traffic during construction at BVS-006.	
Surface Waters			
The route is located within Aras Watershed and crosses the Kura River near KP 64.9. River channel is sinuous with pool and riffle bars and a parabolic cross-section. Width of crossing is 40m and the bank-full width is 35m. Floodplain width is 40m. Bed consists of cobbles and the flow is perennial of a pool and riffle type. Bank-side vegetation comprises grass and flora, although there is no riparian vegetation. Water quality samples taken at the crossing point indicate this is a Class IV river.	Direct disturbance to bank and bed morphology through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in already poor water quality. Therefore, potential for short-term sedimentation and turbidity. Potential impacts on downstream ecology and water abstraction for human use. Potential transboundary impacts as the Kura River has the potential to convey pollution across national borders.	Apply standard mitigation measures in Section 6.4 and the RP (see Appendix C2) for the protection of surface waters, including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench. Assess need for alternative water supply for downstream communities and provide where necessary if sedimentation and turbidity persist for more than 3 days at the community.	**MINOR IMPACT** Disturbance will be short-term and limited to the immediate working area. Sedimentation of Kura River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Ecology			
Protected Areas The route passes around the Ardahan Forest between KP 60.5 and KP 68.0. This area meets the Important Bird Area (IBA) criteria but does not	Minor temporary disturbance to globally-threatened	In line with the requirements of the Ministry of Forestry, the following	**MINOR IMPACT** at most to mammals during the

Environmental Impact Table 4 (Maps 4A and 4B) (KPs 48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
currently have a protection status. The site comprises extensive areas of grazed montane steppe together with areas of meadow, high altitude Scot's Pine forests, a 15ha marshland called Putka Lake covered with *Carex sp.*, and some cultivated land. The route advances c. 360m to the forest at KP 66. Ardahan Forest and the surrounding meadow are important for large mammals including Wild Goat (globally-threatened), Brown Bear, Grey Wolf and Roe Deer. Smaller mammals found within the forest include Bechstein's Bat (globally-threatened), Common Pipistrelle, Greater Mouse-eared Bat, Mediterranean Horseshoe Bat, European Pine Marten, Beech Marten, Eurasian Badger, Stoat and Weasel. Furthermore, the Brown Bear was recorded at KP 64.9 near the Kura River Crossing. The protection status for all species identified in the Ardahan IBA is given in Table 5.21, Section 5.	mammals during seasonal sensitivities (see EMMP, Appendix C1): • hibernation and peak spring feeding periods for brown bears between November to April and March to June, respectively; • breeding season for wild goats between October and December and during birthing between March and April. In severe weather, bears hibernate in underground dens or caves. During this hibernation period, the females give birth to one or two cubs (rarely three) in January or February. Following hibernation, bears enter a period of peak feeding in order to recover weight lost during the winter months. During such periods they are known to wander over wide areas and are most likely to come into conflict with human habitation, particularly in remote areas. Females with cubs are at their most aggressive at this time.	mitigation will be adopted: "*As a result of the review, it was seen that the proposed project will traverse the Ardahan Wildlife Protection Area. The proposed pipeline will be considered convenient by the Ministry of Forestry, General Directorate of National Parks and Game-Wildlife on the following stipulations:* • *avoid disturbing the areas found within the site, where the wild animals drink water, during the excavation works and if disturbed provide new areas for drinking water close to the site.* • *transport the soil excavated during trenching along the route to a place which will not harm wild animals* • *ensure that the noise and the pollution affect on the wild animals will be minimum during the activities".* The RoW within Ardahan Forest will NOT be fenced off temporarily during construction to ensure free passage of large mammals. If any significant length of trench, in terms of interrupting normal paths or passage used by the various species, needs to be left open for more than a few days (72 hours),	construction period where the specified mitigation measures are applied for the seasonal sensitivities identified for each species. There will be no affect on the IBA designation.

Environmental Impact Table 4 (Maps 4A and 4B) (KPs 48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		points of passage will be provided across it at regular intervals (500m). Specific requirements have been established in relation to human interaction with the Eurasian Brown Bear – see Section 4.14 of the Mammals Species Dossier (Appendix B1). In the late summer/early autumn, in areas from which bears have been recorded, preconstruction ground surveys will be undertaken to establish the presence of potential hibernation places. If found, construction activity will be restricted to periods outside the hibernation season. Furthermore, in areas where the presence of bears has been confirmed by these surveys, the specific requirements outlined in Section 4.14.5 of Appendix B1 shall be implemented, including education of workers to be alert and aware of the potential for human/bear interactions. Such education will include refuse management on sites (particularly where construction camps are located) and awareness of sensitive periods of the year described previously. The hunting of bears or	

Environmental Impact Table 4 (Maps 4A and 4B) (KPs 48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		any other wildlife by the BTC Project Personnel or contractors will be strictly forbidden. The preconstruction survey will establish the presence and local distribution of Wild Goats in the areas from which they have been recorded. Depending on the outcome of these surveys, actions may range from avoidance of construction activity during sensitive periods at specific locations to worker training regarding non-disturbance of nearby herds.	
Important Ecological Factors ESA 5 occurs between KP 60.3 and KP 65.5. This ESA is identified for four globally-threatened plant species (*Saponaria picta, Draba bruniifolia sp. armeniaca, Elymus sosnowskyi, Scrophularia versicolor*) and one nationally-threatened species (*Bupleurum brachiatum*). The IUCN status for these species are given in Table 5.20, Section 5. Cotsuyu River is an important ornithological area and is a wide, shallow, fast-flowing, slightly braided river with vegetated shingle banks and fringing marshland supporting a complete suite of northern riverine birds including exceptionally high densities of Black-headed Wagtails. Key species totals counted on 28.06.2001 include – Little Ringed Plover 2; Green Sandpiper 3; Common Sandpiper 8; Grey Wagtail 1; Black-headed Wagtail 39; Whinchat* 7; Black Redstart 1; Dipper* 1; Sedge Warbler 1. (* = nationally threatened). The protection status for all bird species identified at the Cotsuyu River is given in Table 5.21, Section 5.At KP 55.4, 3 Mountain Chiffchaff (restricted-range) were observed. At IP KP 64.9, a Booted Eagle (nationally-threatened) was recorded.	Habitat destruction of sub-alpine meadow may result in the loss of individuals from populations of globally-threatened plants. Crossing the Cotsuyu River may damage marshland habitat and disturb breeding birds. Disturbance to nationally-threatened and restricted-range birds at the Cotsuyu River crossing and KP points identified in the baseline column. Direct disturbance during nesting, feeding or indirectly, through	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 5. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1):	**MODERATE IMPACTS** Short-term disturbance to internationally important flora within the ESA 5. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during

Environmental Impact Table 4 (Maps 4A and 4B) (KPs 48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
A globally-threatened reptile, Meadow Viper, was recorded on the rocky hillside near KP 64.9. Two fish species breeding in the Kura River are on the IUCN 2000 Red List – common carp, (*Cyprinus carpio*), (Data Deficient) between April and June and Italian barbell, (*Barbus plebejus*), (Lower Risk – Near Threatened) from May to June. Both the common carp and the bulatmai barbell (*Barbus capila*) are species breeding in this river from April to June and May to July, respectively, and have a high commercial value. The Black Sea salmon (*Salmo trutta labrax*) also breeds in Kura river between December and February, although this species is not commercially valued. Additional seasonal sensitivities for fish species of medium commercial value are given in the EMMP (see Appendix C1). BVS-006 will be located within subalpine meadow habitat within ESA 5. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to this site of c. 70m in length.	habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive, although the Booted Eagle begins breeding as early as March). July can remain sensitive for late and second broods. Disturbance to the Meadow Viper during August to October when the females give birth to live young. However, this globally-threatened reptile species will not be affected by Kura River crossing as the route does not cross habitat mostly used by Meadow Viper. Temporary potential impacts to aquatic life (spawning fish and aquatic plants providing spawning sites for fish) during pipeline construction across the Kura River. Permanent loss of 350m^2 of subalpine meadow habitat within ESA 5 during construction of BVS-006.	• remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Preconstruction bird surveys will establish whether suitable nesting sites are available within 250m of the Cotsuyu River crossing. If this is the case, construction activity is to be avoided between April and July. The marshland protected from heavy equipment by moveable equipment mats plates and will be turfed as above for ESA 5. Shrubs and dense vegetation along the RoW will be cleared outside the Whinchat's breeding season (April to July). The preconstruction survey will establish the presence of potential nesting sites for the Booted Eagle within 500m of the pipeline route. If nesting sites are identified, avoidance of construction activity from March to July. Potential nesting sites within the RoW will be removed outside the breeding period.	the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to March (although April at the Cotsuyu River), and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACTS** only to the globally-threatened reptile, if the specified mitigation measures for the seasonal sensitivity are applied. **MINOR IMPACTS** at most for all fish species if construction takes place during August to November inclusive. At other times of year (varying by species), impacts will generally be **MINOR** on the basis of the rigid application of water crossing mitigation measures. Where construction is undertaken during the breeding season, impacts may be **MODERATE** for the IUCN listed species common carp (April-June), Italian barbell (May-June) and highly commercially valued bulatmai barbell (May to July).

Environmental Impact Table 4 (Maps 4A and 4B) (KPs 48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Although the habitat crossed by the route is not that mostly used by the Meadow Viper, this species may still be present. Therefore, pre-construction surveys will seek to establish the presence (if any) and abundance of this species along the RoW. Thereafter, clear training to be provided to workers with regards to the conservation importance of the snake, its recognition and procedures for translocating specimens. Particular attention will be applied during the August to October period. Construction activities at river crossings will not be permitted during the breeding season of fish species that are of high commercial value or that are designated has having conservation importance. For construction activity to be permitted during the breeding season of fish species with medium commercial value, the Contractor will be required to submit specific mitigation measures to avoid impacting breeding fish to BOTAŞ for approval. Such measures might include, but not be limited to, the	**MINOR IMPACT** Based on the mitigation measures described, the small area of habitat affected and the temporary nature of construction activities, it is predicted that only minor impacts on the biological environment will occur as a result of construction activities at BVS-006. This assessment will be confirmed by the site-specific survey prior to construction.

Environmental Impact Table 4 (Maps 4A and 4B) (KPs 48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		following: preconstruction survey results indicating that spawning grounds are avoided, the provision of fish passages, etc, in addition to the generic mitigation measures that are required at all river crossings. Prior to construction of BVS-006, a site specific survey will be undertaken by a botanical specialist to identify and locate threatened species at the site and at any surrounding areas potentially affected by construction activities. Based on the findings of this survey, appropriate mitigation will be determined. The area of sensitive habitat in ESA 5 affected by construction activities will be minimised to the minimum necessary for safe working.	
Archaeology and Cultural Heritage			
Hanak Road, a rough cobblestone pavement, built by the Russians after the war with the Ottoman Empire in 1893 is the only archaeological resource that will be potentially affected during pipeline construction. Hanak Yolu is a 2nd Degree Site* and is crossed by the route 3 times. * This site has not yet been registered by the MoC and is provisionally assigned this classification. It has been proposed for Registration by the Regional preservations council.	This site will potentially experience ground disturbance during pipeline construction.	The pipeline will be thrust bored under the road surface to avoid these impacts. Hanak road will also be fenced throughout the construction period. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to temporary disturbance of the site setting and peripheral features.
The following have been proposed for registration by the regional			

Environmental Impact Table 4 (Maps 4A and 4B) (KPs 48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
preservations council: Karahuseyinin Pegler (ii) Sanguletin Pegler; (iii) Purto Plateau; (iv) Rum Cemetery; (v) Kayabasi; (vi) Ziyaret; (vii) Cuma Village (viii) Hanak Road			

Social Impact Table 4 (Maps 4C) (KPs –48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

MAP 4: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There are two block valve stations.

MAP 4: MAP HIGHLIGHTS

- Grazing and rain fed agriculture dominate the land use.
- Conservation forests occupy the hilly land 2km north of the Kuru river.
- Koroglu Dam, Ardahan Forest and Golbasi Lake are located in the area (the latter within 2km of the pipeline).
- Ardahan organised industrial zone is adjacent to KP 60 and closest to Kartalpinar settlement.
- The pipeline crosses the Cotsuyu river and the Kura river.

MAP 4: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted****:* four settlements on this map will be directly impacted by the pipeline project (Alacam, Kartalpinar, Balikcilar and Ortagecit). They will each have land intersected by the proposed pipeline (L). No settlements are within 5km of a construction camp (C) or pump station (P). Two settlements are within 2km of a block valve station (B) (Kartalpinar, Ortagecit). No settlements are within 500m of the pipeline route. Settlements impacted by traffic have not yet been identified. Kartalpinar is < 1km downstream of the pipeline on the Kura River (into which much of the sewerage from Ardahan district centre is placed) (R).

- ***Surveyed:*** two settlements (Kartalpinar and Ortagecit) were surveyed in the field (S) and two additional settlements were surveyed by telephone (T) (Alacam and Balikcilar).
- ***Not surveyed:*** Bastoklu is 1km from the pipeline corridor.

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Alacam (L) (D) (T)			
• ***Safety:*** the settlement centre is located 700m from the pipeline, the nearest house is 300m from the pipeline. • ***Land Ownership & Use:*** grain is the key crop. • ***Accessibility:*** 3km to the district centre.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 4 (Maps 4C) (KPs –48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	settlement is within 500 m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Balikcilar (L) (D) (T)			
• ***Demographics:*** 174 inhabitants, 13% of which migrate seasonally. • ***Safety:*** the settlement centre is located 700m from the pipeline, the nearest house is 300m from the pipeline. • ***Project attitude:*** the Muhtar is of the opinion that local residents would welcome a construction camp. Local residents are aware of the pipeline. • ***Disputes:*** inadequate access to water has disrupted settlement harmony. • ***Settlement livelihood:*** 89% of working adults are farmers, and 9% are family labourers. Local residents are involved in agriculture, bee keeping, local government, education and transport. Two households keep bees and use honey for their own consumption. • ***Land ownership & Use:*** 60% of land is owned by local residents, conflict over the key crop, grain. Irrigation takes place. • ***Availability & skills:*** no previous pipeline experience. • ***Accessibility:*** 3km to the district centre. Roads are closed between February and April. • ***Information provision:*** 95% of local residents are literate. TV and radio are the two favoured sources for local and national information. • ***Environmental and cultural Sites:*** the Muhtar indicated the existence of a 'tower'.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards:***	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for**

Social Impact Table 4 (Maps 4C) (KPs –48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

• ***Infrastructure:*** there is no piped water. Local residents obtain water from nearby settlements	***animals*** Trench poses safety hazard for livestock.	**Livestock crossings will be established** at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Accessibility of recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport need to be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Accessibility of information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Asking residents or workers to translate as necessary.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Irrigation Loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 4 (Maps 4C) (KPs –48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kartalpinar (S) **(L) (D) (B) (R)**			
• ***Demographics:*** 418 inhabitants with 120 households. Population is decreasing due to out-migration to urban areas for employment purposes. • ***Safety:*** settlement centre is 750m from the pipeline and the nearest house is 400m from the pipeline. • ***Project Attitude:*** all surveyed households would welcome a construction camp. There is no hostility and inhabitants, although they have already been impacted, are generally positive. 64% of	***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried

Social Impact Table 4 (Maps 4C) (KPs –48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

have already been impacted, are generally positive. 64% of respondents have expectations of direct employment and 9% have expectations of land compensation. 30% of respondents have no concerns and the remaining 70% raised a range of concerns or do not know what to expect. • ***Land ownership and Use:*** 80% of land is privately owned and used, 20% is communally owned by the settlement. All landowners have title deeds. Land was previously expropriated for the construction of the Ardahan Industrial Site and residents experienced problems. Local residents do not want to confront further problems of this sort. There is cattle, horse and poultry breeding. Seasonal grazing is carried out (Spring and Autumn) and there is concern that grazing will be impacted if roads are changed. Barley and wheat are the key crops. • ***Settlement livelihoods:*** households have recently begun fishing. Bee keeping is a limited economic activity in the settlement. Transportation is a main economic activity (plus agriculture/bee keeping). The establishment of an organised industrial zone an, industrial estate with small workshops, private businesses involving investment (eg in infrastructure) in the region will raise the value of their land and create jobs; hence the settlements feel that living standards are rising. This could attract migrants to the area. • ***Availability and Skills:*** no previous pipeline experience, although seven of the 24 skills useful for pipeline construction are present – engineers, food services, heavy machinery drivers, repairmen, woodcutters, drivers, security personnel and welders. 50% of inhabitants are unemployed. 64% of respondents would accept a temporary job. Stone and sand quarries are available. • ***Accessibility:*** auxiliary roads connecting the settlement to the main road and roads within the settlement are sand. The latter are insufficient in terms of transportation. Roads are not closed in winter. The settlement is 7km from the provincial centre. • ***Information Provision:*** Radio (local information); TV (national information). Literacy rate is 50%. • ***Environmental and Cultural Sites:*** stone quarries are available.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community.	out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 4 (Maps 4C) (KPs –48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

• ***Infrastructure:*** regular piped water is available (contrary to provincial trends). There is electricity infrastructure, but no sewerage or waste system (garbage is used as fertiliser). • ***Services:*** There is a primary school with three teachers. • ***Settlement problems:*** unemployment, and repercussions from the existing economic crisis. • ***Other:*** no respondents are in regular paid jobs***.*** Females in the settlement did not participate in the meetings. They asked *'do you want us to be beaten by our husbands for participating in the meetings?'.* One male respondent stated: *'women do not participate… they cannot participate'.*	***Conservative settlement*** Construction workers are more likely to offend inhabitants.	**Construction workers to be remind**ed of the importance of appropriate behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) to be carefully monitored.	**Low likelihood of significant impacts.** Impacts arising from breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures.
	Fishing Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, if and habitat restoration measures are implemented in full.
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
	Accessibility to information Sectors of the population may not have access to project related information	**Communication with settlement** must take into account settlement characteristics to ensure	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will

Social Impact Table 4 (Maps 4C) (KPs –48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

	on employment opportunities, potential disruption to utilities, etc.	equal access to information for all residents. This should include using appropriate channels of communication and media and emphasising oral communication where literacy is low.	keep this to a minimum.
	Skills and Resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**Potential positive benefits** to local settlements.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Block Valve Station See EIA tables and Overview of the Land Acquisition Process in Appendix C9.		

Social Impact Table 4 (Maps 4C) (KPs –48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Ortagecit (L) (D) (B) (S)			
• ***Demographics:*** 222 inhabitants with 50 households. Decreasing population over the past five years due to unemployment and low income. • ***Safety:*** the pipeline is located 750m from the centre of the settlement and 250m from the nearest house. • ***Health:*** health problems from use of river water and lack of sewerage • ***Project attitude:*** generally positive and believe the pipeline will contribute to the economy and provide local residents with expropriation money. • ***Land ownership and Use:*** 50% of land is communally owned settlement pasture and 30% privately owned and used by local residents. There is concern for land lacking titles and communal land. Key crops are grain (eg wheat/ barley) and vegetables primarily for fodder and subsistence. • ***Settlement livelihood:*** some bee keeping. This is becoming more important. Animal breeding is an important source of income (although revenues are low and have been decreasing). A diverse range of livestock is kept. Seasonal grazing takes place between spring and October. • ***Availability & skills:*** no previous pipeline experience, although local residents have eight of the 24 (heavy machine operators, woodcutters, drivers, security personnel and welders) skills useful for construction. 50% of local residents of working age have been unemployed for more than one year. 64% of respondents would accept a temporary job. • ***Accessibility:*** no new roads have been constructed. Auxiliary roads connecting settlement to main road are of sand and loose binder dust, settlement roads are sand and insufficient for transportation. Roads closed between January and February. The settlement experiences transportation difficulties. The settlement is 6km from the provincial capital and 6km from the district centre. • ***Information Provision:*** Literacy rate is 70%. The Muhtar is the main source of local information, and the TV, the main source of national	***Land*** Potential complications in expropriation process. ***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**See Overview of the Land Acquisition Process in Appendix C9.** **Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be	**See Overview of the Land Acquisition Process in Appendix C9.** **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of

Social Impact Table 4 (Maps 4C) (KPs –48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

source of local information, and the TV, the main source of national information. • ***Infrastructure:*** there is electricity infrastructure, but no piped water, sewerage or waste disposal infrastructure. Waste is partially used as fertiliser. Ardahan city sewerage is emptied into the Kuru creek near the settlement correlating with health problems in the settlement. Stored water is used by inhabitants. • ***Services:*** there is a primary school in the settlement (with three teachers). There are no health services and no other services. Respondents are keen for a clinic: *'too many people are dying in the settlement'.* • ***Settlement problems:*** lack of water, unemployment, insufficient health provisions, transport difficulties. Standard of living has decreased in the past five years and poverty/ unemployment has increased.		erected in areas of danger for livestock.	compensation will be facilitated by the Projects complaints procedure.
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation.
	Accessibility of recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Skills and Resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**Potential positive benefits** to local settlements.
	Source of drinking water	The need for an **alternative**	**No residual impact.**

Social Impact Table 4 (Maps 4C) (KPs –48.7 – 67.9): North of the Cotsuyu River to West of Putka Lake, Ardahan Province

	Potential for disruption or contamination of drinking water during construction ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Block Valve Station*** See EIA tables and Overview of the Land Acquisition Process in Appendix C9.	**source of water** will be evaluated prior to construction, and if necessary will be provided by the project. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Environmental Impact Table 5 (Maps 5A and 5B) (KPs 67.9 – 83.7): Ardahan Plateau, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic to Meso-Cryic Clayey-skeletal to Loamy-skeletal Xerochrepts on undulating and rolling terrain. • As above, but lithic on steep and moderately steep slopes. • Possible Coarse-silty Typic Xerofluvents on floodplains, which merge with channel sands and gravel.	Main potential impacts: • soil erosion; • sediment yield; • altered drainage; • reduced soil productivity.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
South of Ardahan, the landscape character to the north generally persists through this section across the Ardahan Plateau. Landscape sensitivity is moderate. The route crosses open, gently-rolling plateau country, backed by high, steep, but broadly rounded mountains. The plateau, comprising largely grassland with frequent rocky exposures, is partly cultivated and has small streams or rivers flowing through wide flat, often marshy, valleys painted yellow in spring by buttercups. Route passes in close proximity to Tepesuyu in the south of Ardahan and near to major rail and highway crossings.	Insensitive use of heavy plant will give rise to long-term/permanent impact on the marshy grasslands in the valley bottoms	• Reinstatement of the BTC RoW. • Protective and other measures to reduce the impact of heavy machinery will include route narrowing, and use of moveable equipment mats to spread vehicle weight and avoid deep rutting. • Construction will be undertaken at the driest time of the year (July to August). Removal/ replacement of turfs will be necessary if schedules dictate work during wetter periods (April to June).	**MODERATE IMPACT** Sections of marshy grassland are likely to show signs of change in landscape components that may last up to 5 years after construction. Elsewhere, impacts will be minor and short-term, unlikely to last more than one year after construction.
Ecology			
Protected Areas			

Environmental Impact Table 5 (Maps 5A and 5B) (KPs 67.9 – 83.7): Ardahan Plateau, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
The route moves away from the Ardahan Forest Important Bird Area after KP 69.4. This area has been discussed in Environmental Impact Table 4 and Map 4B.	See Environmental Impact Table 4 and Map 4B.	See Environmental Impact Table 4 and Map 4B.	See Environmental Impact Table 4 and Map 4B.
Noise			
Tepesuyu settlement is located c. 224m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Tepesuyu during soil stripping activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of soil stripping activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix	**MINOR IMPACT** Short-term noise impacts are expected to occur during soil stripping at Tepesuyu settlement. However, during soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. This will be short-term in nature, lasting only for a few days.

Environmental Impact Table 5 (Maps 5A and 5B) (KPs 67.9 – 83.7): Ardahan Plateau, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		C4).	

Social Impact Table 5 (Maps 5C) (KPs –67.9 – 83.7): Ardahan Plateau, Ardahan Province

MAP 5: PROJECT INFORMATION			
There are no pump stations, construction camps or block valve stations in the area.			
MAP 5: HIGHLIGHTS			
• Pasture is the main land use, except for the non-agricultural land that covers approximately the last 2.5km of this area. • Ardahan forest is north of the map.			
MAP 5: SURVEYED AND IMPACTED SETTLEMENTS			
• ***Impacted:*** three settlements on this map will be directly impacted by the pipeline project (Ardahan, Tapesuyu and Kucuksutluce). All have land intersected by the proposed pipeline (L) and two (Tapesuyu and Ardahan) are within 500m of the pipeline route (D). No settlements are within 5km of a construction camp or pump station. No settlements are within 2km of a block valve station. Settlements impacted by traffic have not yet been identified. No settlements are downstream of a river (R). • ***Surveyed:*** two settlements (Ardahan, and Kucuksutluce) were surveyed in the field(s) and two settlements were surveyed by telephone (T) (Tapesuyu and Kucuksutluce). • ***Not surveyed:*** Yaylaci (2km from the pipeline) and Kocakoy (2km from the pipeline) are within the 4km pipeline corridor.			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Ardahan (District Centre) (L) (D) (S)			
• ***Demographics:*** 12,426 with 3096 households. Population levels are increasing due to in-migration from rural areas of the province (creating a slight gender in-balance with more men). Population has also increased over the past five years due to an increase in labour opportunities and military personnel and because people have returned since the 1999 earthquake. Smaller average household size (4) indicative of urbanisation and nuclear families. • ***Safety:*** the settlement centre is located 2.5km from the pipeline. Animal breeding (particularly cows) is a main source of income. • ***Disputes:*** no conflicts/ tensions although water shortages (only in one quarter of Ardahan) creates occasional problems. • ***Project attitude:*** there is no hostility to the project. All respondents welcomed a construction camp. • ***Land ownership & Use:*** 80% is owned and used by inhabitants, 10% is pasture land, the remaining is treasury land state. All landowners	***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Irrigation*** Loss of flow from planned/ accidental disruption. Potential contamination of flow from spills or an increase in sedimentation.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow,

Social Impact Table 5 (Maps 5C) (KPs –67.9 – 83.7): Ardahan Plateau, Ardahan Province

have titles. A little grazing is carried out in spring and summer. Irrigation is used in certain quarters of the settlement and with locations varying each year. Grain (there is an operational flour factory and sugar beet (an industrial crop requiring refining) are grown. Cereal cultivation is a main source of income • ***Settlement livelihood:*** forestry is an important economic activity and there is an operational factory. There is an increasing number of inhabitants employed in the service sector, and the organised industrial zone in the region will potentially be a future source of employment. Unemployment is a big problem and 53% of inhabitants are unemployed. • ***Availability & Skills:*** much lower unemployment (varying from 10-35% in different quarters of Ardahan). 20-30% are already in regular paid jobs. No previous pipeline experience but nine of the 24 skills useful for pipeline construction available (eg engineers, heavy operators/ drivers, food services, repairers, wood cutters, drivers, security personnel and welders are available). 40% of respondents would accept a job. There is a stone quarry in the area. • ***Information provision:*** radio is the most important source. A local information and TV are the most important source of national information. 85-90% literacy rate, depending on the area of the settlement. A diverse range of economic activities including transportation, trade and local government, bee keeping, forestry and agriculture are carried out. • ***Environmental & cultural sites:*** there is a thermal spring and military/ religious buildings within the town. • ***Infrastructure:*** all households have piped regular water (contrary to the more rural settlements). • ***Services:*** there are primary schools, high schools and university facilities. There is a market, sports facilities, a Post Office, coffee houses, shops, libraries at least two banks, police, transport and farmer support. Health facilities include midwives, doctors, a health clinic, doctors and access to traditional medicine. There is insufficient health personnel, specialised doctors and technical equipment.	***Skills and Resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Forest*** Loss of a resource used by settlements. Increased expenditure on other fuel sources. ***Special sites*** Refer to Environmental Impact Tables.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	affected land-users will be compensated. **Potential positive benefits** to local settlements. **Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.

Social Impact Table 5 (Maps 5C) (KPs –67.9 – 83.7): Ardahan Plateau, Ardahan Province

• ***Settlement problems:*** poor sewerage system with potential health implications (in two thirds of the town), the current economic crisis in Turkey and restriction of border trade. General standard of living has improved since opening up the order (raising awareness, productivity and establishing public institutions).			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Tapesuyu (L) (D) (T)			
• ***Demography:*** 340 inhabitants, none of whom seasonally migrate. • ***Safety:*** the pipeline is situated 450m from the settlement centre and 300m from the nearest house. • ***Project Attitude:*** the Muhtar suggested that local residents would welcome a construction camp and are generally aware of the pipeline. The Muhtar raised no major concerns. • ***Land ownership & Use:*** 60% of land is owned by the local residents. Seasonal grazing is practiced by the local residents. • ***Settlement Livelihood:*** 80% of local residents working adults are farmers and 5% family labourers. Agriculture, bee keeping trade, local government, education and transport are all activities in the settlement. Five households are involved in bee keeping, although the households are dependent on other sources of income. • ***Availability & Skills:*** no previous pipeline experience. • ***Accessibility:*** the settlement is accessible throughout the year. • ***Information Provision:*** TV and radio are the main sources of information for local and national issues. 96% of the settlement are literate. • ***Infrastructure:*** no piped water, and the main source is the settlement fountain. • ***Settlement problems:*** inadequate access to water and poor roads.	***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 5 (Maps 5C) (KPs –67.9 – 83.7): Ardahan Plateau, Ardahan Province

	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Drinking water Potential for disruption or contamination of drinking	The need for an **alternative source of water** will be evaluated prior to	**No residual impact**

Social Impact Table 5 (Maps 5C) (KPs –67.9 – 83.7): Ardahan Plateau, Ardahan Province

	water during construction ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	construction, and if necessary will be provided by the Project. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Asking residents or workers to translate as necessary.	 **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
KüÇük Sütlüce (L) (S)			
• ***Demographics:*** 465 inhabitants and 84 households. Experiencing a decrease in population levels due to migration to urban areas. • ***Safety:*** the pipeline is 2km from the settlement centre and 1.7km from the nearest house. • ***Health:*** no sewerage system or waste disposal. • ***Project attitude:*** there is no major hostility towards the pipeline. 36% of respondents have expectations of direct employment and 18% have expectations of land compensation. In terms of concerns, 54% of respondents have no concerns and 18% have a range of other concerns. All respondents would welcome a construction camp. • ***Disputes:*** conflicts over water and conflicts between families. The Muhtar and the settlement elders attempt to resolve these in settlement meetings. • ***Landownership & use:*** 45% is communally owned land, 45% owned and used by local residents, and 10% is treasury land. Landowners have title deeds but there is concern over the compensation of communal land. Barley and wheat are grown, and there is concern of damage. There is no seasonal grazing. A diverse range of livestock is kept and animal breeding is the main source of income.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Drinking water*** Potential for disruption or contamination of drinking water during construction ***Construction hazards:***	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the project. **Livestock crossings** will be	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact.** **Potential for accidents**

Social Impact Table 5 (Maps 5C) (KPs –67.9 – 83.7): Ardahan Plateau, Ardahan Province

kept and animal breeding is the main source of income. • ***Settlement livelihoods:*** relatively minor agriculture activity. Ten households are involved in bee keeping. Proceeds from honey/ wax are one of many sources of income for these households. • ***Availability & Skills:*** 94% of respondents are family labourers. No previous pipeline experience, but 9 of the 24 skills use for pipeline construction eg engineers, heavy machine operators/ drivers, repairmen, food providers, repairmen, woodcutters, drivers, security personnel and welders are available. 91% of respondents would accept a temporary job. • ***Accessibility:*** accessibility is not a problem. The settlement is 25km from Ardahan centre. • ***Information provision:*** 80% literacy rate. Radio is the main source of local information and TV the main source of national information. • ***Infrastructure***: no piped water, and household wells are the main source. There is electricity infrastructure, no sewerage, local residents dispose of their own waste. • ***Services:*** a primary school with three teachers located in the settlement. • ***Settlement problems:*** lack of water, health, unemployment (or rather underemployment because 94% respondents stated that they were family labourers) and transportation. • ***Other:*** keen for investment in animal breeding. There is already a small dairy. High female participation at the consultation meeting.	***animals*** Trench poses safety hazard for livestock. ***Land*** Potential complications in expropriation process. ***Skills and resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **See Overview of the Land Acquisition Process in Appendix C9.** **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9.** **Potential positive benefits** to local settlements.

Environmental Impact Table 6 (Maps 6A and 6B) (KPs 83.7 – 99.8): West of Haskoy Settlement to South of Dagci Settlement, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
As described in Environmental Impact Table 5, but lithic on steep and moderately steep slopes. Mesic to Meso-Cryic Clayey-skeletal to Loamy-skeletal Xerochrepts on undulating and rolling terrain. Possible Coarse-silty Typic Xerofluvents on floodplains, which merge with channel sands and gravel.	Main potential impacts: • soil erosion; • sediment yield; • altered drainage; • reduced soil productivity.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
The landscape retains its vast scale and open character. Landcover comprises a mix of cultivated land and flower-rich sub-alpine meadows. The terrain is characterised by gently rolling plateau country, backed by high, steep, but broadly rounded mountains. The partly cultivated plateau, comprises largely grassland with frequent rocky exposures, and with small streams or rivers flowing through wide flat, often marshy, valleys rich in spring flowers. Landscape sensitivity is moderate. BVS-008 will be located at KP 94.7 within subalpine meadow. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to this site of c. 25m in length.	Impacts concern the effects on the marshy grasslands in the valley bottoms from insensitive use of heavy plant and construction equipment. The proximity to several settlements will make the route highly visible to residents during construction and re-instatement, though this will be temporary and, if successful, last no more than one year. Potential impacts and their management during BVS construction will be the same	• Reinstatement of the BTC RoW. • Measures to reduce the impact of heavy machinery on marshy grasslands will include route narrowing, and use of moveable equipment mats to spread vehicle weight and avoid deep rutting. • Construction will be undertaken at the driest time of the year (July to August). Removal / replacement of turfs will be necessary if the construction schedule dictates work during wetter periods (April to June).	**MODERATE IMPACT** Sections of marshy grassland are likely to show signs of change in landscape components that may last up to 5 years after construction. Elsewhere, impacts will be minor and short-term, unlikely to last more than one year after construction.

Environmental Impact Table 6 (Maps 6A and 6B) (KPs 83.7 – 99.8): West of Haskoy Settlement to South of Dagci Settlement, Ardahan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	as those during pipeline construction.		
Archaeology and Cultural Heritage			
Four archaeological sites lie within the 100m Corridor: • Cobanli (1st Degree Site*); • Bahcecik (2nd Degree Site*); • Saricayir Mevki (3rd Degree Site*); • Kuruhacivan (3rd Degree Site*). These are all flat settlements and traces of medieval buildings have been found within the sites of Cobanli and Bahcecik. In Saricayir Mevki, three graves in the form of Kurgan have been identified, dating back to 2000 BC. No architectural remains exist at the flat settlement of Kuruhacivan, although ceramic shards dating back to the Early Bronze Age, Urartian and Roman Ages were found on the surface. * These sites have not yet been registered by the MoC and are provisionally assigned these classifications. The following have also been proposed for registration by the regional preservations councils: The area near Cobanali; The Saricayir area; The area near Dagci; Kuruhacivan; Bahcecik	Potential for ground disturbance to these sites during pipeline construction. In addition, indirect impacts may arise from construction activities that will affect the visual/historical setting of the sites.	The pipeline has been re-routed to avoid these three sites. Potential impacts are therefore avoided. Cobanli and Kuruhacivan will be fenced throughout the construction period. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to temporary disturbance of the setting of these sites and peripheral features.

Social Impact Table 6 (Map 6C) (KPs 83.7 – 99.8):
West of Haskoy Settlement to South of Dagci Settlement, Ardahan Province

MAP 6: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There is one block valve station.

MAP 6: HIGHLIGHTS

- Land use is dominated by grazing on upland pasture on high ground and meadows on low ground.
- Other land use types are non-agricultural land and rain fed agriculture.

MAP 6: SURVEYED AND IMPACTED SETTLEMENTS

- ***Impacted:*** five settlements on this map will be directly impacted by the pipeline project (Calabas, Cobanli, Besiktas, Dagci, and Haskoy). All have land that will be intersected by the proposed pipeline (L) and one (Dagci) is within 500m of the pipeline route (D). No settlements are within 5km of a construction camp or pump station. One settlement (Besiktas) is within 2km of a block valve station (B). Settlements impacted by traffic have not yet been identified. There are no downstream settlements that are likely to be impacted by construction (R).

- ***Surveyed:*** all five settlements (Calabas, Cobanli, Besiktas, Dagci and Haskoy) were surveyed by telephone (T). Dagci was also surveyed in the field(s).

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Calabas (L) **(T)**			
• ***Demographics:*** 241 inhabitants, 7% of whom seasonally migrate. • ***Safety:*** the nearest house is located 1600m from the pipeline, the centre of the settlement is 2000m from the pipeline. Seasonal grazing of livestock is carried out by the villagers. • ***Project Attitudes:*** according to the Muhtar villagers would welcome a construction camp. According to the Muhtar villagers are generally aware of the pipeline and he raised no major concerns. • ***Settlement Livelihoods:*** 80% of working adults are farmers. Economic activities carried out in the settlement are agriculture, trade, local government activities and construction. • ***Land Ownership and Use:*** villagers own 90% of the land, the key crop is grain. • ***Availability & Skills:*** no previous pipeline experience. • ***Accessibility:*** the roads are closed between January and February. The settlement is 29 km to the district area. • ***Information provision:*** All villagers are literate. TV and telephone are the main sources of local information and TV is the main national	***Construction hazard: animals*** Trench poses safety hazard for livestock. ***Accessibility of recruitment*** Decreased access to recruitment process.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No residual impact expected.**

Social Impact Table 6 (Map 6C) (KPs 83.7 – 99.8): West of Haskoy Settlement to South of Dagci Settlement, Ardahan Province

source. • ***Infrastructure:*** there is no piped water to the settlement. The main water source is the settlement fountain. • ***Settlement problems:*** inadequate access to water, inadequate access to the settlement due to poor roads and low income.	***Accessibility of Information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Drinking water*** Potential for disruption or contamination of drinking water during construction	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Cobanli (L) **(T)**			
• ***Demographics:*** 157 inhabitants, none of them migrate seasonally. • ***Safety:*** The settlement centre is situated 900m from the pipeline. Project attitude: according to the Muhtar, villagers would welcome a construction camp. The villagers are generally aware of the pipeline. Villagers are concerned that land will be damaged. • ***Land ownership & uses:*** 70% of land is owned by villagers. Villagers do not carry out seasonal grazing of livestock. Settlement livelihood: 90% of working adults are farmers and 80% family labourers. The main forms of employment are agriculture, trade, local government (eg the Muhtar), construction and transport. • ***Availability & skills:*** no previous pipeline experience. • ***Accessibility:*** the roads are often closed between January and March. 26km to district centre. • ***Information provision:*** 100% of villagers are literate. TV is the main local information source and TV is the main national information source.	***Construction hazards: humans:*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings held** during and	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.**

Social Impact Table 6 (Map 6C) (KPs 83.7 – 99.8): West of Haskoy Settlement to South of Dagci Settlement, Ardahan Province

source. • ***Environmental and Cultural sites:*** according to the Muhtar, there is a mausoleum. • ***Infrastructure:*** no formal piped water system. The main water source is a common depot.	affected if mitigation measures not fully implemented. ***Accessibility of recruitment*** Decreased access to recruitment process. ***Accessibility of Information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	immediately following construction will identify any additional land that has been affected. Winter road closures, seasonal migration and poor transport need to be **taken into account** in the recruitment strategy. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**No residual impact expected.** **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Besiktas (L, B) **(T)**			
• ***Demographics:*** 555 inhabitants (96 households) none of whom migrate seasonally. • ***Safety:*** the settlement centre is located 1.3km from the pipeline and the nearest house 750m from the pipeline. • ***Project Attitudes:*** according to the Muhtar, villagers would generally welcome a construction camp. Villagers are generally aware of the pipeline. Inhabitants had no major concerns with the exception of querying the response to any sabotage during the operation. • ***Land ownership and use:*** 80% of land is privately owned by the settlement. Livestock are not seasonally grazed. • ***Settlement livelihood:*** 90% of working adults are farmers, 7% are family labourers. Animal breeding is the main source of income, although bee keeping, arable agriculture, trade and local government		***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

Social Impact Table 6 (Map 6C) (KPs 83.7 – 99.8): West of Haskoy Settlement to South of Dagci Settlement, Ardahan Province

although bee keeping, arable agriculture, trade and local government are all activities in the settlement. A small dairy producing Kosher cheese (a flat cheddar-type cheese) is present. Inhabitants grow wheat, barley, and vegetables for household consumption. Two households keep bees to use honey for their own consumption. • ***Availability & Skills:*** no previous pipeline experience. Inhabitants are keen that local vehicles are used during construction. • ***Accessibility:*** closed in April. The settlement is 40km from the provincial centre and 33km from the district centre. Roads are generally in good quality, although some are soon to be asphalted. • ***Information provision:*** 95% literacy rates. Females did not participate in the consultation meetings. TV and the district centre are the main sources of local information and TV the main national information source. • ***Infrastructure:*** piped water is provided for villagers, although this is not a regular source of information. Local springs are one of a number of sources. • ***Services:*** there is a primary school with three teachers and no health facilities. • ***Settlement problems:*** unemployment, low incomes and low animal prices.	***Accessibility to Information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Conservative settlement*** Construction workers are more likely to offend inhabitants ***Accessibility to recruitment*** Decreased access to recruitment process.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Asking residents or workers to translate as necessary. **Construction workers will be reminded** of the importance of appropriate behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) to be carefully monitored Winter road closures, seasonal migration and poor transport need to be **taken into account** in the recruitment strategy.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Low likelihood of significant impacts.** Impacts arising from breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures. **No residual impact expected.**

Social Impact Table 6 (Map 6C) (KPs 83.7 – 99.8): West of Haskoy Settlement to South of Dagci Settlement, Ardahan Province

	Block Valve Station See EIA tables and Overview of the Land Acquisition Process in Appendix C9.		
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Dagci (L) (D) (T) (S)			
• ***Demographics:*** 965 inhabitants and 120 households. Population has increased as people have returned to the province after the 1999 earthquake. • ***Safety:*** the pipeline is 450m from the nearest household and 650m from the centre of the settlement. • ***Disputes:*** besides land conflicts, there are conflicts over water and a blood feud between two families. Conflicts are usually resolved with the help of the Muhtar during community meetings. • ***Project attitude:*** generally positive with hope of money during expropriation. All surveyed households would welcome a construction camp. 30% of respondents had expectations of direct employment and 30% had expectations of land compensation. In relation to concerns, 40% did not know and 20% were concerned about noise and dust. • ***Land ownership & uses:*** the majority of landowners have no title deeds. 30% of land is privately owned and used by settlements, 30% communal settlement pastures. There are conflicts over land. Grain (barley and wheat) and a small number of vegetables are grown. There is animal breeding. • ***Settlement livelihoods:*** 70% of inhabitants are unpaid in family enterprises; 20% long term unemployed and 10% temporary workers. Animal breeding is the most important source of income (diverse range of livestock) although this activity has bought in 'no money' in recent years. Although there is only a little bee keeping in the settlement, it has recently become a source of income. • ***Availability & Skills:*** no previous experience on pipeline projects, but construction skills available; heavy machine operators/ drivers, food	***Land*** Potential complications in expropriation process. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Accessibility of recruitment*** Decreased access to recruitment process. ***Drinking water*** Potential for disruption or	**See Overview of the Land Acquisition Process in Appendix C9.** **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. The need for an **alternative source of water** will be	**See Overview of the Land Acquisition Process in Appendix C9.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No residual impact expected.** **No residual impact.**

Social Impact Table 6 (Map 6C) (KPs 83.7 – 99.8): West of Haskoy Settlement to South of Dagci Settlement, Ardahan Province

construction skills available: heavy machine operators/ drivers, food services, repairmen, woodcutters, drivers, security personnel and welders are available. 90% of respondents would accept a temporary job. • ***Accessibility:*** auxiliary roads to the main road are of loose binder dust and sand. The main settlement roads are sand and inadequate. Roads are generally closed January to February. The settlement is 50km from the provincial centre and 34km from the nearest district centre. • ***Information Provision:*** Muhtar (local information); TV (national).. Females were not allowed to participate in the consultation meetings. • ***Infrastructure:*** piped water (main) infrastructure is currently being constructed, meanwhile settlements use the settlement fountain. Electricity infrastructure exists, no sewerage system and primarily through use of fertiliser. 20% of respondents have mobile phones. • ***Services*** There is a primary school with four teachers, but no health facilities. There are also transport facilities. • ***Settlement problems:*** unemployment, transportation, inadequate health care and water supply, the need for a carpet weaving course and a Muhtar room. Decreasing standard of living and income.	contamination of drinking water during construction ***Conservative settlement*** Construction workers are more likely to offend inhabitants. ***Accessibility of information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	evaluated prior to construction, and if necessary will be provided by the project. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) to be carefully monitored. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Asking residents or workers to translate as necessary. **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Low likelihood of significant impacts.** Impacts arising from breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 6 (Map 6C) (KPs 83.7 – 99.8): West of Haskoy Settlement to South of Dagci Settlement, Ardahan Province

	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Skills and resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project	**Potential positive benefits** to local settlements.

Social Impact Table 6 (Map 6C) (KPs 83.7 – 99.8): West of Haskoy Settlement to South of Dagci Settlement, Ardahan Province

		constraints.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Haskoy (L) **(T)**			
• ***Demographics:*** 1,405 inhabitants none of which migrate seasonally. • ***Safety:*** the nearest house is 2.5km from the pipeline, the settlement centre is 4km from the pipeline • ***Project attitude:*** the Muhtar suggests that settlements would welcome a construction camp and are aware of the pipeline. No major concerns raised by the Muhtar. • ***Land ownership & use:*** 50% of land is owned by villagers. There is no seasonal grazing of livestock. • ***Settlement livelihoods:*** fishing is carried out by nine households although fish is consumed by the households. Bee keeping is carried out by two households although is one of a number of income sources. • ***Accessibility:*** accessible all year. • ***Information provision:*** 80% of the settlement are literate. Telephone and TV are the main local information sources and TV the main national information source. • Environmental and Cultural Sites: mausoleum. • ***Infrastructure: there is no piped water.*** The main water sources are the settlement fountain and a local stream amongst others. • ***Settlement problems:*** inhabitants would the settlement to be a sub-district, and an animal market to be established. Inadequate access to water.	***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing. ***Drinking water*** Potential for disruption or contamination of drinking water during construction ***Accessibility to information*** Sectors of the population	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure. The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project. Alternative sources of water will be provided during construction if settlement uses water channels for drinking that are crossed but the construction activities. **Communication with settlement** must take into account settlement	**No significant impacts** if there is compensation for any reduction in yields, if and habitat restoration measures are implemented in full. **No residual impact.** **No residual impact.**

Social Impact Table 6 (Map 6C) (KPs 83.7 – 99.8): West of Haskoy Settlement to South of Dagci Settlement, Ardahan Province

	may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	characteristics to ensure equal access to information for all residents.	

Environmental Impact Table 7 (Maps 7A and 7B) (KPs 99.8 – 115.4): West of Kamisli Creek to East of Karanlik Creek, Ardahan/Kars Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Coarse-loamy Entic Dystrandepts on sloping soils developed from tuff (area unknown). • Possible Mesic Typic Haploxeralfs on gently sloping, well drained ground. • Fine-loamy Andeptic Cryorthents on meadow lands. • Typic Sandy-skeletal Cryochrepts on pasture lands, which may be lithic near rock outcrops.	Main potential impacts: • reduced soil productivity from soils developed from tuff; • waterlogged soils; • frost heave; • soil erosion; • altered drainage.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Use equipment mats. • Further evaluation of risk in field. Bury pipe below 1m.	**MAJOR IMPACT** In areas where the corridor overlies tuff, soils are difficult to reinstate due to lack of depth of topsoil, leaving a whitish tuff exposed and mixed with the original topsoil. Therefore, potential impacts are long-term as soils developed from tuff are unlikely to respond to standard reinstatement and exposed tuff and its effects on reducing soil productivity will continue throughout the duration of the Project. However, a number of additional site-specific mitigation measures will further be employed in tuff areas to manage the above impact, including: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement; • post-reinstatement monitoring.

Environmental Impact Table 7 (Maps 7A and 7B) (KPs 99.8 – 115.4): West of Kamisli Creek to East of Karanlik Creek, Ardahan/Kars Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Landscape and Visual			
The gently-rolling plateau grassland of huge scale and open character continues through this section. The basalt and andesite give way to tuff and alluvium/colluvium in meadows. Grazing dominates the land use, with upland pasture on high ground and meadow on low. South of the Kars-Gole road, the route crosses a broad, flat, marshy river valley rich in spring flowers, before climbing towards the Allahuekber Mountains.	Exposure of tuff or parent materials in low-lying areas will create highly visible whitish strip Impacts from damage to marshy grasslands from insensitive use of heavy plant and construction equipment.	• For affected grasslands, implement fertiliser trials using NPK + micro-nutrients using reinstatement species. • Protective and other measures to reduce the impact of heavy machinery will include route narrowing, and use of moveable equipment mats to spread vehicle weight and avoid deep rutting. • Construction will be undertaken at the driest time of the year (July to August). Removal / replacement of turfs will be necessary if schedules dictate work during wetter periods (April to June).	**MAJOR IMPACT** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies tuff, it will retain its whitish colour and show as a white line across the landscape. The additional site-specific mitigation measures described above under 'Soils' will also be applied to manage landscape impacts. **MODERATE IMPACT** Sections of marshy grassland are likely to show signs of change in landscape components that may last up to 5 years after construction. Elsewhere, impacts will be minor and short-term, unlikely to last more than one year after construction.
Ecology			
Important Ecological Factors Aygir Lake, a large oligotrophic lake located about 8km east of Buyukbogatepe and c. 8.7km west of the route between KPs 112.6 – 117.3, is an important ornithological site supporting Velvet Scoter (nationally-threatened), one of Turkey's rarest breeding birds. The breeding status of these birds on, or around, this lake is unknown, but breeding is possible. The protection status for these species are given in Table 5.21, Section 5.	None along route corridor. Birds, particularly Velvet Scoter, on Aygir Lake could be disturbed if temporary facilities, such as pipe dumps, are located anywhere close to the lake.	A buffer zone of 1km will be maintained around Aygir Lake throughout construction, with the exception of transport using the Kars-Gole Highway to the north of the lake.	**MINOR IMPACTS** only will result since the most sensitive area will be avoided.

Environmental Impact Table 7 (Maps 7A and 7B) (KPs 99.8 – 115.4): West of Kamisli Creek to East of Karanlik Creek, Ardahan/Kars Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
ESA 50 occurs between KP 113.1 and KP 113.8. This ESA is identified for two endemic and globally-threatened plant species (*Lathyrus cf. karsianus* and *Draba brunifolia spp. armeniaca*) found within the construction corridor. In addition, the area provides habitat for the Meadow Viper (*Vipera ursinii*), which is classified as Engangered on the 2000 IUCN Red List.	Habitat destruction of subalpine meadow may result in the loss of individuals from populations of globally-threatened plants. Disturbance to the Meadow Viper during August to October when the females give birth to live young.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 50. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Pre-construction surveys will seek to establish the presence and abundance of Meadow Viper along the RoW. Thereafter, clear training to be provided to workers with regards to the conservation importance of the snake, its recognition and procedures for translocating specimens. Particular	**MODERATE IMPACTS** Short-term disturbance to internationally important flora within the ESA 50. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** to the globally-threatened Meadow Viper, if the specified mitigation measures for seasonal sensitivity and the management of construction are applied.

Environmental Impact Table 7 (Maps 7A and 7B) (KPs 99.8 – 115.4): West of Kamisli Creek to East of Karanlik Creek, Ardahan/Kars Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		attention will be applied during the August to October period.	
Archaeology and Cultural Heritage			
Near Buyuk Bogatepe flat settlement (3rd Degree Site*) lies within the 100m corridor (near KP 108.3). Although no architectural remains were discovered, Roman ceramic shards were found on the surface at this site. This may, therefore, be a rural Roman settlement. Near Orta Kilise Hill (3rd Degree Site*) lies within the 100m Corridor. Graves in the form of Kurgan and Cromleh have been found in good condition at this site. * These sites have not yet been registered by the MoC and are provisionally assigned these classifications. These sites have been proposed for registration by the regional preservarions council.	Potential for ground disturbance to these sites during pipeline construction. In addition, indirect impacts may arise from construction activities that will affect the visual/historical setting of the sites.	The pipeline has been re-routed to avoid both sites. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to temporary disturbance of the setting of these sites and peripheral features.

Social Impact Table 7 (Map 7C) (KPs –99.8 – 115.4):
West of Kamisli Creek to East of Karanlik Creek, Ardahan/Kars Province Border

MAP 7: PROJECT INFORMATION			
There are no pump stations, construction camps or block valve stations in the area.			
MAP 7: MAP HIGHLIGHTS			
• Grazing dominates land use with upland pasture on high ground and meadow on lowland. The route also crosses non-agricultural land. High ground water occurs in low elevations. • The pipeline crosses Aynali Creek and a national highway.			
MAP 7: SURVEYED AND IMPACTED SETTLEMENTS			
• ***Impacted:*** one settlement on this map (Buyukbogatepe) will be directly impacted by the pipeline project (D) and will have land intersected by the pipeline (L). No settlements are within 5km of a construction camp or a pump station, within 2km of a block valve station, or within 500m of the pipeline route. Settlements impacted by traffic have not yet been identified. Two settlements (Kucukbogatepe and Buyukbogatepe) are on a water course downstream of the pipeline (R) (Karasu Dam & Aynali Creek). • ***Not surveyed:*** Kucukbogatepe. • ***Disclosure Meeting Location:*** Buyukbogatepe			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Buyukbogatepe (L) (T)			
• ***Demographics:*** 430 inhabitants, there is no seasonal migration. • ***Safety:*** the pipeline is located 1.5km from the nearest house and 2km from the centre of the settlement. • ***Project attitude:*** construction camp would be welcome, there are no major concerns. • ***Landownership & use:*** 70% of land is settlement owned, there is seasonal grazing and temporary irrigation. • ***Settlement livelihood:*** 90% of inhabitants are farmers, 6% are family labourers. There is no fishing or bee keeping. Small agricultural business community with accumulated wealth. There is dairy production, which is owned by the Karakalpak (a Turkic tribe with central Asian origin). The workers are Kurdish. There is internal conflict between the rich and the poor. • ***Availability & skills:*** there is no previous experience • ***Accessibility:*** settlement is accessible all year, 29km to district centre	**Construction hazards: animals** Trench poses safety hazard for livestock. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents	**High likelihood of a few accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 7 (Map 7C) (KPs –99.8 – 115.4): West of Kamisli Creek to East of Karanlik Creek, Ardahan/Kars Province Border

• ***Information provision:*** Turkish is spoken. The literacy rate is 95%. The main local source of information is TV and family whereas the national source is TV. • ***Environmental & cultural sites****:* mausoleum • ***Infrastructure:*** there is piped water, although the supply is irregular. The alternative water source is a spring.	on employment opportunities, potential disruption to utilities, etc.	for all residents.	
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Irrigation Loss of flow from planned/ accidental disruption. Potential contamination of flow from spills or an increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Environmental Impact Table 8 (Maps 8A and 8B) (KPs 115.4 – 132.9): Allahuekber and Kabak Mountain areas, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Coarse-loamy Entic Dystrandepts on sloping soils developed from tuff (area unknown). • Possible Mesic Typic Haploxeralfs on gently sloping, well drained ground. • Fine-loamy Andeptic Cryorthents on meadow lands and in valleys. • Typic Sandy-skeletal Cryochrepts on pasture lands, which may be lithic near rock outcrops. • Sandy-skeletal Cryochrepts or Entic Dystrandepts on sloping lands having elevations <2,000m.	Main potential impacts: • reduced soil productivity from soils developed from tuff; • waterlogged soils; • soil erosion; • altered drainage; • sediment yield; • muddied lowland soils; • frost heave.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Support equipment on moveable mats. • Further evaluation of risk of frost heave in field. Bury pipe below 1m.	**MAJOR IMPACT** In areas where the corridor overlies tuff, soils are difficult to reinstate due to lack of depth of topsoil, leaving a whitish tuff exposed and mixed with the original topsoil. Therefore, potential impacts are long-term as soils developed from tuff are unlikely to respond to standard reinstatement and exposed tuff and its effects on reducing soil productivity will continue throughout the duration of the Project. However, a number of additional site-specific mitigation measures will further be employed in tuff areas to manage the above impact, including: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal,

Environmental Impact Table 8 (Maps 8A and 8B) (KPs 115.4 – 132.9): Allahuekber and Kabak Mountain areas, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			storage and reinstatement; • post-reinstatement monitoring.
Landscape and Visual			
As the land rises into the Allahuekber Mountains, the greater diversity of landform and landcover enhances the visual interest of the scenery and increases its sensitivity to change. The foothills of the Allahuekber Mountains are generally still gently rolling and the landscape retains its huge scale, but the vegetation changes to a dry, short sub-alpine meadow with flat rocky outcrops, flower-rich but quite distinct in character from that present in the Yalnizcam Mountains near Posof. Spring lines create localised areas of wet ground. The mountains themselves are high, reaching 2,650m above sea level (asl), but their broad and rounded relief encourages pastures of lush short grass sward, which are used by summer migrant herders between May and October. However, many of the summer settlements now lie abandoned, often the result of overgrazing. Occasional lakes are present on high flat ground. BVS-009 will be located at KP 119.1 within subalpine meadow habitat. A new access road will be constructed to this site of c. 60m in length. BVS-010 will be located at KP 133.9 and will have an access road of 45m. Approximately 350m^2 of permanent landtake required for each BVS. Tuygun settlement lies c. 240m away from BVS-010.	Exposure of tuff or parent materials will create highly visible whitish strip. Saturated lowlands are vulnerable to damage. Potential for short-term visual impact during construction for settlements in Tuygun settlement during construction of BVS-010.	• For affected grasslands, implement fertiliser trials using NPK + micro-nutrients using reinstatement species. Care needed with fertiliser to avoid forming a green line across the landscape. • Protective and other measures to reduce the impact of heavy machinery will include route narrowing, and use of moveable equipment mats to spread vehicle weight and avoid deep rutting. • Particular attention will be paid to the control of dust, noise and traffic during construction at BVS-010.	**MAJOR IMPACTS** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies tuff, it will retain its whitish colour and show as a white line across the landscape. The additional site-specific mitigation measures described above under 'Soils' will also be applied to manage landscape impacts. This impact will persist in the short to medium-term across shallow-soiled grasslands in areas of remote character. Elsewhere, moderate impacts will occur from same source. **MINOR IMPACT** Given the relatively small size of the block valve station and the temporary nature of construction activities, impacts are anticipated to be minor, subject to implementation of the specified mitigation measures.

Environmental Impact Table 8 (Maps 8A and 8B) (KPs 115.4 – 132.9): Allahuekber and Kabak Mountain areas, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Ecology			
Important Ecological Factors 1 Cinereous Vulture (globally-threatened), 1 Griffon vulture and 2 Whinchat (both nationally-threatened) were recorded c. 2.5km east of the route between KPs 129 – 123. One Imperial eagle (globally-threatened) was recorded at c. 740m east of the route between KPs 123.0 – 134.1. The protection status for these species are given in Table 5.21, Section 5.	Both vultures were observed soaring over mountains NW of the bird survey point (previous route) where the existing route now crosses. Potential for direct disturbance to globally and nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between March and July inclusive). July can remain sensitive for late and second broods.	The preconstruction survey will establish the presence of mature trees and rock ledges within 500m of the pipeline route. If nesting raptor sites are identified, avoidance of construction activity from March to July. Shrubs and dense vegetation along the RoW will be cleared outside the Whinchat's breeding season (April to July).	**MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to March, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.
Archaeology and Cultural Heritage			
Near Hinzirik Plateau (3rd Degree Site*) lies at the edge of the 100m Corridor. Although there are no architectural remains in this flat settlement, Early Bronze Age ceramic shards and stones of a possible old grave are found on the surface. * This site has not yet been registered by the MoC and is provisionally assigned this classification. Two areas near Hinzirik Plateau have been proposed for registration by the regional preservations council	Potential for ground disturbance at this site during pipeline construction. In addition, indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	The pipeline has been re-routed to avoid this site. Potential impacts are therefore avoided. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to temporary disturbance of the site setting and peripheral features.
Carkiklar Ridge has been proposed for registration by the regional preservations council			

Kars Socio-Economic Overview

Demographics:
The province of Kars has a total population of 323,000 with a density of 36 inhabitants per km^2. Low levels of urbanisation have resulted in this relatively low density. The average size of households surveyed is just above six members, indicating traditional and patri-local* family structures and a tendency for many children. The urban population of surveyed settlements is relatively stable, as opposed to rural areas that are experiencing out-migration. Local settlements are relatively homogenous - 100% of surveyed inhabitants are Sunni Muslims. Virtually all men and most women speak Turkish. Only 0.4% of surveyed villages speak another language such as Kurdish, Serbian or Bulgarian as their first language. 57% of respondents speak Kurdish as their second language.

Land:
According to the State Institute for Statistics (SIS), approximately 17% of agricultural land is irrigated (compared with 45% in Adana). There is an abundance of small-scale land plots (due to land inheritance patterns) correlating with the dominance of subsistence agriculture. Landownership is primarily owner cultivated and secondly, share cropping on family land. Generally, wheat and barley are grown for animal fodder. Typically, only one crop is harvested a year. Animal husbandry is the main income generating activity. There is, however, increasing bee keeping and cheese production (including kosar cheese) for national markets in many of the settlements.

Livelihoods:
On the basis of the survey, Kars is ranked ninth of the pipeline provinces in terms of both average household income and overall wealth levels. Owner cultivation and sharecropping are the two most common ownership patterns. Local people are very sensitive to economic fluctuations as a result of their low earnings, which are derived primarily from agricultural and livestock activities.

Infrastructure & Services:
There is an inadequate supply of both regular electricity and access to national telecommunication networks. Average literacy rates are high (89%) even though 23% of respondents have had no schooling. 56% have attended primary school and 21% secondary school. Only 1% of respondents have a university education.

Key Problems:
The main settlement problems identified by residents are poor access to drinking water systems, lack of a formal sewerage disposal system, inadequate health facilities, and the low quality of roads.

Project Attitude:
The province has a positive attitude towards the pipeline, as it is “good for Turkey”. Surveyed settlements perceive direct employment as a positive impact of the project and only a small proportion anticipate negative impacts on agricultural production, livestock or land.

Source: Household and Settlement Survey (2001)

* Patri-local: a situation where the wife moves to live with the husbands’ family group

Social Impact Table 8 (Map 8C) (KPs 15.4 – 132.9): Allahuekber and Kabak Mountain areas, Kars Province

MAP 8: PROJECT INFORMATION			
There are no pump stations or construction camps in the area. There is one block valve station.			
MAP 8: MAP HIGHLIGHTS			
• Pipeline passes only a few isolated settlements. • Grazing dominates land use – upland pasture on high ground and meadow on low lands. Secondary land uses include dry agriculture ie cultivation of oats, barley, wheat and some bee keeping. • Majority of settlements do not have irrigation systems and most landowners do not have legal title deeds for their land. • Kosher cheese production is becoming an increasingly important income generating activity in several settlements. • Settlement roads and their auxiliary roads are generally poor quality. Can be inaccessible in winter. • Generally poor access to national telecommunication networks. • Pipeline passes through the Allahuekber Mountains.			
MAP 8: IMPACTED AND SURVEYED SETTLEMENTS			
• ***Impacted****:* one settlement on this map (Bozkus) will be directly impacted by the pipeline project. It will have land intersected (L) by the proposed pipeline. No settlements are located within 500m of the pipeline route (D) and no settlements are within 5km of construction camps or pump stations (P/C). One settlement is located within 2km of a block valve station (B) (Bozkus). Settlements impacted by traffic have not yet been identified. • ***Surveyed:*** one settlement (Bozkus) was surveyed by telephone (T).			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Bozkus (L) (B) (T)			
• ***Demographics:*** 1,515 inhabitants with 147 households. • ***Safety:*** the nearest house in the settlement is situated 900m from the pipeline and the centre of the settlement is 1400m from the pipeline. • ***Health:*** lack of sewerage and waste disposal systems potentially causing disease. • ***Security:*** there are tensions between cultural groups in the region. • ***Disputes:*** the settlement suffered from political unrest in the 1990's. There are now two opposed groups among the local residents. They are divided according to their political alliances – Peoples' Democracy Party versus mainstream parties, with the latter group the more powerful due to close relations with rural security forces and local	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Accessibility to***	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Communication with**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Any change can highlight**

Social Impact Table 8 (Map 8C) (KPs 15.4 – 132.9): Allahuekber and Kabak Mountain areas, Kars Province

powerful due to close relations with rural security forces and local government agencies. However, it is unlikely that such issues will disrupt the construction or operation of the pipeline. • ***Project attitude:*** the respondents were generally positive about the project and had no major concerns. • ***Land ownership & use:*** 40% of land is privately owned by local residents. Most landowners do not have legal titles for their land. Much concern (see section 5.13.2) exists over the future of communal pastureland. There is seasonal grazing of livestock. Wheat and barley (for household consumption are the main crops) • ***Settlement Livelihood:*** agriculture, animal husbandry, bee keeping (two households for their own consumption), trade and local government. • ***Accessibility:*** 133km to provincial centre of Kars. The settlement is inaccessible in February. • ***Information provision:*** 100% of the population is literate. • ***Environmental & cultural sites:*** there is a cemetery on mountainside bordering the settlement. • ***Infrastructure:*** piped water is supplied to households. A drinking water system is under construction. • ***Services:*** there is a primary school but no health services. • ***Settlement problems:*** poor roads, poor accessibility, poor transportation, poor water supply and infrastructure problems.	***information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Land*** Potential complications in expropriation process. ***Accessibility of recruitment*** Decreased access to recruitment process. ***Block Valve Station*** See Environmental Impact Tables and the Overview of the Land Acquisition Process in Appendix C9	**settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include using appropriate channels of communication and media. **See Overview of the Land Acquisition Process in Appendix C9.** Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **See Overview of the Land Acquisition Process in Appendix C9.** **No residual impact expected.**

Environmental Impact Table 9 (Maps 9A and 9B) (KPs 132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Sandy-skeletal Cryochrepts or Entic Dystrandepts on sloping lands having elevations <2,000m. • Fine-loamy Andeptic Cryorthents in valleys.	Main potential impacts: • soil erosion; • reduced soil productivity; • sediment yield; • frost heave; • muddied lowland soil; • altered drainage.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Support equipment on moveable mats. • Further evaluation of risk of frost heave in field. Bury pipe below 1m.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
The route descends from the mountains and as it does so the agricultural character returns (near KP 140) with many small, compact, permanent agricultural settlements amidst farmland. Houses are adapted for life in a cold climate with few, small windows and narrow doorways; roofs lined with thick sod; and hay stacked alongside outside walls as insulation. Landscape sensitivities are generally low. The rolling terrain is punctuated by sections of steep and moderately steep land. Streams pass through flat valley lands separated by rounded uplands, where many springs emerge to create marshy areas. Uplands are often stony, especially where basalt lies close to or emerges from the surface. The RoW passes close to the settlement of Tuygun.	Saturated lowland areas are vulnerable to damage. Disturbance of soils overlying tuff will result in exposed whitish strip. Proximity of pipeline upstream of Tuygun will detract from settlement character.	• In wetland areas support equipment on moveable mats. • For affected grasslands, implement fertiliser trials using NPK + micro-nutrients using reinstatement species.	**MODERATE IMPACT** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies tuff, it will retain its whitish colour and show as a white line across the landscape. However, landscape sensitivities are low in this route section and impacts will be moderate at most. In addition, a number of

Environmental Impact Table 9 (Maps 9A and 9B) (KPs 132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			site-specific mitigation measures will further be employed in tuff areas to manage the above impact, including: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement; • post-reinstatement monitoring. **MINOR IMPACTS** elsewhere, although any remaining will be highly visible to the many settlement residents along this part of the route.
Ecology			
Important Ecological Factors ESA 6 occurs between KP 142.9 and KP 143.8 and is identified for two globally-threatened plant species (*Saponaria picta* and *Necranthus orobanchioides*). ESA 7 occurs between KP 153.7 and KP 154.2 and is identified for one globally-threatened species (*Alchemilla procerrima*). The IUCN status for these species are given in Table 5.20, Section 5. Two Whinchat (nationally-threatened) were observed at c. 470m west of the route between KPs 134.6 – 136.6 and 5 at KP 153.7 (within ESA 7). The protection status for this species are given in Table 5.21, Section 5.	Habitat destruction of sub-alpine meadow or areas peripheral to cultivated lands may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 6 & 7. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated	**MINOR IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement

Environmental Impact Table 9 (Maps 9A and 9B) (KPs 132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep topsoil and subsoil separate, protect topsoil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during re-instatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 6 though it may have no adverse effect in ESA 7. Shrubs and dense vegetation along the RoW will be cleared outside the Whinchat's breeding season.	(see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.
Noise			
Tuygun settlement in Selim District, Kars Province is located c. 117m from the centreline of the pipeline. The route will pass through the outskirts of the settlement.	Short-term noise impacts are expected to occur at Tuygun settlement during soil stripping, welding and	The following mitigation measures will be applied: • use of silenced/low noise construction plant and	**MINOR IMPACT** Short-term noise impacts are expected to occur during soil stripping at Tuygun. During

Environmental Impact Table 9 (Maps 9A and 9B) (KPs 132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	lowering and backfilling activities.	machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	soil stripping it may not be possible to screen dwellings from the works by using stockpiles of spoil and hence, noise impacts are likely to occur. This impact will be short-term in nature.
Archaeology and Cultural Heritage			
Three archaeological sites lie within the 100m Corridor in this section: • Near Kulahtepe (3rd Degree Site*). Graves in the form of Kurgan and Cromleh have been found in good condition at this site; • Near Hasbey-1 and Hasbey-2 (3rd Degree Sites*). Although there are no architectural remains in the Hasbey-1 and Hasbey-2 flat settlements, ceramic shards belonging to different periods (Early Bronze Age, Middle Bronze Age, Urartian, Roman and Medieval) are found on the surface.	Potential for ground disturbance at both sites during pipeline construction. In addition, indirect impacts may arise from construction activities that will affect the	The pipeline has been re-routed to avoid crossing these sites. Potential impacts are therefore avoided. Construction will be carried out under the supervision of an	**MINOR IMPACT** Impacts will be limited to the temporary disturbance of the setting of the sites and peripheral features.

Environmental Impact Table 9 (Maps 9A and 9B) (KPs 132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
* These sites have not yet been registered by the MoC and are provisionally assigned these classifications. These sites have been proposed for registration by the regional preservations council	visual/historical setting of these sites.	archaeologist authorised by BOTAŞ.	
The following areas have been proposed for registration by the regional preservations council: (i) Kurugol; (ii) area near Hasbey 3; (iii) Topkaya; (iv) area near Yenice; (v) area near Akcakale; (vi) area near Kale; (vii) area near Sarigun			

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

MAP 9: PROJECT INFORMATION
There are no pump stations or construction camps in the area. There is one block valve station.
MAP 9: MAP HIGHLIGHTS
• Grazing and rain-fed agriculture dominate land use. • The majority of land is owned and used by the landowner. However, many landowners do not have legal title deeds for their land. • Primary land use is animal husbandry. Secondary land uses include dry agriculture, the cultivation of barley and wheat for fodder, and some bee keeping. • Generally settlements are based on a subsistence economy, with only one harvest per year and limited product diversification. • Settlement roads and their auxiliary roads are generally of poor quality, and are often inaccessible for several days of each month during winter. • Few settlements have sewerage or waste disposal systems. • Pipeline passes to north of the ancient settlement of Aktas Hill.
MAP 9: IMPACTED AND SURVEYED SETTLEMENTS
• ***Impacted:*** six settlements on this map will be directly impacted by the pipeline project (Hasbey, Baykara, Darbogaz, Yenice, Akcakale Karakale). They will each have land intersected by the proposed pipeline (L). Three of these settlements (Tuygun, Yenice & Hasbey) are within 500m of the pipeline route (D). No settlements are within 5km of a construction camp or pump station. One (Tuygun) is within 2km of a block valve station (B). Settlements impacted by traffic have not yet been identified. Three settlements are on creeks downstream of the pipeline crossing (Tuygun is downstream of Kamisli creek, Eskigazi is more than 2km downstream of Kamisli creek and Mozurgan creek, Yenice is downstream of Karapinar and Cayir creek). • ***Surveyed:*** five settlements (Hasbey, Darbogaz, Akcakale, Karakale & Sarigun) were surveyed in the field (S). Three additional settlements were surveyed by telephone (T) (Tuygun, Baykara & Yenice). • ***Disclosure Meeting Location***: Tuygun, Akcakale

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Tuygun (D) (B) (T)			
• ***Demographics:*** 433 inhabitants with 65 households. • ***Safety:*** the nearest house in the settlement is located 75m from the pipeline and the centre of the settlement is located 250m from the pipeline. • ***Health:*** lack of sewerage and waste disposal systems impacts upon health levels in the settlement.	***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

• ***Project attitude:*** inhabitants are generally positive towards the project and according to the Muhtar would welcome a construction camp. Inhabitants are sensitive to any disruption in animal husbandry or to any damage to pasture lands. • ***Land ownership & use:*** 50% of land is owned privately by local residents. Many local landowners do not have legal title deeds for their land. Irrigation is not undertaken. No seasonal grazing of livestock. Key crops are wheat and barley. • ***Settlement Livelihood:*** animal husbandry, agriculture and bee keeping (by four households for their own consumption). • ***Accessibility:*** 59km to provincial centre of Kars, 21km to district centre of Selim. Roads are inaccessible in February. • ***Information provision:*** 99% of the population is literate. Best information provision tools include TV and the telephone. • ***Environmental & cultural sites:*** Martyr monument. • ***Infrastructure:*** piped water is available year round. There is no alternative water source. No sewerage or waste disposal system. • ***Services:*** there is a primary school with two teachers and no health services. • ***Settlement problems:*** inadequate childcare facilities and the need for a Muhtar room.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children. Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards:***	the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will	specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents**

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

	animals Trench poses safety hazard for livestock.	be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Accessibility of recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Block Valve Station*** See Environmental Impact Tables and Overview of the	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

	Land Acquisition Process in Appendix C9		
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Hasbey (D) (L) (S) (T)			
• ***Demographics:*** 950 inhabitants with 130 households. • ***Safety:*** the nearest settlement is located 158m from the pipeline. • ***Local opinion of the pipeline:*** generally positive – all surveyed households would welcome a construction camp. • ***Project attitude:*** 73% of households expect to benefit from direct employment. • ***Land ownership & use:*** 60% of land is privately owned by the local residents. Seasonal grazing and irrigation occurs. • ***Settlement livelihood:*** agriculture (grain – barley and wheat for subsistence) and animal husbandry. • ***Availability & skills:*** food service, heavy vehicle drivers, tree fellers, drivers, security, welders are available. 82% of surveyed respondents would accept a temporary job. • ***Accessibility:*** 19km to district centre. Roads open all year excepting 3-5 days in January & February. • ***Information provision:*** 80%-90% of the population is literate. Best information provision tools include TV and the radio. • ***Environmental & cultural sites:*** nearby dam • ***Infrastructure:*** piped water is available year round. There is no alternative water source. A dam has recently been constructed near the settlement. • ***Services:*** electricity, water and telephone available. No sewerage system or health facilities. There is also a primary school with four teachers. • ***Settlement problems:*** unemployment, animal breeding becoming unprofitable, poor health conditions, poor sewerage system with resultant health implications, garbage, lack of health centre, and poor	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children. Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

transportation accessibility. Standard of life is deteriorating.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	danger for livestock. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Potential positive benefits** to local settlements. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Baykara (L) (T)			
• ***Demographics:*** 115 inhabitants. Seasonal migration of 10% of the	***Construction hazards:***		

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

population. • ***Safety:*** the nearest house in the settlement is located 1.5km from the pipeline and the centre of the settlement is located 2km from the pipeline. • ***Land ownership & use:*** Many local landowners do not have legal title deeds for their land. • ***Settlement livelihood:*** animal husbandry and agriculture. • ***Accessibility:*** 15km to the district centre.	***animals*** Trench poses safety hazard for livestock. ***Accessibility to information:*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc ***Land*** Potential complications in expropriation process.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. **See Overview of the Land Acquisition Process in Appendix C9.**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **See Overview of the Land Acquisition Process in Appendix C9.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Darbogaz (L) (S) (T)			
• ***Demographics:*** 300 inhabitants with 50 households. • ***Safety:*** settlement located 1.6km from pipeline. • ***Health:*** lack of sewerage causing health problems. • ***Project attitude:*** respondents are generally positive towards the project. • ***Land ownership & use:*** 80% of land is privately owned by local residents and 10% is jointly cultivated. Many local landowners do not have legal title deeds for their land. • ***Settlement Livelihood:*** agriculture (barley and wheat for animal and household consumption. Cultivation is undertaken mainly for	***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

household consumption. Cultivation is undertaken mainly for subsistence) and animal husbandry (cattle breeding is particularly important. Sheep, poultry and horses also bred. • ***Availability & skills:*** Food service, heavy vehicle drivers, mechanics, tree feller, drivers, security personnel, welder are available. • ***Accessibility:*** 52km to provincial centre of Kars and 19m to district centre of Selim. The settlement is accessible all year except 2-3 days in February and March. Relatively good quality roads. • ***Information provision:*** 80-90% of the population is literate. Best information provision tools include TV, the telephone and the radio. • ***Religion/ethnicity:*** Sunni Karakalpak (a Turkic ethnic group migrated from Azerbaijan). • ***Irrigation:*** seasonal irrigation undertaken in north of settlement. Canals are situated across path of the pipeline. • ***Infrastructure:*** piped water is supplied to households and functions well. There is no alternative water source. Electricity and telephone infrastructure is available. There is no sewerage system. • ***Services:*** there is an elementary school with two teachers and traditional health services are available, but there is no health care centre. • ***Settlement problems:*** unemployment, garbage, poor health conditions, no sewerage, poor accessibility. However, the settlement's living standards and income levels are relatively higher than that of surrounding settlements, although it is deteriorating due to unemployment and animal breeding becoming unprofitable.	***Land*** Potential complications in expropriation process. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	**See Overview of the Land Acquisition Process in Appendix C9.** **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**See Overview of the Land Acquisition Process in Appendix C9.** **Potential positive benefits** to local settlements. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Yenice (L) **(T)**			
• ***Demographics:*** 188 inhabitants. • ***Safety:*** the centre of the settlement is located 1km from pipeline, and the nearest house in the settlement is 700m from the pipeline. • ***Project attitude:*** the Muhtar suggested that inhabitants would welcome a construction camp. No major concerns were raised.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing.	**Continued attention** to mitigation measures will be critical to prevent injury.

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

• ***Land ownership & use:*** 70% of land is communally owned. Many local landowners do not have legal title deeds for their land. Seasonal grazing occurs as does seasonal irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (one household for own consumption), construction, trade, local government, transport, education. • ***Accessibility:*** 16 km to district centre. Roads are of poor quality. • ***Information provision:*** 99% of the population is literate. Best information provision tools include TV, newspapers and the telephone. • ***Environmental & cultural sites:*** mausoleum. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** debt, poor roads, poor accessibility, and outdated farm machinery.		**Community liaison meetings** held prior to and during construction will include safety briefings.	**Benefits** from awareness raising.
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

		prior to moving back close to their original location.	complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Akcakale (L) (S) (T)			
• ***Demographics:*** 950 inhabitants, with 185 households. • ***Safety:*** the nearest house in the settlement is located 850m from the pipeline and the centre of the settlement is located 1100m from the pipeline. • ***Health:*** lack of sewerage with health implications. • ***Disputes:*** The settlement suffered from political unrest in the early 1990's, however, there is no apparent conflict or dissent in the	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

1990's, however, there is no apparent conflict or dissent in the settlement. • ***Project attitude:*** respondents are generally positive and no major concerns were raised. All surveyed households would welcome a construction camp. 45% of respondents expect direct employment and 27% expect land compensation. • ***Land ownership & use:*** 52% of land is privately owned by the local residents, 33% is public land and 15% commonly owned lands. Many local landowners do not have legal title deeds for their land. • ***Settlement livelihood:*** animal husbandry is the main economic activity. Agriculture (predominantly animal feed cultivated) and recently bee keeping (40 households produce honey in addition to other income source) is also undertaken. • ***Availability & skills:*** engineers, food service, heavy vehicle driver, mechanics, tree fellers, drivers, security, welders are available. • ***Accessibility:*** 59km to provincial centre of Kars and 19km to the district centre. Accessible all year except 3-5 days in January, February and March. Roads of relatively poor quality. • ***Information provision:*** 90% of the population is literate. Best information provision tools include teachers, TV, radio, telephone. • ***Environmental & cultural sites:*** mountains & water resources. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. Electricity and telephone networks are available. There are no sewerage or waste disposal systems. • ***Services:*** there is no health care centre, but there are two primary schools with ten teachers. • ***Settlement problems:*** unemployment, poor health conditions, inadequate sewerage system, poor accessibility. However, the living standards and income level of the settlement are better than that of neighbouring settlements. • ***Other:*** inhabitants would like the project to improve settlement's roads.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Land*** Potential complications in expropriation process. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Access to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **See Overview of the Land Acquisition Process in Appendix C9.** **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Asking residents or workers to translate as necessary.	**Any additional damage will be compensated for.** **See Overview of the Land Acquisition Process in Appendix C9.** **Potential positive benefits** to local settlements. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Karakale (L) (S) (T)			
• ***Demographics:*** 550 inhabitants with 110 households, and seasonal migration of 13%. • ***Safety:*** the nearest house in the settlement is located 1.7km from the pipeline and the centre of the settlement is 2km from the pipeline. • ***Health:*** significant health problems due to dumping of dead animals in nearby creek, and lack of sewerage treatment. • ***Disputes:*** significant tension exists among local residents as there is insufficient water supplied to the settlement. Local residents have not been able to adequately determine the rules and mechanisms regarding equal distribution of drinking water. • ***Project attitude:*** respondents are generally positive. 73% have expectations of direct employment and 18% have expectations of land compensation. • ***Land ownership & use:*** primary land ownership is the local residents (50%) and share cropping (50%). Only 50% of landowners have title deeds. Irrigation is undertaken. There is no seasonal grazing. • ***Settlement Livelihood:*** agriculture (barley and wheat) and livestock/animal husbandry, and recently bee keeping (50 households produce honey in addition to other income sources). • ***Availability & skills:*** food service, heavy vehicle drivers, mechanic, tree feller, drivers, security personnel are available. 73% of respondents would accept a temporary job. • ***Accessibility:*** 50km to provincial centre of Kars and 20 km to the district centre. Accessible all year excepting 3-4 days in January and February. Roads are relatively poor quality. • ***Information provision:*** 90% of the population is literate. Best information provision tools include TV and the telephone. • ***Environmental & cultural sites:*** forest and Martyr monument in the Allahuekber mountain (north-west of the settlement).	***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Land*** Potential complications in expropriation process. ***Accessibility of recruitment*** Decreased access to recruitment process. ***Access to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Irrigation*** Potential loss of flow from	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **See Overview of the Land Acquisition Process in Appendix C9.** Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Contractor will **consult**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9.** **No residual impact expected.** **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **If irrigation water is**

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

• ***Infrastructure:*** piped water is supplied to households, however its supply is irregular with regular water cuts. Electricity, and telephone infrastructure is available. There is no sewerage system • ***Services:*** and no health care centre. There is a primary school with three teachers. • ***Settlement problems:*** unemployment, diminishing animal husbandry, inadequate sewerage system and resultant health impacts, insufficient teachers and water cuts.	planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	with authorities to determine maximum acceptable time for disruption. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Sarigun (S)			
• ***Demographics:*** 1,540 inhabitants with 208 households. • ***Safety:*** settlement is 2km from the pipeline. • ***Health:*** lack of sewerage with health implications. • ***Disputes:*** there are two opposing groups within the settlement, for and one against the Muhtar. Frequent water cuts resulting in insufficient drinking water exacerbates this tension between the two groups. • ***Project attitude:*** inhabitants are generally positive. 73% of households expect to benefit from direct employment, 18% were not sure of potential benefits and 9% of households would expect to benefit from land compensation. Respondents are not sure what negative impacts to expect.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. **Information is highlighted to Contractor** so that they can ensure that directly	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Potential positive benefits** to local settlements.

Social Impact Table 9 (Map 9C) (KPs –132.9 – 154.6): Kamisli Creek to Kara mountain area, Kars Province

• ***Land ownership & use:*** all land is privately owned by the local residents. There is no public/communal land in the settlement. Diverse livestock graze. Seasonal grazing occurs during spring, summer and November. • ***Settlement livelihood:*** dry agriculture (grain & vegetables), animal husbandry, bee keeping (which is becoming an important income generating activity) and employment as settlement guards. Overall good economic situation in the settlement. • ***Availability & skills:*** food service, heavy vehicle drivers, tree fellers, drivers, security personnel, welders are available. 91% of respondents would accept a temporary job. • ***Accessibility:*** 57km to provincial centre of Kars and 22km to district centre. The settlement is accessible all year except in January and February. Roads are, however, of relatively poor quality. • ***Information provision:*** Turkish is spoken by all local residents. 90% of the population is literate. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. There is no electricity or telephone infrastructure and no sewerage system or waste disposal system. • ***Services:*** the health care centre is not staffed. There is a primary school with four teachers. • ***Settlement problems:*** unemployment, poor health conditions, no sewerage system, garbage, lack of health stuff, and poor accessibility.	goods or materials. ***Accessibility of recruitment*** Decreased access to recruitment process.	impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy	**No residual impact expected.**

Environmental Impact Table 10 (Maps 10A and 10B) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Fine-loamy Andeptic Cryorthents on valley bottoms; • Sandy-skeletal Typic Cryochrepts on slopes.	Main potential impact is reduced productivity in waterlogged locations. Other potential impacts include: • soil erosion; • sediment yield; • altered drainage.	• Install moveable mats beneath heavy equipment. • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed. Furthermore, water is predicted to remain in surface depressions for less than 3 months after construction is completed. Soils will be inspected for waterlogging, which if observed, additional remedial measures will be applied.
Landscape and Visual			
Up to and between KP155 and 160, the undulating terrain is broken by intermittent rolling lands and steep stream crossings. High groundwater restricts settlements to well-drained slopes. The route passes along a broad marshy valley rich in wildflowers. Grazing dominates the local economy. South of KP 160, the cryic, rolling landscape becomes hilly and then steeply dissected. Stone outcrops dominate minor peaks and steep lands with landslides occur between KP 165 and 170. Grazing and conservation forestry are important land occupations. Up to this point, landscape sensitivity is moderate to low. The route then rises through bushy country to skirt through existing gaps around the edge of Sarikamis Forest. South of KP 170, the route passes along the edge of two very different but equally scenic landscapes – to the south the broad, wild, rolling mountain pastures, and to the north the plunging gorge of the Kuyularin Creek and the arid,	Visual impacts likely to concern mostly the formation of conspicuous whitish line across landscape where pale-coloured tuff soils or parent material exposed along the large part of this route section. Through the long marshy valley south of Baskoy settlement saturated soils may be damaged easily during construction. Potential impacts and their management during BVS	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Revegetation of disturbed surfaces. • Potential impacts are reduced as the route utilises an existing corridor through the edge of Sarikamis Forest.	**MAJOR IMPACT** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies tuff, it will retain its whitish colour and show as a white line across a highly visible landscape. However, a number of additional site-specific mitigation measures will further be employed in tuff areas to manage the above impact, including: • soil survey prior to construction to determine

Environmental Impact Table 10 (Maps 10A and 10B) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
angular mountains beyond. BVS-011 will be located at KP 161.2 within sub-alpine meadow habitat. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to this site of c. 40m in length.	construction will be the same as those during pipeline construction.		topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement; • post-reinstatement monitoring. **MODERATE IMPACT** Shallow soils may prolong the period for reinstatement of mountain pastures to be effective.
Ecology			
Protected Areas The route passes through the Sarikamis Forest, of which c. 20,000ha are legally protected as a Natural Site Area for its important Scot's Pine forest communities. An existing corridor within the forest has been utilised in routing the Pipeline through this area and the route crosses through c. 4.1km of the site between KPs 167.6 – 171.7. Sarikamis Forest is important for large mammals including Wild Goat (globally-threatened), Brown Bear, Grey Wolf and Roe Deer. Smaller mammals include Mediterranean Horseshoe Bat (globally-threatened), Common Pipistrelle, Greater Mouse-eared Bat, Weasel, European Pine Marten, Beech Marten, Eurasian Badger, Stoat and Caucasian Squirrel. The globally-threatened amphibian, Southern Crested Newt, is also present within the forest, although this species was not recorded during ecological surveys. The protection status for all species identified in Sarikamis Forest is given in Table 5.21, Section 5.	Field investigations suggest the site can be crossed with little impact since the trees are widely spaced and there is an existing corridor where only a few trees are present. Therefore impacts on the forest are likely to be slight and fragmentation is not considered likely. Minor temporary disturbance to globally-threatened mammals during seasonal sensitivities (see EMMP,	The RoW has been narrowed to 22m within Sarikamis Forest and will NOT be fenced off temporarily during construction to ensure free passage of large mammals. If any significant length of trench, in terms of interrupting normal paths or passage used by the various species, needs to be left open for more than a few days (72 hours), points of passage will be provided across it at regular intervals (500m). Specific requirements have been	**MINOR IMPACT** at most to mammals during the construction period where the specified mitigation measures are applied for the seasonal sensitivities identified for each species. There will be no effect on the Forest's protection status. **MINOR IMPACTS** only to globally-threatened amphibians, if the construction period avoids the seasonal sensitivity.

Environmental Impact Table 10 (Maps 10A and 10B) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	Appendix C1): • hibernation and peak spring feeding periods for brown bears between November to April and March to June, respectively; • breeding season for wild goats between October and December and during birthing between March and April; • breeding and hibernation periods for globally-threatened bat species, from September to May and for the Common Pipistrelle bat between October and July. In severe weather, bears hibernate in underground dens or caves. During this hibernation period, the females give birth to one or two cubs (rarely three) in January or February. Following hibernation, bears enter a period of peak feeding in order to recover weight lost during the winter months. During such periods they are known to wander over wide areas and are most likely to come into conflict with human	established in relation to human interaction with the Eurasian Brown Bear – see Section 4.14 of the Mammals Species Dossier (Appendix B1). In the late summer/early autumn, in areas from which bears have been recorded, preconstruction ground surveys will be undertaken to establish the presence of potential hibernation places. If found, construction activity will be restricted to periods outside the hibernation season. Furthermore, in areas where the presence of bears has been confirmed by these surveys, the specific requirements outlined in Section 4.14.5 of Appendix B1 shall be implemented, including education of workers to be alert and aware of the potential for human/bear interactions. Such education will include refuse management on sites (particularly where construction camps are located) and awareness of sensitive periods of the year described previously. The hunting of bears or any other wildlife by the BTC Project personnel or contractors will be strictly forbidden.	

Environmental Impact Table 10 (Maps 10A and 10B) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	habitation, particularly in remote areas. Females with cubs are at their most aggressive at this time. Temporary local disturbance to globally-threatened amphibian species during the spawning season between May and June inclusive.	The preconstruction survey will establish the presence and local distribution of Wild Goats in the areas from which they have been recorded. Depending on the outcome of these surveys, actions may range from avoidance of construction activity during sensitive periods at specific locations to worker training regarding non-disturbance of nearby herds. Preconstruction bat surveys during the summer months will aim to establish the presence and abundance of the species and seek to identify summer colonies and potential winter hibernation roosts. Hollow trees within the RoW of the Pipeline route will be removed during the late summer months, under the close supervision of an ecologist approved by BOTAŞ, to prevent their use as winter roosting sites and to allow construction to continue during the autumn, winter and early spring periods. Caves, ruins or underground cavities, that have been identified as hibernation roosts (particularly those close to camps and works	

Environmental Impact Table 10 (Maps 10A and 10B) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		sites), will be secured and placed out of bounds to avoid their disturbance by workers. Specifically for the Common Pipistrelle, preconstruction surveys in the vicinity of river crossings will aim to identify the location and level of occupation of maternity colonies, summer roosts and potential mating/winter hibernation roosts. Preconstruction walkover amphibian surveys will establish the presence of appropriate spawning locations, such as small pools and ponds, within the RoW of the route. Translocation of species will be carried out in those parts of the route where construction is scheduled to occur between May and June.	
Important Ecological Factors Seven globally-threatened plant species (*Onosma nigricaule, Cirsium woronowii, Senecio integrifolius spp. karsianus, Lathyrus karsianus, Onobrychis stenostachya spp. sosnowskyi, Necranthus orobanchioides, Rumex gracilescens*) and one nationally-threatened species (*Senecio integrifolius*) occur between KP 167.0 and KP 173.0. ESA 8 is identified for these species. The IUCN status for these species are given in Table 5.20, Section 5. The gorge north and west of the route between KPs 172.5 – 174.7 is the single most important location for raptors along the route. A single	Habitat destruction of sub-alpine meadow and forest floor may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 8. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2).

Environmental Impact Table 10 (Maps 10A and 10B) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Lammergeyer (nationally-threatened and one of Turkey's rarest breeding birds) was observed on the cliffs here. A roost of Griffon Vultures (nationally-threatened) is also located here and nesting may be possible. A single Saker Falcon (nationally-threatened) was seen here and nearby at KP 170.9 and the species probably breeds in the vicinity. Another nationally-threatened raptor, Northern Goshawk, was observed c.130m after KP 160.8 and probably breeds in the forest. A pair of Teal (nationally-threatened) was observed on the marshy stream at KP 177.9 and may breed here. Whinchat (nationally-threatened) was present at several points – 3 c. 420m south of the route between KPs 160.8 – 162.7; 5 c.90m west of the route at KP 167.0; and 4 in the gorge described above. Mountain Chiffchaff (restricted-range) were present at several points in Sarakamis Forest – 2 c.2.1km east of the route around KP 171.0; 2 at KP 171.9; and 1c.1.9km east of the route between KPs 172.0 – 172.5. The protection status for these bird species are given in Table 5.21, Section 5.	during the breeding season (ie between March and July inclusive). July can remain sensitive for late and second broods.	possible. Otherwise one or a combination of the following techniques will be used supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. The preconstruction bird survey will establish the presence of mature trees and rock ledges within 500m of the Pipeline route. If nesting raptor sites are identified, avoidance of construction activity from March to July. Shrubs and dense vegetation along the RoW will be cleared outside the Whinchat's breeding season (April to July). Seasonal sensitivity constraints in this route section are likely to be in keeping with constraints imposed by the high altitude and harsh climate. The gorge will be made out of bounds for workers and fencing between the works and the gorge	**MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to March, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Environmental Impact Table 10 (Maps 10A and 10B) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		entrance will be secured. Furthermore, the road up the gorge from Cermikkoy settlement will be placed out-of-bounds to all construction personnel and traffic.	
Archaeology and Cultural Heritage			
Near Beykoy-1 (1st Degree Site*) is a flat settlement located within the 100m Corridor. There are traces of Medieval buildings on this site and ceramics belonging to different periods (Early Bronze Age, Urartian, Roman and Medieval). * This site has not yet been registered by the MoC and is provisionally assigned this classification. It has been proposed for registration by the regional preservations council	Potential for direct impact to this site during pipeline construction through structural damage to the site and vibration. In addition, indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	The pipeline has been re-routed to avoid this site. Potential impacts are therefore avoided. If blasting is required, then it will be conducted in such a way that it does not pose a threat to the integrity of the site. To avoid vibration impacts, percussive piling will not be allowed within 100m of Near Beykoy-1. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	MINOR IMPACT Impacts will be limited to the temporary disturbance of the site setting and peripheral features.
The following have also been proposed for registration by the regional preservations council: (i) Abandoned Ruins; (ii) area near Beykoy 3; (iii) area near Beykoy 2; (iv) area near Baskoy - 1st Degree; (v) Zavot Ruins - 1st Degree			

Social Impact Table 10 (Maps 10C) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

MAP 10: PROJECT INFORMATION
There are no pump stations or construction camps in the area. There is one block valve station.
MAP 10: MAP HIGHLIGHTS
• Main land use is pasture, with some areas of non-agricultural land, and some rain-fed agriculture. • Pipeline traverses over cultivated lands, sub-alpine meadow, grasslands and forests. • The primary land use is animal husbandry. Secondary land uses include the cultivation of barley and wheat for fodder, and some bee keeping. • Settlement roads and their auxiliary roads are generally poor quality, and are often inaccessible for extended periods. • Pipeline passes north of the ruins of an abandoned settlement, and north-west of Zavot Ruins. • A protected environmental area is situated in the area.
MAP 10: SURVEYED AND IMPACTED SETTELEMENTS
• ***Impacted:*** five settlements on this map will be directly impacted by the pipeline project. (Beyoglu, Baskoy, Cermikkoy, Cermikyayla & Goresken Yayla). They will each have land intersected by the proposed pipeline (L). Three have settlements within 1km of the pipeline route or houses 500m from the pipeline route (Baskoy, Goresken Yayla, Cermikyayla) (D). None are within 5km of a construction camp or pump station (P/C) or within 2km of a block valve station. Settlements impacted by traffic have not yet been identified. Two settlements (Cermikkoy is downstream of the Kuyularin creek and Goresken is downstream of the Circirinardi creek) are on a watercourse downstream of a pipeline crossing. • ***Surveyed:*** three settlements (Baskoy, Sarigun, Beyoglu) were surveyed in the field (S) and one settlement (Goresken Yayla) was surveyed by telephone (T). • ***Not surveyed:*** Goresken Yayla (935m from the pipeline); Cermikyayla (685m from the pipeline) are within 2km of the pipeline. • ***Not on the map:*** Beykoy • ***Disclosure Meeting Location:*** Baskoy

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Baskoy (L) (D) (S)			
• ***Demographics:*** 700 inhabitants with 130 households. • ***Safety:*** nearest house in settlement located 500m from the pipeline and the centre of the settlement is located 1.2km from the pipeline. • ***Health:*** lack of sewerage system has health implications. • ***Project attitude:*** positive, however, the settlement believes that the State should cover any expenses that arise due to any damage to the land. The majority of respondents would welcome a construction camp. The settlement expects to benefit from land damage	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from awareness raising.

Social Impact Table 10 (Maps 10C) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

camp. The settlement expects to benefit from land damage expenses from the state. • ***Land ownership & use:*** all land is privately owned by local residents. Some landowners have title deeds, some do not. Livestock grazing occurs during spring, summer and November. There is no irrigation. • ***Settlement Livelihood:*** agriculture (barley & wheat are cultivated mainly for subsistence) and bee keeping (seven households produce honey for own consumption). In addition cattle breeding is important and horses are also bred. The standard of life in the settlement is deteriorating due to unemployment and animal breeding becoming unprofitable. • ***Availability & skills:*** food service, heavy vehicle drivers, mechanic, tree feller, drivers, security personnel, welder are available. 73% of respondents would accept a temporary job. • ***Accessibility:*** 66km to provincial centre of Kars and 22km to district centre. Settlement is accessible all year except for approximately 15 days in January. • ***Information provision:*** Turkish is spoken by all local residents. 90% of the population is literate. The best information provision tool is the television. • ***Infrastructure:*** piped water is supplied to households, however its supply is irregular with some water cuts. There is also a local spring. Electricity and telephone infrastructure is available. There is no sewerage system. • ***Services:*** the health care centre is not staffed. There is a primary school with one teacher. • ***Settlement problems:*** unemployment, waste disposal, poor health conditions, no sewerage system, poor accessibility, and poor water supply. • ***Other:*** some lands on route of pipeline more fertile than others.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Land*** Potential complications in expropriation process. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **See Overview of the Land Acquisition Process in Appendix C9.** **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee

Social Impact Table 10 (Maps 10C) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

		must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Skills & resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements.
	Accessibility of recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Potential positive benefits** to local settlements.

Social Impact Table 10 (Maps 10C) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include: - Using appropriate channels of communication and media. - Emphasising oral communication where literacy is low. - Translation as necessary. ***Ground water*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Beyoglu (S) (T)			
• ***Demographics:*** 800 inhabitants with 130 households. • ***Safety:*** the nearest house in the settlement is located 1.2km from the pipeline and the settlement centre is located 1.5km from the pipeline.	***Accessibility to information*** Sectors of the population may not have access to project related information on	**Communication with settlement** must take into account settlement characteristics to ensure	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will

Social Impact Table 10 (Maps 10C) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

• ***Health:*** the lack of a sewerage system and uncollected garbage contributes to poor health. • ***Disputes:*** settlement is separated into two groups due to competition in Muhtar elections. Conflict between current and ex-Muhtar, and between Muhtar and teachers. • ***Project attitude:*** respondents are generally positive. The majority of respondents would welcome a construction camp. 72% of households would expect to benefit from direct employment, 18% would expect to benefit from land compensation, no major concerns. Cattle, sheep goats and horses are kept. Seasonal grazing takes place. • ***Land ownership & use:*** 60% of land is privately owned by the local residents and the remaining 25% is share cropped. There is local concern over the legal status of land without title deeds. Seasonal grazing occurs in spring, summer and November. There is an irrigation system. • ***Settlement livelihood:*** animal husbandry (cattle breeding is important, sheep, goats and horses also bred), agriculture (barley & wheat cultivated predominantly for subsistence), bee keeping (five households for own consumption) and trade. Standard of life in settlement is decreasing due to unemployment and animal breeding becoming unprofitable. • ***Availability & skills:*** 91% of respondents would accept a temporary job. • ***Accessibility:*** 57km to provincial centre of Kars. The settlement is accessible all year, excepting February to March. Poor roads. • ***Information provision:*** Turkish is spoken by all local residents. 90% of the population is literate. The best information provision tool is the television. • ***Environmental & cultural sites:*** the surrounding mountains are viewed as significant by inhabitants. • ***Infrastructure:*** piped water is supplied to households, however its supply is irregular and there are frequent water cuts. Electricity and telephone infrastructure is also available.	employment opportunities, potential disruption to utilities, etc. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials ***Accessibility of recruitment*** Decreased access to recruitment process. ***Irrigation*** Loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation	equal access to information for all residents. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	keep this to a minimum. **Potential positive benefits** to local settlements. **No residual impact expected.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 10 (Maps 10C) (KPs 154.6 – 179.0): Allahuekber Mountains, Kars Province

• ***Services:*** there is no health care centre, but there is a primary school with three teachers. • ***Settlement problems:*** poor accessibility, poor water supply causes settlement conflicts, no sewerage system, garbage, lack of health facilities and overall infrastructure problems.			

Environmental Impact Table 11 (Maps 11A and 11B) (KPs 179.0 – 197.0): Circirinardi Creek to Akdere Creek, Kars/Ezurum Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soils in this route section comprise: • Sandy-skeletal Cryorthents on slopes; • Andeptic Cryorthents near streams except where these are steep, when the soils become Typic; • Mesic Clayey-skeletal to Loamy-skeletal Typic Xerochrepts on non-tuff slopes; • Mesic-Coarse-loamy Entic Dystrandepts on slopes derived from tuff; • Typic Xerorthents, Haploxeralfs, or Rhodoxeralfs on valley floors.	Main potential impacts: • soil erosion; • sediment yield; • altered drainage; • reduced soil productivity; • muddied valley bottoms; • debris in stream channels; • polluted soils.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Moveable equipment mats. • Remove debris to disposal site or use as construction fill.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
Rising once again into the mountains, the route is framed by broad, wild, rolling mountain pastures of high scenic merit. The landscape along the route changes dramatically in this section from being largely green montane grazing land to cultivated arable land with occasional trees on an undulating plateau edged by more jagged, barren, browner mountains. The pipeline follows a moderately steep, V-shaped valley near KP 185, following which it re-enters more varying relief but with stony outcrops (andesite and basalt sandstone). Many of the river valleys remain as wet meadows, rich in flowers and bushes eg near KP 195, in marked counterpoint to the agricultural landscape surrounding them. South of KP 195, the hilly land west of the Karasu River supports cereals grown on gently rounded sedimentary summits. Grazing continues as an important land use, especially on hill slopes.	Disturbance of soils overlying tuff will result in exposed whitish strip, although visibility will depend on precise location and character of landscape. Impact will be less pronounced in more intensively farmed and vegetated areas. Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Re-vegetation of disturbed surfaces • Crushed rock.	**MODERATE TO MAJOR IMPACT** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies tuff, it will retain its whitish colour and show as a white line across the landscape. This impact will be less pronounced in the more intensively farmed and vegetated areas and in contrast highly visible in the more sensitive landscape

Environmental Impact Table 11 (Maps 11A and 11B) (KPs 179.0 – 197.0): Circirinardi Creek to Akdere Creek, Kars/Ezurum Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
In contrast to the dramatic scenery of the surrounding mountains, the agricultural landscape along much of this route is less susceptible to change, the field tapestry potentially concealing the route's alignment. BVS-012 will be located at KP 189.3, within plain steppe habitat. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to this site of c. 45m in length.			surrounding the Soganli Mountains, which is less resilient to change. However, a number of additional site-specific mitigation measures will further be employed in tuff areas to manage the above impact, including: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement; • post-reinstatement monitoring.
Ecology			
Important Ecological Factors Three Griffon Vultures (nationally-threatened) were observed at KP 179.7, although these related to the roost/nest site in the gorge described in Environmental Impact Table 10 (see Map 10B). Eight Whinchats (nationally-threatened) were observed at KP 185.0. The protection status for these species are given in Table 5.21, Section 5.	Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between March and July inclusive). July can remain sensitive for late and second broods.	The preconstruction bird survey will establish the presence of vulture nesting sites within 500m of the pipeline route. If nesting sites are identified, avoidance of construction activity within 500m from March to July. Shrubs and dense vegetation along the RoW will be cleared outside the Whinchat's breeding season (April to July). Seasonal sensitivity	**MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to March, and **MODERATE**, where construction occurs during the

Environmental Impact Table 11 (Maps 11A and 11B) (KPs 179.0 – 197.0): Circirinardi Creek to Akdere Creek, Kars/Ezurum Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		constraints in this route section are likely to be in keeping with constraints imposed by the high altitude and harsh climate.	breeding season without prior clearance of the RoW.
Archeaology and Cultural Heritage			
The following have been proposed for Registration by the Regional Preservations Council: (i) Nekiryolak Ridge; (ii) area near Yenigun; (iii) area near Yenikoy; (v) area near Kurbancayiri 1			

Social Impact Table 11 (Map 11C) (KPs 179.0 – 197.0): Circirinardi Creek to Akdere Creek, Kars/Ezurum Province Border

MAP 11: PROJECT INFORMATION			
There are no pump stations or construction camps in the area. There is one block valve station.			
MAP 11: MAP HIGHLIGHTS			
• There are limited settlements in this area. • Dominant land use is grazing. Hilly land west of the Karasu River supports cereals. • The pipeline traverses over predominantly grasslands and pasture, and some sub-alpine meadow. • The primary land use is animal husbandry, particularly cattle breeding. Secondary land uses include the cultivation of barley and wheat for fodder and some bee keeping. • Unclassified roads link local settlements. A creek runs parallel to the pipeline.			
MAP 11: SURVEYED AND IMPACTED SETTLEMENTS			
• ***Impacted:*** one settlement on this map (Yenikoy) will be directly impacted by the pipeline project. It has land intersected by the proposed pipeline (L) and is within 500m of the pipeline route (D). No settlements are within 5km of a construction camp or pump station, and no settlements are within 2km of the block valve station. Settlements impacted by traffic have not yet been identified. There are no settlements downstream of a creek/ river crossing. • ***Surveyed:*** one settlement (Yenikoy) was surveyed in the field (S), and one settlement (Kurancayiri) was surveyed by telephone (T). • ***Not surveyed:*** Sirataslar (2km from the pipeline) and Sirbasan. • ***Disclosure Meeting Location:*** Yenikoy			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yenikoy (L) (D) (S)			
• ***Demographics:*** 1,540 inhabitants with 208 households. Some of the local residents are Alevi Muslims. • ***Safety:*** the nearest house in the settlement is located 250m from the pipeline and the centre of the settlement is located 650m from the pipeline. • ***Health:*** lack of sewerage system with health implications. • ***Security:*** no issues at present, however, settlement suffered from 1990's political unrest in Turkey and still has several settlement guards (*koy korucusu*). • ***Project Attitude:*** 64% of households expect to benefit from direct employment and 18% expect to benefit in other ways. No major	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 11 (Map 11C) (KPs 179.0 – 197.0): Circirinardi Creek to Akdere Creek, Kars/Ezurum Province Border

employment and 18% expect to benefit in other ways. No major concerns were raised. • ***Disputes:*** the last Muhtar election divided the local residents into two competing groups. • ***Local opinion of the pipeline:*** inhabitants are generally positive. • ***Land ownership & use:*** 80% of land is privately owned by the local residents and the remaining 20% is public land used as common pasture by local residents. Some land is irrigated. Seasonal grazing occurs in spring, summer and November. • ***Settlement livelihood:*** animal husbandry (cattle predominantly), agriculture (barley & wheat although cultivation is undertaken mainly for subsistence), bee keeping (20 households), trade and local government. The standard of life in the settlement is decreasing due to unemployment and animal breeding becoming unprofitable. • ***Availability & skills:*** food service, heavy vehicle drivers, mechanic, tree feller, drivers, welder are available. 73% of respondents would accept a temporary job. • ***Accessibility:*** 120km to the provincial centre of Kars and 30km to the district centre. The settlement is accessible all year except January and February. Roads are relatively good quality. • ***Information provision:*** 85% of the population is literate. The best information provision tools include TV, radio and newspapers. • ***Environmental & cultural sites:*** mausoleum and forests. • ***Infrastructure:*** piped water is available, however are frequent water cuts. There is no alternative water source. Electricity and telecommunication infrastructure is available, however there is no sewerage system. • ***Services:*** there is a health centre, however, it's not staffed and there is a primary school with 10 teachers. • ***Settlement problems:*** no sewerage system, unemployment, no waste disposal system, and poor accessibility.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Accessibility to Information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried

Social Impact Table 11 (Map 11C) (KPs 179.0 – 197.0): Circirinardi Creek to Akdere Creek, Kars/Ezurum Province Border

		at least 7km from their original position for 15-20 days prior to moving back close to their original location.	out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility of recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**

Social Impact Table 11 (Map 11C) (KPs 179.0 – 197.0): Circirinardi Creek to Akdere Creek, Kars/Ezurum Province Border

SITE SPECIFIC IMPACTS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Kurancayiri (L) **(T)**			
• ***Demographics**:* 435 inhabitants. • ***Health:*** poor sewerage system causing disease. • ***Project attitude:*** according to the Muhtar, local residents are generally positive. The respondents would welcome a construction camp. There were no major concerns were raised. • ***Land ownership & use:*** primary landowner is the local residents (60%). Irrigation systems in place. • ***Settlement livelihood:*** agriculture, bee keeping (six households produce honey), construction, and trade. • ***Accessibility:*** The settlement is accessible all year. • ***Information provision:*** 98% of the population is literate. The best information provision tool is TV and the telephone. • ***Environmental & cultural sites:*** forest and mausoleum • ***Infrastructure:*** piped water is supplied to households, however its supply is irregular. There is also a settlement fountain. • ***Settlement problems:*** infrastructure problems, no sewerage system, and poor water supply.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Asking residents or workers to translate as necessary.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Environmental Impact Table 12 (Maps 12A and 12B) (KPs 197.0 – 217.5): West of Kurbancayiri Settlement to East of Kusburnu Settlement, Ezurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Coarse-loamy Entic Dystrandepts on slopes derived from tuff. • Mesic Clayey-skeletal to Loamy-skeletal Typic Xerochrepts on non-tuff slopes. • Typic Xerorthents, Haploxeralfs, or Rhodoxeralfs on valley floors.	Main potential impacts: • soil erosion; • sediment yield; • reduced soil productivity. Other impacts include: • altered drainage; • polluted soils.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MAJOR IMPACT** In areas where the corridor overlies tuff, soils are difficult to reinstate due to lack of depth of topsoil, leaving a whitish tuff exposed and mixed with the original topsoil. Therefore, potential impacts are long-term as soils developed from tuff are unlikely to respond to standard reinstatement and exposed tuff and its effects on reducing soil productivity will continue throughout the duration of the Project. However, a number of additional site-specific mitigation measures will further be employed in tuff areas to manage the above impact, including: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement;

Environmental Impact Table 12 (Maps 12A and 12B) (KPs 197.0 – 217.5): West of Kurbancayiri Settlement to East of Kusburnu Settlement, Ezurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			• post-reinstatement monitoring.
Landscape and Visual			
A quite intensively farmed and low sensitivity landscape. Hilly land west of the Karasu River supports cereals grown on gently rounded sedimentary summits backed generally by fairly jagged, barren, brown mountains. Small cereal fields with unmarked boundaries on an undulating plateau. Some river valleys remain as wet meadows, rich in flowers and bushes. Irrigated agriculture occurs along the Akviran Creek west of Karaurgan settlement. Grazing continues as an important land use, especially on hill slopes. The area generally well populated with settlements and roads.	Formation of conspicuous whitish line across landscape where pale-coloured tuff soils or parent material exposed, although this would be attenuated by the field tapestry, which would conceal it to some extent.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils • Bio-restoration. • Implement fertiliser trials using NPK + micro-nutrients with reinstatement species.	**MODERATE TO MINOR IMPACT** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies tuff, it will retain its whitish colour and show as a white line across the landscape. However, both the existing field tapestry in this intensively farmed region and the low sensitivity landscape, which is tolerant of change, will largely attenuate this impact. In tuff areas, a number of additional site-specific measures will be employed: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement; • post-reinstatement

Environmental Impact Table 12 (Maps 12A and 12B) (KPs 197.0 – 217.5): West of Kurbancayiri Settlement to East of Kusburnu Settlement, Ezurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			monitoring.
Noise			
Yukari Horum settlement in Horasan District, Erzurum Province is located c. 374m west of the route, adjacent to a provincial highway crossing.	Noise impacts are expected to occur at Yukari Horum during works associated with the highway crossing.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	**MINOR IMPACT** Short-term noise impacts are expected to occur during soil stripping at Yukari Horum settlement. However, during soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. This will be short-term in nature, lasting only for a few days.

Social Impact Table 12 (Map 12C) (KPs 197.0 – 217.5): West of Kurbancayiri Settlement to East of Kusburnu Settlement, Ezurum Province

MAP 12: PROJECT INFORMATION			
There are no pump stations, construction camps or block valve stations in the area.			
MAP 12: MAP HIGHLIGHTS			
• Rolling land in the area supports cereal crops. Land use changes to grazing after passing Akviran River where the terrain changes to gently sloping valleys. • The primary land use is animal husbandry. Secondary land uses include the cultivation of barley and wheat for fodder, some vegetables and some bee keeping. • Two water courses bisect pipeline. Unclassified roads link local settlements. • There is limited product diversification and only one harvest per year. • Settlement roads are generally inaccessible for limited periods during the year.			
MAP 12: SURVEYED AND IMPACTED SETTLEMENTS			
• ***Impacted:*** four settlements on this map will be directly impacted by the pipeline project (Issisu, Karaurgan, Yukari Horum, Asagi Horum), all four have land intersected by the proposed pipeline (L) and two (Karaurgan, Issisu and Yukari Horum) are within 500m of the pipeline route (D). None are within 5km of a construction camp or pump station, and none are within 2km of a block valve station. Settlements impacted by traffic have not yet been identified. One settlement (Zivin) is 3km downstream of the pipeline (R). • ***Surveyed:*** one settlement (Karaurgan) was surveyed in the field (S) and by telephone (T). One settlement (Issisu) was surveyed by telephone (T). • ***Not surveyed:*** Abulbar (1.65km from the pipeline); Kurbancayiri (1.5km from the pipeline); Yukari Horum (450m from the pipeline); Asagi Horum (500m from the pipeline); Talkesen (2km from the pipeline), Zivin (3km from the pipeline).			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Issisu (L) (D) (T)			
• ***Demographics:*** 810 inhabitants. • ***Safety:*** the nearest house in the settlement is located 750m from the pipeline and the centre of the settlement is located 1km from the pipeline. • ***Project attitude:*** inhabitants are generally positive. No major concerns were raised. • ***Land ownership & use:*** 75% of land is privately owned by local residents. Seasonal grazing of diverse livestock occurs and irrigation systems are in place. • ***Settlement Livelihood:*** agriculture, bee keeping (six households produce honey for their own consumption), construction, trade, local	***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Construction hazards:***	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Road safety training** will be	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Continued attention** to

Social Impact Table 12 (Map 12C) (KPs 197.0 – 217.5): West of Kurbancayiri Settlement to East of Kusburnu Settlement, Ezurum Province

government and education. • ***Availability & skills:*** respondents would welcome a construction camp. • ***Accessibility:*** 34km to district centre. The settlement is accessible all year. • ***Information provision:*** 70% of the population is literate. • ***Environmental & cultural sites:*** the Muhtar raised plateau & mountains as significant sites. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** poor water supply and unemployment.	***humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc ***Bees*** Disturbance of any stationary hives located within 300m of	held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at	mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No significant impacts expected.** If settlements believe that more than

Social Impact Table 12 (Map 12C) (KPs 197.0 – 217.5): West of Kurbancayiri Settlement to East of Kusburnu Settlement, Ezurum Province

	the route. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Karaurgan (L) (D) (S) (T)			
• ***Demographics:*** 850 inhabitants with 120 households. Some local residents have migrated to Izmir, Istanbul and Ankara. • ***Safety:*** settlement is 305m from the pipeline. • ***Project Attitude:*** the respondents are generally positive. The majority of respondents would welcome a construction camp. 75% of households expect to benefit from direct employment, 8% expect to benefit from land compensation. No major concerns were raised. • ***Health:*** poor sewerage system and uncollected garbage have health implications.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing**	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 12 (Map 12C) (KPs 197.0 – 217.5): West of Kurbancayiri Settlement to East of Kusburnu Settlement, Ezurum Province

• ***Land ownership & use:*** 90% of land is privately owned by the local residents (90%), and public land (pasture) 10%. Much land is issued in name of grandfathers, not existing users. Seasonal grazing of diverse livestock and also irrigation is undertaken. • ***Settlement livelihood:*** animal breeding (cattle, horses & poultry are bred) is main activity. Also dry agriculture (barley & wheat, vegetables and herbs cultivated mainly for subsistence), bee keeping (15 households produce honey), trade, local government and education. The settlement standard of life has deteriorated due to unemployment and animal breeding becoming unprofitable. • ***Availability & skills:*** food service, heavy vehicle drivers, mechanic, tree feller, drivers, security personnel, welder are available. 75% of respondents would accept a temporary job. • ***Accessibility:*** 90km to provincial centre of Kars and 34km to the nearest district centre. The settlement is accessible except for 2-4 days in January. Roads of relatively good quality. • ***Information provision:*** 90%-100% of the population is literate. The best information provision tools are TV, newspapers and the telephone. • ***Environmental & cultural sites:*** civilian architecture and graves. Forests. • ***Infrastructure:*** piped water is supplied to households, however its supply is irregular, with frequent water cuts. Electricity and telephone infrastructure is also available. There is no sewerage system. • ***Services:*** there is a health centre, but it has no staff. Traditional methods are instead applied in health matters. There is a primary and secondary school with 12 teachers. • ***Settlement problems:*** lack of drinking water, unemployment, no sewerage system, and inadequate waste disposal.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 12 (Map 12C) (KPs 197.0 – 217.5): West of Kurbancayiri Settlement to East of Kusburnu Settlement, Ezurum Province

	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Accessibility of recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Skills & resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-

Social Impact Table 12 (Map 12C) (KPs 197.0 – 217.5): West of Kurbancayiri Settlement to East of Kusburnu Settlement, Ezurum Province

	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	users will be compensated. **See Overview of the Land Acquisition Process in Appendix C9.**
SITE IMPACT CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Horum (L) (D) (T)			
• ***Demographics:*** 430 inhabitants reside in this settlement. • ***Safety****:* the settlement is situated 500m from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the project and have no major concerns. • ***Land ownership & use:*** the primary landownership is communal (60%). No irrigation or seasonal grazing occurs. • ***Settlement livelihood:*** agriculture, bee keeping (six households produce honey for their own consumption), education, local government, construction and trade are the key sources of livelihood. • ***Accessibility:*** the settlement is x km from the district centre and is accessible all year. • ***Information provision:*** 95% of the population is literate. The best information provision tools include television and family members. • ***Environmental & cultural sites:*** there is an ancient city and a forest in the area. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Services:*** health care facilities in the settlement are poor. • ***Settlement problems:*** problems include inadequate access to water and health care.	***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 12 (Map 12C) (KPs 197.0 – 217.5): West of Kurbancayiri Settlement to East of Kusburnu Settlement, Ezurum Province

	Land Potential complications in expropriation process. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**See Overview of the Land Acquisition Process in Appendix C9.** **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**See Overview of the Land Acquisition Process in Appendix C9.** **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Environmental Impact Table 13 (Maps 13A and 13B) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Coarse-loamy Entic Dystrandepts on slopes derived from tuff. • Mesic Clayey-skeletal to Loamy-skeletal Typic Xerochrepts on non-tuff slopes. • Typic Xerorthents, Haploxeralfs, or Rhodoxeralfs on valley floors. • Typic Xerorthents or Xerofluvents near channels.	Main potential impacts: • soil erosion; • sediment yield; • reduced soil productivity. Other impacts include: • altered drainage; • polluted soils.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MAJOR IMPACT** In areas where the corridor overlies tuff, soils are difficult to reinstate due to lack of depth of topsoil, leaving a whitish tuff exposed and mixed with the original topsoil. Therefore, potential impacts are long-term as soils developed from tuff are unlikely to respond to standard reinstatement and exposed tuff and its effects on reducing soil productivity will continue throughout the duration of the Project. However, a number of additional site-specific mitigation measures will further be employed in tuff areas to manage the above impact, including: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement;

Environmental Impact Table 13 (Maps 13A and 13B) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			• post-reinstatement monitoring.
Landscape and Visual			
The intensively farmed, low sensitivity landscape of the previous section persists. Hilly lands support cereals grown on gently rounded sedimentary summits, especially west of KP 225 where it replaces the steep landscape. Small cereal fields with unmarked boundaries on an undulating plateau backed generally by fairly jagged, barren, brown mountains. Some river valleys remain as wet meadows, rich in flowers and bushes. Irrigated agriculture occurs intermittently along the main river valleys. BVS-013 will be located at KP 222.1 within plain steppe habitat. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to this site of c. 35m in length.	Formation of conspicuous whitish line across landscape where pale-coloured tuff soils or parent material exposed, although this would be attenuated by the field tapestry, which would conceal it to some extent. Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils • Re-vegetation of disturbed surfaces • Implement fertiliser trials using NPK + micro-nutrients with reinstatement species	**MODERATE TO MINOR IMPACT** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies tuff, it will retain its whitish colour and show as a white line across the landscape. However, both the existing field tapestry in this intensively farmed region and the low sensitivity landscape, which is tolerant of change, will largely attenuate this impact. In tuff areas, a number of additional site-specific measures will be employed: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement; • post-reinstatement

Environmental Impact Table 13 (Maps 13A and 13B) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			monitoring.
Ecology			
Important Ecological Factors ESA 9 is identified for one globally-threatened plant species (*Onobrychis stenostachya sp. Sosnowskyi*) between KP 223.0 and KP 223.5. The IUCN status for this species is given in Table 5.20, Section 5. One Barred Warbler (nationally-threatened) was observed at KP 226.0 and another 2 at KP 226.3 near the Alakilise River. These are likely to have been migrants. Three Whinchats (nationally-threatened) were observed during the bird survey at KP 232.2. The protection status for these species are given in Table 5.21, Section 5.	Habitat destruction of plain steppe may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 9. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during re-instatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 9.	**MODERATE IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Environmental Impact Table 13 (Maps 13A and 13B) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Shrubs and dense vegetation along the RoW will be cleared outside the both the Whinchat and Barred Warbler's breeding season. Specifically for the Barred Warbler, clearance of riverside trees, shrubs and thickets in advance of the construction of watercourse crossings to be undertaken outside the April to July period.	
Noise			
Akcatas Settlement in Horasan District, is located c. 207m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Akcatas during soil stripping activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise	**MINOR IMPACT** Since it may not be possible to utilise spoil stockpiles to screen dwellings from soil stripping activities, short term noise impacts are expected to occur.

Environmental Impact Table 13 (Maps 13A and 13B) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		mitigation measures, such as mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	
Archaeology and Cultural Heritage			
The settlements of Kirkdikme-1 and Kirkdikme-2 (3rd Degree Sites*) lie within the 100m Corridor. There are no architectural remains on the surface in these flat settlements due to prior agricultural activities. However, there are ceramics dating to different periods (Late Calcolitic, Early Bronze Age, Iron Age, Hellenistic and Middle Age). * These sites have not yet been registered by the MoC and are provisionally assigned these classifications. Kirkdikme 1 and Kirkdikme 2 are Proposed for Registration by the regional preservation council	Potential for direct impact to these sites during pipeline construction through ground disturbance. In addition, indirect impacts may arise from construction activities that will affect the visual/historical setting of these sites.	The pipeline has been re-routed to avoid both sites. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	MINOR IMPACT Impacts will be limited to the temporary disturbance of the setting of the sites and peripheral features.

Erzurum Socio-Economic Overview

Demographics:
Erzurum has a total population of 873,000 inhabitants and the fourth highest density ratio (of surveyed provinces) of 47 per km^2. Census data suggests that 47% of inhabitants live in urban areas. The average surveyed household size is high (seven members) indicating traditional and patri-local family structures and a tendency to have numerous children. The population in urban areas is relatively stable, whereas rural areas have experienced considerable out-migration. An overwhelming majority of surveyed settlements speak Turkish (99.5%) as their first language. The province is characterised as traditionally conservative, with religion of importance and communities typically more closed to 'outsiders'.

Land:
According to the State Institute for Statistics (SIS), approximately 21% of agricultural land is irrigated (compared with 45% in Adana). Private ownership and sharecropping are the two most common landownership patterns. The majority of landowners lack title deeds, resulting in local residents concern that they may not receive payments from land acquisition. There is mild inequality in land distribution.

Livelihoods:
The province has the highest income levels of the surveyed provinces and is ranked fourth in terms of combined assets and average household income. According to the SIS, it is the leading province in terms of bank deposits and credits. Erzurum (along with Kars) has more industry than other northern provinces (firms operate in five of nine sectors), but experiences no foreign trade (SIS).

Infrastructure & Services:
Almost all settlements have access to grid electricity (used primarily for lighting), although lack energy for heating. The majority experience few problems with water and sewerage and have well-developed infrastructure even when compared to the most developed pipeline province of Adana. Average literacy rates are high (88%), and 72% of local residents have attended at least primary or secondary school. Only 2% have attended university. In general, as with the more northern provinces, there are fewer children per teacher and school, indicative of out-migration levels. However, according to the SIS, female illiteracy is a significant 31% for the entire province. All settlements have mosques, primary schools and a health centre – although in certain settlements the health centre is not functioning due to a lack of health personnel.

Key Problems:
Unemployment is regarded as a main settlement problem for 43% of households surveyed. The poor quality of infrastructure and services were also raised as a problem in the province.

Project Attitude:
The attitude of Muhtars and some local residents towards the proposed pipeline was dependent on whether they had experience of the NGP Project, which they criticised for damaging irrigation channels, injuring livestock by leaving behind construction materials, and failure to reinstall facilities.

Source: Household and Settlement Survey (2001)

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

MAP 13: PROJECT INFORMATION
There are no pump stations or construction camps in the area. There is one block valve station.
MAP 13: MAP HIGHLIGHTS
• Crop land and grazing are the two main land uses. • Unclassified roads link local settlements. Highway 100 lies between the pipeline route and the main stem of the Aras River. • Several creeks and rivers bisect the pipeline route.
MAP 13: IMPACTED & SURVEYED SETTLEMENTS
• ***Impacted:*** 10 settlements on this map will be directly impacted by the pipeline project. All of these settlements will have land intersected by the proposed pipeline (Yukari Bademozu, Asagi Bademozu, Akcatas, Kalender, Kirkdikme, Haciahmet, Yesildere, Degirmenler, Mollamelik, Azap) (L). Three settlements (Yukari Bademozu, Akcatas and Kirkdikme) are within 500m of the pipeline route (D). None are within 5km of a construction camp or pump station. One is within 2km of a block valve station (B) (Akcatas). Settlements impacted by traffic have not yet been identified. Akcatas is 500m downstream of the pipeline. • ***Surveyed:*** 10 settlements were surveyed by telephone (T). • ***Not surveyed:*** Degirmenler (2.2km south of pipeline). • ***Not on map:*** Haciahmet and Yesildere.

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Yukari Bademozu (L) (D) (T)			
• ***Demographics:*** there are 305 inhabitants in the settlement, with seasonal migration of 25%. • ***Safety****:* the centre of the settlement is 800m from the pipeline and the nearest house in the settlement is 500m from the pipeline. • ***Project attitude:*** according to the Muhtar*,* inhabitants are generally positive towards the project and have no major concerns. • ***Land ownership & use:*** primary landownership is communal (60%). No grazing or irrigation takes place. • ***Settlement livelihood:*** agriculture, bee keeping (one household), tourism, local government, transport and trade are the main sources of livelihood. • ***Accessibility:*** the settlement is 15km from Horasan district centre. The settlement is accessible all year round.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

The settlement is accessible all year round. • ***Information provision:*** 100% of the population is literate. Television and newspapers are the best information provision tools. • ***Water infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Services:*** there is no health care centre. • ***Settlement problems:*** inadequate health care and poor telecommunications are the main problems facing the settlement.	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Land Potential complications in	**See Overview of the Land Acquisition Process in**	**See Overview of the Land Acquisition Process in**

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

	expropriation process. ***Accessibility of recruitment*** Decreased access to recruitment process.	**Appendix C9.** Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Appendix C9.** **No residual impact expected.**
SITE IMPACT CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Asagi Bademozu (L) **(T)**			
• ***Demographics:*** 144 inhabitants reside in the settlement, with seasonal migration of 75%. • ***Safety****:* the settlement is situated 1.8km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the pipeline and have no major concerns. • ***Land ownership & use:*** 90% of the land is privately owned by the inhabitants. No grazing or irrigation takes place. • ***Settlement livelihood:*** agriculture, fishing, trade and local government are the main sources of livelihood • ***Accessibility:*** it is 12km to Horasan district centre. The settlement is accessible all year. • ***Information provision:*** 98% of the population is literate. Television and the telephone are the best information provision tools. • ***Environmental & cultural sites:*** a mausoleum and nursery are located in the settlement. • ***Infrastructure:*** piped water is supplied to households, however, there is still inadequate access to drinking water. There is no alternative water source. • ***Settlement problems:*** the main problem facing the settlement is inadequate access to water.	***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats if within 2 km downstream of a river crossing. ***Accessibility of recruitment*** Decreased access to recruitment process.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full. **No residual impact expected.**

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

SITE IMPACT CHARACTERISTICS	ADDITIONAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Akcatas (L) (D) (B) (R) (T)			
• ***Demographics:*** 284 inhabitants reside in the settlement with seasonal migration of 2%. • ***Safety:*** the settlement centre is 500m from the pipeline, the nearest house in the settlement is 200m from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the project and have no major concerns. • ***Land ownership & use:*** primary landownership is communal (50%). Grazing and irrigation activities occur. • ***Settlement livelihood:*** animal husbandry, agriculture, construction, transport, education and local government are the main sources of livelihood. • ***Accessibility:*** the settlement is 11km from Horasan district centre. The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. Television and the telephone are the best information provision tools. • ***Environmental & cultural sites:*** there is a mausoleum in the area. • ***Infrastructure:*** piped water is supplied to households, however it is irregular with frequent water cuts. There is also a local spring. • ***Settlement problems:*** inadequate access to water and disharmony amongst residents are two problems facing this settlement.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land**

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	**Acquisition Process in Appendix C9.**
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Access to Information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Block Valve Station See Environmental Impact Tables and the Overview of		

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

	the Land Acquisition Process in Appendix C9		
SITE IMPACT CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Kalender (L) **(T)**			
• ***Demographics:*** there are 258 inhabitants with seasonal migration of 5%. • ***Safety****:* the settlement centre is situated 1.6km from the pipeline. The nearest house in the settlement is 1.5km from the pipeline. • ***Project attitude:*** attitudes towards the project are generally positive and inhabitants have no major concerns. • ***Land ownership & use:*** the primary landownership is communal (40%). No irrigation channels are used and there is no seasonal grazing. • ***Settlement livelihood:*** agriculture, bee keeping (six households produce honey for their own consumption), local government, construction and transport are the main sources of livelihood. • ***Accessibility:*** the settlement is 13km from Horasan district centre. The settlement is accessible throughout the year. • ***Information provision:*** 90% of the population is literate. The best information provision tools include television and the telephone. • ***Infrastructure:*** piped water is supplied to households, there is no alternative water source.	***Land*** Potential complications in expropriation process. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**See Overview of the Land Acquisition Process in Appendix C9.** **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**See Overview of the Land Acquisition Process in Appendix C9.** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE IMPACT CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Kirkdikme (L) (D) **(T)**			
• ***Demographics:*** 177 inhabitants reside in this settlement. • ***Safety****:* the settlement centre is situated 600m from the pipeline, the nearest house in the settlement is 500m from the pipeline. • ***Project attitude:*** inhabitants are generally positive towards the project and have no major concerns. • ***Land ownership & use:*** 72% of land is privately owned by the	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

inhabitants. Seasonal irrigation is undertaken but there is no grazing. • ***Settlement livelihood:*** agriculture, construction, transport, trade, education and local government are the key sources of livelihood. • ***Accessibility:*** the settlement is 15km from Horasan district centre. The settlement is accessible all year. • ***Information provision:*** 95% of the population is literate. Television and radio are the best local information provision tools. • ***Infrastructure:*** piped water is supplied to households, however the supply is irregular. An artesian well is an alternative water source. • ***Services:*** there is no health care centre to serve the settlement. • ***Settlement problems:*** inadequate access to water and inadequate health care are among the problems in the settlement.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	safety awareness raising. **Any additional damage will be compensated for.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE IMPACT CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Haciahmet (L) **(T)**			
• ***Demographics:*** there are 435 inhabitants in the settlement. • ***Safety****:* the settlement centre is situated 2.6km from the pipeline, the nearest house in the settlement is 2.4km • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the project and have no major concerns. • ***Land ownership & use:*** 60% of land is privately owned by inhabitants. Seasonal irrigation and grazing are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (two households), trade, local government and construction are the main sources of livelihood. • ***Accessibility:*** the settlement is 14km from the district centre. The settlement is accessible all year. • ***Information provision:*** 95% of the population is literate. The best information provision tools include television and the telephone. • ***Environmental & cultural sites:*** there is a mausoleum in the area. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems***: the main problem in the settlement is unemployment.	***Land*** Potential complications in expropriation process. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar	**See Overview of the Land Acquisition Process in Appendix C9.** **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary.	**See Overview of the Land Acquisition Process in Appendix C9.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

	production. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Community liaison meetings:** issue to be discussed at meetings before and during construction. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **High likelihood of a few accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
SITE IMPACT CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Mollamelik (L) (T)			
• ***Demographics:*** 31 inhabitants reside in the settlement, 40% of whom seasonally migrate. • ***Safety****:* the settlement centre is situated 2.9km from pipeline, the nearest house in the settlement is 2.7km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the project and have no major concerns. • ***Land ownership & use:*** the primary landownership is communal (50%). There is no irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (two households produce honey as one of a number of income sources), hunting	***Land*** Potential complications in expropriation process. ***Hunting*** Temporary reduction in game due to disturbance during construction.	**See Overview of the Land Acquisition Process in Appendix C9.** Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of	**See Overview of the Land Acquisition Process in Appendix C9.** Significance cannot be established at this time.

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

produce honey as one of a number of income sources), hunting, education, local government and construction are the main sources of livelihood • ***Availability & skills:*** inhabitants have previous pipeline experience from the Iran-Ankara natural gas project. • ***Accessibility:*** the settlement is 13km from the district centre. The settlement is accessible all year round. • ***Information provision:*** 70% of the population is literate. The best information provision tools include television and the newspapers. • ***Infrastructure:*** piped water is available but the supply is unreliable. There is also a settlement fountain. • ***Settlement problems:*** inadequate health care is the main problem in the settlement.		subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Accessibility of information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility of recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into**	**No residual impact expected.**

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1): East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**account** in the recruitment strategy. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE IMPACT CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Azap/Azab (L) (R) (T)			
• ***Demographics:*** 333 inhabitants reside in the settlement. • ***Safety****:* the settlement centre is situated 3.2km from the pipeline. The nearest house in the settlement is 3km from the pipeline. • ***Project attitude:*** attitudes towards the project are mixed, the inhabitants are concerned about land costs. • ***Land ownership & use:*** 60% of land is privately owned by the inhabitants. There is no irrigation and no seasonal grazing. • ***Settlement livelihood:*** agriculture, transport, construction and local government are the main sources of livelihood. • ***Accessibility:*** the settlement is 7km to the district centre. The settlement is accessible all year. • ***Information provision:*** 95% of the population is literate. Television, newspapers, radio and the telephone are the best information provision tools. • ***Infrastructure:*** piped water is supplied to households however supply is irregular. There are nearby settlements that provide an	No additional impacts identified.		

Social Impact Table 13 (Map 13C) (KPs 217.5 – 238.1):
East of Yukari Bademozu Settlement to Kirkdikme Settlement, Erzurum Province

alternative water source. • ***Settlement problems:*** there is inadequate access to water and unemployment.			

Environmental Impact Table 14 (Maps 14A and 14B) (KPs 238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Up to KP 240, (a total length of 2km of the route), soils comprise: • Mesic Clayey-skeletal to Loamy-skeletal Typic Xerochrepts on undulating soils derived from alluvium; • Coarse-loamy Entic Dystrandepts on soils developed from tuff; • Typic Xerorthents or Xerofluvents near channels.	The main potential impact will be reduced soil productivity. Other impacts will include: • soil erosion; • sediment yield; • altered drainage; • polluted soils.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MAJOR IMPACT** In areas where the corridor overlies tuff, soils are difficult to reinstate due to lack of depth of topsoil, leaving a whitish tuff exposed and mixed with the original topsoil. Therefore, potential impacts are long-term as soils developed from tuff are unlikely to respond to standard reinstatement and exposed tuff and its effects on reducing soil productivity will continue throughout the duration of the Project. However this impact will only be experienced for the first 2km of the construction corridor in this route section. In tuff areas, a number of additional site-specific measures will be employed: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance

Environmental Impact Table 14 (Maps 14A and 14B) (KPs 238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			throughout topsoil removal, storage and reinstatement ; • post-reinstatement monitoring.
Between KP 240 to the end of the section soils comprise: • Mesic Coarse-loamy to Coarse-silty Xerochrepts, which become skeletal near hillock crests; • Mesic Typic Xerorthents or Xerofluvents near channels.	Main potential impacts: • sediment yield; • reduced soil productivity. Other impacts will include: • soil erosion; • contaminated soils.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
Up to KP 240, moderately well-drained undulating landscape punctuated by tributaries of the Aras River whose floodplain is occasionally visible from the pipeline route some 2 - 3km away. Numerous settlements every 3 – 6km derive their livelihoods from cereal production in small- to medium-sized fields with boundaries unmarked by fences, walls, or hedges, but dotted with occasional trees. Grazing also occurs. Meandering channels become anastomose on lower plains. South of KP 240, the rolling terrain is interrupted by east-flowing tributaries of the Aras River. Rainfed cereals combine with irrigated crops. Settlements every 3 – 5km have rail and road links to Erzurum. The pipeline route lies c. 1.5km north of Highway 100. Tributaries of the Aras become sinuous as they enter the plains. A reservoir is situated 250m north of the pipeline route at KP 251. The pipeline route lies on the plateau above Highway 100 and the adjacent railway for most of its length, the route will	Disturbance of soils overlying tuff will result in exposed whitish strip, although visibility will depend on precise location and character of landscape. Impact will be less pronounced in more intensively farmed and vegetated areas. Short-term visual impacts as a result of the presence temporary of Construction Camp A during the construction period.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Implement fertiliser trials using NPK + micro-nutrients with reinstatement species	**MODERATE TO MINOR IMPACTS** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies tuff, it will retain its whitish colour and show as a white line across the landscape. However, this impact will be less pronounced in this area of high agricultural activity. In tuff areas, a number of additional site-specific

Environmental Impact Table 14 (Maps 14A and 14B) (KPs 238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
therefore, be largely invisible from these. Construction Camp A will be tentatively located at KP 255.5, although the precise location for this camp is still being finalised. The camp will occupy an area of c. 15.4ha.			measures will be employed: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement; • post-reinstatement monitoring.
Surface and Ground Water			
Groundwater The end of the route on this map passes over the Pasinler Plain (containing both unconfined and confined aquifers). Water samples taken from a well located over the unconfined aquifer c. 500m north of KP 258 indicate that groundwater quality is Class II.	Potential for moderate and localised impacts to groundwater quality from construction activities.	Apply standard mitigation measures in Section 6.5 and the PPP (Appendix C4) to avoid reducing groundwater quality and conflicting with other users, including: • No groundwater abstraction within 50m of springs or wells. Groundwater will not be abstracted for use as hydrotest water. • No facilities (construction camps, pipe yards, fuel stores etc) will be located within 50m of springs or wells.	**MINOR IMPACT** With the application of the specified mitigation measures described, only minor impacts are expected to occur, which will be short-term in nature.
Ecology			
Important Ecological Factors ESA 10 occurs between KP 239.2 and KP 255.1 and is identified for nine	Habitat destruction of plain	Threatened plant species will be	**MODERATE IMPACT** Short-term disturbance to

Environmental Impact Table 14 (Maps 14A and 14B) (KPs 238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
globally-threatened plant species (*Onosma arcuatum, Campanula ledebouriana, Centaurea hedgei, Isatis candolleana, Iris taochia, Thymus canoviridis, Onobrychis huetiana, Reseda armena, Ferula huber-morathii*). Although the area defined for this ESA is large, (c. 16km), the same species occur at intervals throughout, hence it has been identified as a single entity. The IUCN status for these species are given in Table 5.20, Section 5. A globally-threatened mammal species, Schreiber's Long-Fingered bat, was recorded at KP 255.9. The protection status for this species is given in Table 5.21, Section 5. Construction Camp A will be located adjacent to the sighting of this globally-threatened mammal species. Three Pale Rock Sparrows (nationally-threatened) were recorded near KP 244.6. One Red-necked Grebe (nationally-threatened) was observed on 23Temmuz Reservoir. The protection status for these species are given in Table 5.21, Section 5. BVS-014 will be located at KP 252.1 within an area of cultivated land in ESA 10. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to this site of c. 30m in length.	steppe and habitats peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Minor temporary disturbance to globally-threatened mammal during seasonal sensitivity (see EMMP, Appendix C1). Seasonal sensitivities for the Schreiber's Long-Fingered bat in Turkey are October – November (birth of young) and from September/October to spring (hibernation in cold climates or curtailing of activity during cold weather in hollow trees, ruins or caves). This species also migrates up to 200km between summer and winter retreats. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	identified and located during pre-construction surveys, particularly within ESA 10. Since *Campanula ledebouriana, Isatis candolleana* and *Iris taochia* occur within ESA 10 at various points over a large area, diligence will be exercised in searching for them throughout the ESA. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during re-instatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 10.	internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACT** at most to bats during the construction period where the specified mitigation measures are applied for the seasonal sensitivities identified. **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACT** Based on the mitigation measures described, the small area of habitat affected

Environmental Impact Table 14 (Maps 14A and 14B) (KPs 238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	Permanent loss of 350m^2 of habitat within ESA 10 during construction of BVS-014.	sparingly or not at all in ESA 10, despite much of this site being cultivated land. Preconstruction surveys for the Schreiber's Long-Fingered bat during the summer months will aim to establish the presence and abundance of this species and seek to identify summer colonies and potential winter hibernation roosts. Hollow trees within the RoW of the pipeline route will be removed during the late summer months to prevent their use as winter roosting sites and to allow construction to continue during the autumn, winter and early spring periods. Caves, ruins or underground cavities, that have been identified as hibernation roosts (particularly those close to camps and works sites), will be secured and placed out of bounds to avoid their disturbance by workers. Construction activities, including the establishment of the intended Construction Camp A, will be avoided between September and November and take place during the summer once the RoW has been cleared of potential winter roosting sites.	and the temporary nature of construction activities, it is predicted that only minor impacts on the biological environment will occur as a result of construction activities at BVS-014. This assessment will be confirmed by the site-specific survey prior to construction.

Environmental Impact Table 14 (Maps 14A and 14B) (KPs 238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Shrubs and dense vegetation along the RoW will be cleared outside the breeding season for the Pale Rock Sparrow. Dense vegetation alongside Temmuz Reservoir to be cleared outside the breeding season for the Red-necked Grebe. Prior to construction of BVS-014, a site specific survey will be undertaken by an ecological specialist to identify and locate threatened species at the site and at any surrounding areas potentially affected by construction activities. Based on the findings of this survey, appropriate mitigation will be determined. The area of sensitive habitat in ESA 10 affected by construction activities will be minimised to the minimum necessary for safe working.	
Archaeology and Cultural Heritage			
Three archaeological sites will be potentially impacted during pipeline construction: • Cakmak Ridge (2nd Degree Site*) – flat settlement located south-east of the route. No architectural remains are visible due to agricultural activities. The site dates back to the Late Calcolitic, Early Bronze Age, Iron Age, Hellenistic and Medieval Age. • Istiklal Hill 1 (2nd Degree Site*) – flat settlement located south-east of the Pipeline. No architectural remains are visible due to agricultural activities. The site dates back to Late Calcolitic, Early Bronze Age, Iron Age, Hellenistic, and Medieval Age.	Potential for direct impact to these sites during pipeline construction through ground disturbance. In addition, indirect impacts may arise from construction activities that will affect the visual/historical setting of these sites.	The pipeline has been re-routed to avoid these sites. In addition, Cakmak Ridge will be fenced throughout the construction period. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to the temporary disturbance of the setting of the sites and peripheral features.

Environmental Impact Table 14 (Maps 14A and 14B) (KPs 238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Hellenistic, and Medieval Age. • Celmiktas Hill (2nd Degree Site*) is also located within the 100m Corridor. No architectural remains have been found here, due to prior agricultural activities. * These sites have not yet been registered by the MoC and are provisionally assigned these classifications. Celmiktas Hill, Cakmak Ridge and Istiklal Hill 1 have been Proposed for Registration by the regional council of preservation			
The following have been proposed for registration by the regional preservation council: (i) Yapagili Mound; (ii) Istiklal Hill 2			

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

MAP 14: PROJECT INFORMATION

A primary construction camp is located to the south-west of this map (Ref Map 15). No pump stations in the area. There is one block valve station.
The campsite has been moved, adjacent to its original site location. It requires 15.14ha of temporary land. It will occupy mostly state land, except one parcel. The original site was highly cultivated agricultural area, with many private parcels.

MAP 14: MAP HIGHLIGHTS

- Unclassified roads link local settlements. National Highway crosses then runs north-east, parallel to the pipeline.
- Primary land uses are animal husbandry and agriculture.
- Agricultural production generally comprises wheat, barley and cereals.
- Land is generally unproductive. There is limited irrigation.

MAP 14: IMPACTED & SURVEYED SETTLEMENTS

- Nine settlements will be directly impacted by the pipeline. Six settlements will have land intersected by the pipeline (L) (Masra, Kizilca, Asagi Cakmak, Yapagili, Yukari Sogutlu and Cakirtas Settlement). Three settlements (Koprukoy, Egirmez Settlement, Cakirtas Settlement) are within 5km of a construction camp (C), and one settlement is within 2km of a block valve station (B) (Koprukoy). Three settlements (Asagi Cakmak, Yapagili, Sogutlu) are within 500m of the pipeline route (D). Settlements impacted by traffic have not yet been identified.

- ***Surveyed:*** two settlements (Merkez and Asagi Cakmak) were surveyed in the field (S), five settlements were surveyed by telephone (T).
- ***Not surveyed:*** Masra (1.95km from the pipeline), Kizilca (1.7km from the pipeline).
- ***Not on map:*** Merkez and Pasinler Merkez 2.
- ***Disclosure Meeting Location:*** Cakirtas

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Kizilca (L) **(T)**			
• ***Demographics:*** there are 171 inhabitants in the settlement. • ***Safety****:* the settlement is situated 1.5km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the project and have no major concerns. • ***Land ownership & use:*** 59% of land is privately owned by the local residents. Irrigation is undertaken. • ***Settlement livelihood:*** agriculture, transport, construction, and local government are important sources of livelihood	***Irrigation*** Potential loss of flow from planned or accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

• ***Accessibility:*** 20km to Horasan district centre. The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. TV and the telephone are the best information provision tools. • ***Environmental & cultural sites:*** a mausoleum. • ***Water infrastructure:*** piped water is supplied to households, however its supply is irregular. Nearby settlements provide an alternative water source. • ***Settlement problems:*** inadequate access to water and the need for a pond /lake.			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Asagi Cakmakli (L) (D) (S)			
• ***Population:*** 320 inhabitants with 20 households. There is serious migration flow to the metropolitan areas of Istanbul, Bursa and Adapazari. There is also considerable seasonal employment in the construction field in neighbouring towns and metropolitan areas during non-harvest seasons. Only 20 houses are occupied, with 15-20 houses vacant. • ***Safety****:* the centre of the settlement is 1km from the pipeline and the nearest house in the settlement is 800m from pipeline. • ***Health:*** snake attacks in the hills forced the settlement to relocate to the plain. Also an earthquake area. • ***Disputes:*** conflict over natural resources as some families not on good terms with Muhtar as his animals entered their land without permission. • ***Project attitude:*** generally positive. 45% of those interviewed see employment opportunities and 18% see land compensation as benefits of the pipeline. 73% believe there are no constraints, 9% believe there will be noise and dust impacts and 9% are concerned about increased traffic. • ***Land ownership & use:*** 90% of land is privately owned by local residents. The remaining 10% is communal land. Large-scale	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazard: animals*** Trench poses safety hazard for livestock.	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

farming is dominant, although land is generally unproductive and there are no irrigation facilities. Wet agricultural activities not carried out as there is not sufficient water supply in the settlement. • ***Settlement livelihood:*** main economic activities are agriculture (wheat & barley) and animal husbandry. In addition there is construction, transport, education. There is considerable seasonal migration to neighbouring towns and metropolitan areas outside of harvesting season. • ***Availability & skills:*** heavy vehicle driver, drivers and security personnel are available. 82% of those interviewed would accept a temporary job on the pipeline construction. • ***Accessibility:*** 65km to Erzurum provincial centre and 7km to district centre. Accessibility is poor in February and March. • ***Information provision:*** 75% of the population is literate. • ***Environmental & cultural sites:*** ancient settlement area and the remnants of an old cemetery are near the settlement. The settlement was founded by migrants from Ardahan almost 100 years ago. • ***Infrastructure:*** there is no piped water. No water is supplied to houses. Instead a community fountain provides insufficient water. There is a sewerage system and electricity. No waste disposal system • ***Services:*** there is also an elementary school with one teacher and 18 students. After 5th grade, students attend another school in a nearby settlement. Local residents attach much importance to education. There are no health facilities in the settlement. Local residents travel to Erzurum and Koprukoy for health services. • ***Settlement problems:*** lack of water, non-irrigated lands and low agricultural productivity.	***Drinking water*** Potential for disruption or contamination of drinking water during construction ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Accessibility of recruitment*** Decreased access to recruitment process. ***Health*** Potential health impacts on construction workers	**Stock proof fencing** will be erected in areas of danger for livestock. The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the project. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Information is highlighted to contractor** so that they can ensure that their workers are protected.	be given. The level of compensation will be facilitated by the Projects complaints procedure. **No residual impact.** **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected.** **No residual impact.**

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Yapagili (L) (D) (T)			
• ***Demographics:*** 460 inhabitants, there is no seasonal migration. • ***Safety****:* settlement centre is situated 700m from pipeline, the nearest house in the settlement from the pipeline is 500m. • ***Project attitude:*** according to the Muhtar*,* inhabitants are generally positive with no major concerns. • ***Land ownership:*** 70% of land is privately owned by local residents. Irrigation occurs. • ***Settlement livelihood:*** agriculture, construction, trade, local and government are the most important sources of livelihood. • ***Accessibility:*** 10km from Koprukoy district centre. The settlement is accessible all year. • ***Information provision:*** 98% of the population is literate. TV is the best information provision tool. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** inadequate access to water, poor roads and the need for a bridge.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Yukari Sogutlu (L) (D) (T)			
• ***Demographics:*** 152 inhabitants, there is no seasonal migration. • ***Safety****:* settlement centre is situated 700m from pipeline, the nearest house in the settlement from the pipeline is 500m. • ***Project attitude:*** according to the Muhtar*,* local residents are generally positive with no major concerns. • ***Land ownership & use:*** primary landownership is communal (70%). Seasonal irrigation is undertaken. No grazing occurs. • ***Settlement livelihood:*** agriculture, education, local and government are the main sources of livelihood. • ***Accessibility:*** 6km from Koprukoy district centre. The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. TV is the best information provision tool. • ***Infrastructure:*** piped water is supplied to households. A settlement fountain is an alternative water source. • ***Settlement problems:*** inadequate access to water and the requirement for more teachers.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Land*** Potential complications in expropriation process.	***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **See Overview of the Land Acquisition Process in Appendix C9.**	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **See Overview of the Land Acquisition Process in Appendix C9.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Merkez 1 (L) (district centre) (S/T)			
• ***Demographics:*** 13,650 inhabitants with 6,000 households, the population has increased.	***Irrigation*** Potential loss of flow from	Contractor will **consult** with	**If irrigation water is**

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

• ***Safety**:* settlement is situated 1km from pipeline. • ***Project attitude:*** according to the Muhtar, respondents are generally positive with no major concerns. • ***Land ownership & use:*** 70% of land is privately owned by local residents and 20% is sharecropped. Seasonal irrigation is undertaken. • ***Settlement livelihood:*** agriculture (grain, herbs, sugar beet), bee keeping, hunting and tourism are important sources of livelihood. • ***Availability & skills:*** previous pipeline construction experience. Engineer, food service, heavy vehicle drivers, mechanics, tree fellers, drivers, welder are available. • ***Accessibility:*** accessible all year. • ***Information provision:*** 85% of the population is literate. • ***Environmental & cultural sites:*** Hasankale (Pasinler) Castle, 4 Ottoman mosques, SOS Hoyugu (BC 2000). • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. There is electricity and a sewerage system • ***Services:*** there is also a primary school, a health care centre, a market, and a State hospital. • ***Settlement problems:*** unemployment, economic crisis, insufficient financial resources and interest rates.	planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance during construction. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Access to information*** Sectors of the population may not have access to	authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. **Communication with settlement** must take into account settlement	**disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. Significance cannot be established at this time**.** **Potential positive benefits** to local settlements. **Any change can highlight and exacerbate existing divisions** in communities.

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

	project related information on employment opportunities, potential disruption to utilities, etc.	characteristics to ensure equal access to information for all residents.	Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Pasinler Merkez (2)			
• ***Population**:* 1,350 inhabitants. The population has increased. • ***Safety**:* the centre if the settlement is situated 2.6km from pipeline, the nearest house in the settlement to the pipeline is 1.6km • ***Project attitude:*** generally positive with no major concerns. • ***Land ownership & use:*** 64% of land is privately owned by local residents, and 20% is sharecropped. Seasonal grazing occurs and irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture (grain, vegetables, herbs, sugar beet), bee keeping, fishing and tourism are important sources of livelihood. • ***Availability & skills:*** previous pipeline construction experience. Cold iron, heavy machinery operator, food service, heavy vehicle drivers, mechanic, tree feller, drivers, welder are available. • ***Accessibility:*** The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. A community fountain provides alternative water. • ***Services:*** waste is collected by truck and taken to settlement dump. The settlement also has a midwife health centre, doctor and undertakes traditional health methods. • ***Settlement problems:*** low incomes, low financial sources for the local government.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats if within 2 km downstream of a river crossing.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. **Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

		compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	
	Skills & resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements.
	Access to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Koprukoy (C) (B) (S)			
• ***Demographics:*** 3,850 inhabitants. • ***Safety****:* centre of the settlement is situated 510m from pipeline and within 2 km of Construction Camp A. • ***Project attitude:*** generally positive, however local residents would prefer to have the camp located at the site of the old natural gas pipeline camp area. • ***Local opinion of construction camps:*** welcoming, as the project is expected to bring welfare and economic growth to the district.	***Lot A Construction Camp*** Primary receptor of impacts resulting from construction workers.	Consider moving construction camp to the site of the campsite of the NGP. Otherwise move it more than 2km from settlement or identify why this is not possible.	**Low likelihood of significant impacts.** Residual impacts will depend on distance of campsite from the settlement. There is potential for Impacts arising from breaches of rules and

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

expected to bring welfare and economic growth to the district. • ***Perceived benefits of construction camp:*** opportunity to sell dairy products and goods & services in general to the camp, and opportunity to open currently closed shops. • ***Perceived problems of construction camp:*** none • ***Land ownership & use:*** 60% of land is privately owned by the local residents. Seasonal irrigation is undertaken. • ***Settlement livelihood:*** agriculture (wheat, barley, corn, sugar beet), construction, transport, trade, education and local government are the main sources of livelihood. • ***Availability & Skills:*** skilled & unskilled workers in the settlement. During the Iran-Ankara pipeline construction 50 local residents were employed as welders and unskilled workers. In addition, the settlement has three trucks and two buses. Previous pipeline experience with the Iran-Ankara natural gas project. • ***Accessibility:*** Located close to main highway and train station so good all year accessibility. • ***Information provision:*** 90% of the population is literate. TV and newspapers are the best local information provision tools. • ***Environmental & cultural sites:*** a bridge (AD1297), and particularly healthy water that the local residents would like to preserve. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. Overall, infrastructure is good, there is a full electricity system, extensive water resources, and a sewerage system. • ***Services:*** there is a high school and a primary school. • ***Other settlement services (of potential use to construction workers):*** two small markets and two coffee houses, however trade facilities are minimal and no bank. • ***Settlement problems:*** unemployment, the lack of support for farmers and the need for a bank.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Land*** Potential complications in expropriation process. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Monthly community liaison** meetings will be held. **Preferential employment** opportunities. **Project to liase** with local health authorities BTC Company to look at opportunities to cooperate in providing **health awareness training.** Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **See Overview of the Land Acquisition Process in Appendix C9.** **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in	procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of community investment activities. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **See Overview of the Land Acquisition Process in Appendix C9.** **Potential positive benefits** to local settlements.

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

	Access to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Block Valve Station*** See Environmental Impact Tables and the Overview of the Land Acquisition Process in Appendix C9.	sourcing of goods and supplies within Project constraints. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Egirmez Settlement (C)			
• ***Demographics:*** approximately 800 inhabitants. • ***Safety:*** the centre of the settlement is located 2.6km from the pipeline. The construction camp is 2-3km from the nearest house and 2-3km to the nearest land plot. • ***Local opinion of construction camp:*** local residents would generally welcome a construction camp. • ***Perceived benefits of construction camp:*** potential for employment on construction of pipeline, increase in settlement incomes, provision of transportation services, and potential to have local roads upgraded. • ***Perceived problems of construction camp:*** none • ***Disputes:*** no conflict amongst local residents, however, there is conflict with Yastiktepe settlement about access to water for irrigation. • ***Environmental & cultural sites:*** cemetery for people killed by Armenians 2km from settlement.	***Lot A Construction Camp*** Primary receptors of impacts resulting from construction workers.	**Monthly community liaison** meetings to be held. **Preferential employment** opportunities. **Project to liase** with local health authorities BTC Company to look at opportunities to cooperate in providing **health awareness training.**	**Low likelihood of significant impacts.** Potential for impacts arising from breaches of rules and procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local).

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

• ***Land ownership & use:*** legal titles held. No sharecropping nor treasure land. Some settlements have pasture land. Grazing occurs predominantly on settlement pasture land, and to a lesser extent on private land from May to October. There is however irrigation, as the settlement has no water supply for land due to their conflict with Yastiktepe settlement. • ***Settlement livelihood:*** agriculture: grain (consumed & sold), sugar beat (sold), leguminous (predominantly sold), vegetables (consumed); animal husbandry; seasonal construction; and transportation (temporary) are the main sources of livelihood. • ***Employment:*** short term (<1yr) unemployment of 80%, employment in agriculture 60%, women do not work outside the home. • ***Availability & skills:*** six men worked on previous pipeline job as: drivers, heavy vehicle drivers, security personnel, repair services, welder, pipe lifting & measurement, and food services. (one as team leader). During the construction of the natural gas pipeline, the settlement bridge collapsed and pasture land was destroyed, however local residents still welcome new pipeline. • ***Information provision:*** 98% of population literate. 15 women are illiterate, but attending classes. Best information provision tools include TV, radio, newspaper, the Muhtar and imam, and via the school. • ***Accessibility:*** 5km to district centre. Roads of poor quality, although they are accessible year round excepting one day in December, January and February due to heavy snow. • ***Infrastructure:*** main source of water is piped water to households. • ***Services:*** regular electricity supply, sewerage system serves each household (new), waste disposal system in place, most households have telephone and are within mobile range. There is also a 5-year primary school. • ***Other settlement services (of potential use to construction workers):*** coffee house, small market, transportation, soccer field (poor condition); no ATM, restaurant or any other shop.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Conservative settlement*** Construction workers are more likely to offend inhabitants.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) to be carefully monitored.	Further positive benefits dependent on scale of social investment activities. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Potential positive benefits** to local settlements. **Low likelihood of significant impacts.** Impacts arising from breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures.

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Cakirtas (C) (L) (T)			
• ***Demographics:*** 410 inhabitants, there is no seasonal migration. • ***Safety****:* settlement is situated 750m from the pipeline, the nearest house in the settlement from the pipeline is 300m. The construction camp is 2km from the nearest house, and on fertile land owned by Cakirtas local residents. • ***Local opinion of the pipeline:*** generally positive, but local residents are concerned about dust and its impact on agricultural products. • ***Pipeline area land ownership:*** 95% of land is owned by local residents. Most possess legal titles. 30% also engage in agriculture as sharecroppers. Seasonal grazing occurs from May to September. Seasonal irrigation is undertaken by approximately 80% of local residents. • ***Local opinion of construction camps:*** generally welcoming. • ***Perceived benefits of construction camp:*** possible employment opportunities at construction camp and in pipeline construction; increase in settlement income; potential to sell items such as bread, milk, cheese, grain etc. to camp; and potential provision of transportation services to workers. Also hope to benefit from upgrading of local roads. • ***Perceived problems of construction camp:*** potential to destroy social harmony and existing male-female relations, negative impacts on land, pressure on local infrastructure. • ***Settlement livelihood:*** agriculture: grain – wheat & barley (sold & consumed), vegetables (consumed), leguminous (sold & consumed), sugar beat (sold) animal feed (used); livestock: poultry (consumed), bovine; fishing (four households as their main source of income); seasonal construction; transport; and trade. 40% of the settlement population is unemployed. • ***Availability & skills:*** welder with previous pipeline experience. • ***Accessibility:*** 11km to district centre. Poor roads, however the settlement is accessible all year.	***Lot A Construction Camp*** Primary receptors of impacts resulting from construction workers. ***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Monthly community liaison** meetings will be held. **Preferential employment** opportunities. **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.** **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

• ***Information provision:*** 98% of the population is literate, including women. TV is the best information provision tool. • ***Environmental & cultural sites:*** cemetery for people killed by Armenians is approximately 2km from settlement. • ***Infrastructure:*** piped water is supplied to households year round. There is no alternative water source. Regular electricity supply, sewerage system services each household, waste disposal system in place, most households have a telephone and are within mobile coverage. • ***Utilities/ services:*** there is a 5-year primary school. Students travel to Pasinler district centre for a further three years of education. There is no health care centre. • ***Other settlement services (of potential use to construction workers):*** small market, car transportation, soccer field (in poor condition); no coffee house, ATM, restaurant or shop. • ***Settlement problems:*** poor roads, unemployment, insufficient water supply, and insufficient health care.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Sensitive crops*** Dust may affect yields of crops essential for subsistence or commercial livelihoods. ***Fisheries*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where	**Any additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

		necessary. The level of compensation will be facilitated by the Projects complaints procedure.	
	Skills & resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements.
	Conservative settlement Construction workers are more likely to offend inhabitants	**Construction workers to be remind**ed of the importance of appropriate behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) to be carefully monitored.	**Low likelihood of significant impacts.** Impacts arising from breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Access to information	**Communication with settlement** must take into	**Any change can highlight and exacerbate existing**

Social Impact Table 14 (Map 14C) (KPs –238.1 – 259.2): Kurut Creek to West of Cakirtas Settlement, Erzurum Province

	Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	account settlement characteristics to ensure equal access to information for all residents.	**divisions** in communities. Mitigation measures will keep this to a minimum.

Environmental Impact Table 15 (Maps 15A and 15B) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Mesic Coarse-loamy to Coarse-silty Xerochrepts or Xerorthents over alluvium. PT2 will be located at KP 278.3 and the site has only recently been selected as the preferred location for this pump station. Baseline soil quality information is therefore absent at this stage.	Soil related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Other potential impacts include: • reduced soil productivity; • potential for existing soil contamination at the PT2 site. Soils at the PT2 site may be susceptible to waterlogging and particular attention will be given to drainage control at off-site construction areas.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and NGP corridors are reinstated. **MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed. **MINOR IMPACT** Water is predicted to remain in surface depressions for less than 3 months after construction is completed at the PT2 site.

Environmental Impact Table 15 (Maps 15A and 15B) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Permanent erosion control devices. • Bio-restoration. Install moveable mats beneath heavy equipment. Particular attention will be given to minimising off-site impacts to agricultural land and the full reinstatement of the temporary construction camp. An additional survey to record existing baseline soil conditions will be undertaken at the PT2 site to identify any areas of existing soil contamination.	
Landscape and Visual			
The route crosses the Hasankale River to its southern side and follows it westward through the Pasinler Plain. It follows this broad, flat, river plain, framed by distant angular eroded mountains for the whole of this section. The land is farmed intensively through irrigation for vegetables, root crops, and cereals. Distant settlements and towns occur only along the edge of the plain. Groups of mature trees and a number of massive electricity pylons are prominent in this vast low sensitivity landscape. Much of the RoW of the NGP has been incorporated into agricultural fields and has limited visual impact. PT2 will be located in an area of flat land c.4.5km north-west of the settlement of Alvar and will require a permanent landtake of c. 16.9ha. The temporary construction camp will occupy c. 12.5ha during construction of PT2. Landscape value in this area is low due to the generally flat, agricultural nature of the surrounding area, combined with the presence of an industrial area to the south of the site. Groups of mature trees and a	Generally minor and short-term construction-related visual impacts. Approximately, 16.9ha of cultivated land will be impacted by construction activities at the PT2 site. Some additional areas may also be affected during offsite construction activities, including the temporary landtake for the construction camp. The facility is predicted to be	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any	**INDIRECT POSITIVE IMPACT** in areas where the BTC and NGP corridors are reinstated. **MINOR IMPACT** Given the limited landscape and visual impact of the existing NGP, impacts from the BTC Pipeline will be minor and localised. **MINOR IMPACT** Based on the mitigation measures described, the temporary nature of

Environmental Impact Table 15 (Maps 15A and 15B) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
number of electricity transmission pylons are prominent features of the landscape. The landscape's mesic, poorly drained soils support marginal crops of rainfed cereals - grasslands dominate the site's natural vegetation, and shrubs occupy the banks of nearby streams.	visible for up to 5km from the site in most directions. This relatively large area of visual influence is due to the generally flat terrain in which the site is located. There is some screening of the facility to the north-west. Workers at the industrial area to the south of PT2 will experience temporary short-distance (c. 500m) visual impacts during construction. Whereas, long distance (c. 5km) visual impacts from construction activities will be experienced by residents on the western edge of Alvar settlement and the northern edge of Yukari Cakmak.	additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). PT2 has been located within the rural environment to minimise its impact on residential properties. Mitigation measures in Section 6.3 will be applied, including full reinstatement, using species appropriate to the surrounding habitat or landuse of all areas of non-permanent landtake, such as the temporary construction camp.	construction activities, the low landscape values in the area, and the distance to high sensitivity residential viewers, the landscape and visual impacts during construction will be minor (see Section 7.2.2 for an assessment of operational landscape and visual impacts).
Surface Waters			
The route crosses Hasankale River (KPs 260.0 – 260.5), which is a main tributary of Aras River. River channel is irregular with mid-channel bars and a parabolic cross-section. Width of crossing is 33m, with a bank-full width of 10m and a floodplain of between 33 – 165m. Bed consists of sand and gravel and the flow is perennial of a uniform and tranquil type. Bank-side vegetation comprises grass and flora and riparian vegetation is absent. River supports trout (*Salmo trutto caspius*) and mountain frogs (*Rana macrocnemis*). Water quality samples taken 450m downstream of the crossing point indicate that this is a Class IV river..	Disturbance directly through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in already poor water quality. Therefore, potential for short-term sedimentation and turbidity.	Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, to avoid sedimentation and turbidity at the crossing point, including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench.	**MINOR IMPACT** Disturbance will be limited to the immediate working area. Sedimentation of Hasankale River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.

Environmental Impact Table 15 (Maps 15A and 15B) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	Potential impacts on downstream ecology and water abstraction for human use.	flow from open trench. Assess need for alternative water supply for downstream communities and provide where necessary if sedimentation and turbidity persist for more than 3 days at the community.	
Groundwater			
The majority of the route lies over the Pasinler Plain, which has both unconfined and confined aquifers. Water samples taken over the unconfined aquifer, c. 680m west of the route (KPs 266.6 – 267.7) at Well Site No.2 and c. 20m west of the route (KPs 276.4-278.0) at Well Site No.3, indicate that groundwater quality is Class I. BVS-015 will be located at KP 265.7 on the unconfined aquifer. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 35m in length.	Groundwater quality in this area is high and suitable for drinking water supply (post disinfection) and water supply for food industries. Potential for moderate and localised impacts to groundwater quality from construction activities. Construction of the Pipeline and BVS-015 will disturb a small proportion of the recharge area for an unconfined aquifer comprising a Class I drinking water supply.	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including: • No groundwater abstraction within 50m of springs or wells. Groundwater will not be abstracted for use as hydrotest water. • Construction camps and other temporary facilities will not be located in areas of Class 1 unconfined aquifers or within 50m of springs or wells. Soakaways will not be used as a means for disposal of treated wastes in such locations. • Fuels and other oils will not be stored in areas of Class 1 unconfined aquifers. If it is necessary to store fuels etc in such locations they will be stored in bunded areas on impermeable	**MODERATE IMPACT** The presence of a Class I unconfined aquifer means that there is the potential for moderate impacts during both pipeline and BVS construction. Strict adherence to the mitigation measures contained in the EMMP (Appendix C1) and PPP (Appendix C4) will be required.

Environmental Impact Table 15 (Maps 15A and 15B) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		bases and the inventories will be kept to a practical minimum.	
At the proposed location for PT2, groundwater was found at between 6.5 and 8.2m in borehole drillings in the area. This site is located over an area of confined aquifer.	Potential for moderate and localised impacts to groundwater quality during construction of PT2.	Particular regard will be given to measures to minimise the potential for contamination of ground waters at PT2. The potential for impacts on groundwater at this site have been minimised by locating this site on an area of confined aquifer rather than within the nearby area of unconfined aquifer. Hydraulic constraints mean that it is not possible to locate this site completely outside the area of both confined and unconfined aquifers.	**MINOR IMPACT** With the application of the specified mitigation measures described, only minor impacts are expected to occur, which will be short-term in nature.
Ecology			
Important Ecological Factors ESA 11 is identified for two globally-threatened plant species (*Lathyrus layardii* and *Onobrychis araxina*), which were recorded along the pipeline route between KP 259.5 and KP 260.9. The IUCN status for these species are given in Table 5.20, Section 5. The European Marbled Polecat, a globally-threatened mammal species, was recorded at KP 262.1. Another globally-threatened mammal, The Grey Hamster, was recorded at KP 273.6. The protection status for these species are given in Table 5.21, Section 5.	Destruction of habitats peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Minor temporary disturbance to a globally-threatened mammal during seasonal sensitivity (see EMMP, Appendix C1), ie when young polecats are born from February to March.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 11. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used supervised throughout by a	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACT** at most to globally-threatened mammals during the construction period where the specified mitigation

Environmental Impact Table 15 (Maps 15A and 15B) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
At Hasankale River crossing, 2 White-winged Black Tern and 23 Oystercatcher (nationally-threatened) were recorded at KP 260.1. 2 Oystercatcher and a Barred Warbler (nationally-threatened) were recorded at KP 262.1. At Kurdi Creek crossing, 1 Long-eared Owl (nationally-threatened) was recorded. At KP 267.7, 2 Pale Rock Sparrow (nationally-threatened) were recorded. Two Whinchat (nationally- threatened), were recorded near KP 273.2. The protection status for these species are given in Table 5.21, Section 5.	Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW.	measures are applied for the seasonal sensitivities identified. **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.
Fish species breeding in Hasankale River include species on the IUCN 2000 Red List – common carp, (*Cyprinus carpio*), (Data Deficient) from April to June and Italian barbell, (*Barbus plebejus*), (Lower Risk – Near Threatened) between May and June. Both the common carp and the bulatmai barbell (*Barbus capila*), which also breeds in this river, are species with a high commercial value. The Black Sea salmon (*Salmo trutta labrax*) also breeds in Kura river between December and February, although this species is not commercially valued. Additional seasonal sensitivities for fish species of medium commercial value are given in the EMMP (see Appendix C1).	Temporary potential impacts to aquatic life (spawning fish and aquatic plants providing spawning sites for fish) during construction across Hasankale River.	Preconstruction surveys of the area within which the European Marbled Polecat has been recorded will establish whether the pipeline construction would impact upon burrows, cavities or dens that might be used for rearing young between February and May. If such sites are found, construction activities must avoid the area for those sensitive periods; in the absence of such sites, no further action would be required. Careful re-instatement of steppe and natural grasslands will also mitigate long-term secondary impacts for mammals.	**MINOR IMPACTS** at most for all fish species if construction takes place during August to November inclusive. At other times of year (varying by species), impacts will generally be **MINOR** on the basis of the rigid application of water crossing mitigation measures. Where construction is undertaken during the breeding season, Impacts may be **MODERATE** for the IUCN listed species common carp (April-June) and Italian barbell (May-June).
The PT2 site is located on cultivated land and ecologically surveys undertaken in mid-2002 have confirmed that the site is not ecologically sensitive.	No ecologically sensitive areas will be impacted by the re-route or the construction of PT2.	Shrubs and dense vegetation along the RoW will be cleared outside the breeding season for both the Pale Rock Sparrow and Whinchat. Clearance of riverside	

Environmental Impact Table 15 (Maps 15A and 15B) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Whinchat. Clearance of riverside trees, shrubs and thickets in advance of the construction of the Hasankale and Kurdi River crossings to be undertaken outside the April to July period for the Barred Warbler, Oystercatcher, White-winged Black Tern and Long-eared Owl. Construction activities at river crossings will not be permitted during the breeding season of fish species that are of high commercial value or that are designated has having conservation importance. For construction activity to be permitted during the breeding season of fish species with medium commercial value, the Contractor will be required to submit specific mitigation measures to avoid impacting breeding fish to BOTAŞ for approval. Such measures might include, but not be limited to, the following: preconstruction survey results indicating that spawning grounds are avoided, the provision of fish passages, etc, in addition to the generic mitigation measures that are required at all river crossings.	**MINOR IMPACT** Based on the mitigation measures described, the limited area of habitat affected and the absence of known ecologically sensitive features, it is predicted that only minor impacts on the biological environment will occur as a result of construction activities at PT2. This assessment will be confirmed by site-specific vegetation and faunal surveys prior to construction.

Environmental Impact Table 15 (Maps 15A and 15B) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Archaeology and Cultural Heritage			
Three archaeological sites are located within the 100m Corridor in this section – Bekleduzu flat settlement (3rd Degree Site*) and Eskikoy Area Settlements-1 and 2 (3rd Degree Sites*). No architectural remains have been found in this settlement, due to prior agricultural activities. Ceramic shards have been found dating back to the Hellenistic, Roman, Byzantium and early Islamic periods. *These sites have not yet been registered by the MoC and are provisionally assigned these classifications. Bekleduzu, Eskikoy 1 and Eskikoy 2 settlements are Proposed for Registration by the regional preservations council	Potential for direct impact to these sites during pipeline construction through ground disturbance. In addition, indirect impacts may arise from construction activities that will affect the visual/historical setting of these sites.	The pipeline has been re-routed to avoid these sites. Potential impacts are therefore avoided. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to the temporary disturbance of setting of the sites and peripheral features. Although, no known archaeological sites were identified within the vicinity of the PT2 site, this site has only recently been selected as the preferred location for PT2. Baseline archaeological investigations will be undertaken of surface features at the site and surrounding areas prior to construction to confirm the presence, or potential presence, of archaeological features.
The following have been proposed for registration by the regional preservations council: (i) Tepecik Mound; (ii) Mahmutdede Tomb; (iii) Seyyidehanım Tomb; (iv) Golller Area Settlement 1; (v) Goller area settlement 2			

Social Impact Table 15 (Maps 15C) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

MAP 15: PROJECT INFORMATION

There is one pump station (PT2), one primary construction camp, and one block valve station in the area (on the junction of maps 15 and 16).
There were two options considered for PT2, Option 2 has been selected, it requires 16.94ha and is on privately owned land, on the Alvar Plain, close to the district centre of Pasinler. Adjacent to the pump station is its temporary construction camp (12.53ha).

MAP 15: MAP HIGHLIGHTS

- The pipeline crosses three rivers/creeks (the Kurdi river, the Altinbasak creek and the Hasankale creek)
- The pipeline crosses road and rail links to Erzurum.
- An industrial area lies at the end of this section.
- Unclassified roads link local settlements.
- Primary land uses are animal husbandry and agricultural production.
- There is cultivation of rain fed cereals and irrigated crops.

MAP 15: IMPACTED AND SURVEYED SETTLEMENTS

- ***Impacted:*** six settlements will be directly impacted by the pipeline project (Ebsemce, Yukari Danisment, Tepecik, Sunak, Altinbasak, Alvar): all will have land intersected by the proposed pipeline (L), four (Ebsemce, Yukari Danishment, Tepeckik and Sunak) are within 5km of a construction camp (C); one (Alvar) is 3km from a pump station (P); one (Altinbasak) is within 2km of the block valve station (B), and two (Altinbasak and Tepeckik) are within 500m of the pipeline route (D). Settlements impacted by traffic have not yet been identified. There are no settlements downstream of a river/creek crossing (R).

- ***Surveyed:*** three settlements (Ebsemce, Altinbasak & Alvar) were surveyed in the field (S) and two settlements were surveyed by telephone (T) (Yukari Danisment & Tepecik). In addition, Yukari Danisment & Tepecik were involved in construction camp consultation meetings.
- ***Not surveyed:*** Sunak (1.7km south of pipeline and within 5km of construction camp)
- ***Disclosure Meeting Location:*** Alvar

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Ebsemce (C) **(S)**			
• ***Demographics:*** 900 inhabitants with 120 households. The predecessors of the inhabitants migrated from Urfa in southeastern Turkey nearly 100 years ago. Polygamy is practiced, especially by older men. The number of children is high. • ***Safety:*** settlement is situated 1.8km from pipeline and is within 2km of the construction camp. • ***Disputes:*** there seems to be some unrest between two groups within	***Construction camp*** Primary receptor of impacts resulting from construction workers.	**Monthly community liaison** meetings will be held. **Preferential employment** opportunities. **Project to liase** with local health authorities.	**Low likelihood of significant impacts.** Potential impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved

Social Impact Table 15 (Maps 15C) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

the settlement. The Muhtar has had his position for 42 years and it appears that some residents are wary of him. • ***Project attitude:*** generally positive, however, the settlement has experienced many problems with the Turkish Electricity Distribution Authority and expropriation for a high voltage line. Lawsuits may be ongoing. • ***Local opinion of construction camp:*** generally welcoming**,** however they do not want the construction workers to visit their settlement. • ***Perceived benefits of construction camp:*** potential for local employment at the camp or on the pipeline construction. • ***Perceived problems of construction camp:*** negative impact on local roads which are already of poor quality and insufficient number, concerns about the potential for dust to affect agricultural products, and concerns of potential damage to water channels. • ***Land ownership & use:*** all households have land. The primary landowner is the local residents (49%) and 40% is leased by local residents. Large and medium sized farming is the dominant structure. Seasonal irrigation is undertaken, however, irrigation channels are re-located regularly. • ***Settlement livelihood:*** the main economic activities are wet agriculture (grain/cereals, potatoes, sunflower, cabbage, sugar beet) and animal husbandry; with trade and transport activities also undertaken. A number of people also work in Pasinler as civil servants. This is also the only settlement surveyed that breeds water buffalo. • ***Availability & skills:*** the settlement has previous pipeline experience. Heavy machine operators, food service, heavy vehicle drivers, mechanics, tree feller, drivers, security personnel and welders are available. Local skilled & unskilled workforce. Four to five inhabitants with heavy truck driver's licenses and one person with pipeline (BOTAŞ) experience. • ***Accessibility:*** 51km to Erzurum provincial centre and 8km to Pasinler district centre. Located near a main road. Accessible all year.		BTC Company to look at opportunities to cooperate in providing **health awareness training.** **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m	and used as examples to reinforce procedures. **Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities. **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Construction hazards: animals Trench poses safety hazard for livestock. ***Sensitive crops*** Dust may affect yields of crops essential for subsistence or commercial livelihoods.		

Social Impact Table 15 (Maps 15C) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

year. • ***Information provision:*** 100% of the population is literate. TV is the best information provision tool. • ***Environmental & cultural sites:*** ancient Armenian Church close to settlement. • ***Infrastructure:*** piped water is available, however its supply is irregular and it is not connected to houses. Local residents use water from boreholes in front of each house. A community fountain and wells provide an alternative water source. Electricity and sewerage system operational. No waste disposal system, however, recycling is undertaken. • ***Services:*** there is a primary school with three teachers and 100 students, and the local residents have access to a travelling health team. There is no health care centre. • ***Settlement problems:*** poor roads, dust and repercussions from the national economic crisis. • ***Other:*** conservative settlement		down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Conservative settlement Construction workers are more likely to offend inhabitants	**Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) to be carefully monitored	**Low likelihood of significant impacts.** Impacts arising from breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures.
	Access to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Skills and resources	**Information is highlighted**	**Potential positive benefits**

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	Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	to local settlements.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yukari Danisment (C) (L) (T)			
• ***Demographics:*** 128 inhabitants. • ***Safety****:* the centre of the settlement is situated 1.25km from pipeline and within 5km of the construction camp. The nearest house in the settlement is 1.2km from the pipeline. • ***Project attitude:*** mixed, generally positive but local residents are wondering about land costs. • ***Local opinion of construction camp:*** generally welcoming. • ***Land ownership & use:*** 95% of land is privately owned by the local residents. • ***Settlement livelihood:*** agriculture, bee keeping (five households produce honey for own consumption), local government, transport, trade and tourism are important sources of livelihood. • ***Accessibility:*** 8km to Pasinler district centre. The settlement is accessible all year. • ***Information provision:*** 98% of the population is literate. TV is the best information provision tool. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** none identified.	**Construction camp** Primary receptors of impacts resulting from construction workers. **Irrigation** Potential loss of flow from planned/ accidental	**Monthly community liaison** meetings. **Preferential employment** opportunities. **Project to liase** with local health authorities BTC Company to look at opportunities to cooperate in providing **health awareness training.** Contractor will **consult** with authorities to determine	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities. **If irrigation water is disrupted** longer than time

Social Impact Table 15 (Maps 15C) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

	disruption. Contaminations of flow from spills or increase in sedimentation. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	maximum acceptable time for disruption. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Tepecik (C) (L) (D) (T)			
• ***Demographics:*** 450 inhabitants with seasonal migration of 11%. • ***Safety****:* nearest house in the settlement is300m from the pipeline and the settlement is within 5km of the primary construction camp. • ***Project attitude:*** **negative**: the local residents are concerned about potential health issues, particularly regarding potential explosions and they have expropriation concerns. • ***Local opinion of construction camp:*** inhabitants would NOT welcome a construction camp. • ***Land ownership & use:*** 70% of land is privately owned by the local residents. There is no seasonal grazing. • ***Settlement livelihood:*** agriculture, trade, education and local government are main sources of livelihood. • ***Accessibility:*** 9km to Pasinler district centre. The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. The best information provision tools are TV, radio and the telephone.	***Settlement opposed to construction camp*** Nearby construction camp would not be welcomed by some/all settlements.	Additional consultation required prior to finalising site of construction camp to identify and resolve concerns. Construction camp will not be located if settlement remains opposed. If settlement remains a construction camp site then: **Monthly community liaison** meetings will be held. **Preferential employment** opportunities.	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce

Social Impact Table 15 (Maps 15C) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

information provision tools are TV, radio and the telephone. • ***Environmental & cultural sites:*** mountains. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** low income.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children. Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.** **Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	(many of whom are local). Further positive benefits dependent on scale of social investment activities. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Additional damage to be compensated for.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Altinbasak (L) (D) (B) (S)			
• ***Demographics:*** 1,800 inhabitants with 250 households. • ***Safety****:* the centre of the settlement is 500m from the pipeline, the nearest house in the settlement is 100m from the pipeline.	***Construction hazards: human*** Working areas pose safety	**Road safety training** will be held in schools prior to	**Continued attention** to mitigation measures will be

Social Impact Table 15 (Maps 15C) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

nearest house in the settlement is 100m from the pipeline. • ***Health:*** lack of sewerage system resulting in health problems. • ***Disputes:*** economic. • ***Project attitude:*** mixed. The natural gas pipeline caused damage to lands. As a result, one landowner is adamant that he does not want construction of the pipeline on his land. Request for trees along the route to be left and not disturbed during construction. 36% of those interviewed believe that the pipeline will result in direct employment opportunities. 27% believe there will be no benefits. 18% are concerned about dust, noise and increased traffic.	hazard to residents, particularly small children.	construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	critical to prevent injury. **Benefits** from health and safety awareness raising.
• ***Land ownership & use:*** 92% of land is privately owned by the local residents. Large-sized farming is the dominant structure. Land ownership is particularly high. Seasonal irrigation is undertaken and grazing occurs. • ***Settlement livelihood:*** main economic activities are: agriculture including grain (cereals) vegetables (potatoes, sunflower, cabbage), herbs, sugar beet; animal husbandry; public services; and various types of employment in the construction sector. In addition, forestry, and transportation are undertaken. (Lands are irrigated through common irrigation ducts in return for payment). • ***Availability & skills:*** previous pipeline construction experience. Heavy machine operators, food service personnel, heavy vehicle drivers, mechanics, tree feller, drivers, security personnel and welders are available. Concern that people from Kars and northern regions will be employed in Erzurum rather than local people, as with previous projects. 82% of those interviewed would accept a temporary job working on the pipeline construction. • ***Accessibility:*** 50km to Erzurum provincial centre and 4km to Pasinler district centre. The settlement is accessible all year. • ***Information provision:*** 80% of the population is literate. The best information provision tools include TV, radio and the telephone. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. There is good electricity supply, however, no sewerage or waste disposal systems, and no health care system.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Land*** Potential complications in expropriation process due to a broad range of agricultural products cultivated. ***Forest*** Loss of a resource used by	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **See Overview of Land Acquisition Process in Appendix C9.** If a significant number of	**Additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of Land Acquisition Process in Appendix C9.** **Significant impact** where

Social Impact Table 15 (Maps 15C) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

• ***Services:*** there is also a primary school with four teachers and approximately 200 students. • ***Settlement problems:*** poor health conditions, sewerage system has not yet reached a small part of settlement and low income and low profits.	settlements. Increased expenditure on other fuel sources.	trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	more than 10% of trees are cut on forestry land used by any one settlement.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Skills & resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements.
	Negative experience Possible **opposition** to project and **increased sensitivity** to any negative impacts.	BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these	Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Social Impact Table 15 (Maps 15C) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

	Block Valve Station See Environmental Impact Tables and the Overview of Land Acquisition Process in Appendix C9.	communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be remind**ed of the importance of appropriate behaviour in daily **briefings.**	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Alvar (P) (L) (S)			
• ***Demographics:*** there is a winter population of 3,100 inhabitants with 500 households and a summer population of 3,500 people in 500 households. Migration to Erzurum occurs. • ***Safety****:* the centre of the settlement is situated 1.6km from pipeline and 4km from the pump station (visible). The nearest house in the settlement is 1.1km from the pipeline. • ***Health:*** earthquake prone area. • ***Disputes:*** over natural resources and economic issues. • ***Project attitude:*** mixed, but overall positive. Concern that this project will be a repeat of the natural gas project. Its construction damaged agricultural products and livestock (animals died after eating iron filings/wastes left on site after construction). Reinstatement was not realised and irrigation channels were damaged. 36% of those interviewed see employment opportunities as benefits of the project, 27% believe there will be no benefits. 36% believe there will be no constraints.	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of Land Acquisition Process in Appendix C9. **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction	**Monthly community liaison** meetings will be held**.**	**Low likelihood of significant impacts.** Potential for impacts arising

Social Impact Table 15 (Maps 15C) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

• ***Local opinion of pump station:*** inhabitants are generally welcoming. • ***Land ownership at actual pump station site:*** unused private land (belonging to Cogender). • ***Land ownership at pump station construction campsite:*** the campsite is immediately adjacent to PT1. It will be 12.53ha in size, all of which is privately owned agricultural land (with land title deeds). • ***Perceived benefits of pipeline and pump station:*** employment opportunities and increased incomes, and upgrade of local road to the train station. • ***Perceived problems of pipeline and pumps station:*** risk of damage to settlement social relations, risk of damage to agricultural activities and water canals, and safety risks for children. • ***General land ownership & use:*** 55% of land is privately owned by the local residents, with an additional 29% leased by the local residents. Sharecropping is common in Alvar. Irrigation is undertaken. Many local residents obtained title deeds when the natural gas pipeline was constructed. Inheritance procedures had not been carried out over the years and local residents had to pay fees for the transfer of title deeds after expropriation. This cost more than expropriation payments. • ***Settlement livelihood:*** the main economic activities are agriculture (cereals, potatoes, sugar beet, beans and animal feeds) and animal husbandry (cattle). There are two co-operatives – the agricultural credit cooperative and the agricultural cooperative. In addition, forestry, construction, transport, trade, local government activities are undertaken. • ***Availability & skills:*** previous pipeline construction and oil drilling experience. Heavy machine operators, food service personnel, heavy vehicle drivers, mechanics, tree feller, drivers, security personnel and welders are available. • ***Accessibility:*** 50 km to provincial centre and 7km to district centre of Pasinler. The settlement has good connecting roads to main roads. • ***Information provision:*** 95% of the population is literate.	workers ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Land*** Potential complications in expropriation process. ***Health*** Potential health impacts on construction workers.	**Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Project to look at opportunities to cooperate in providing **health awareness training**. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **See Overview of Land Acquisition Process in Appendix C9.** **Information is highlighted to contractor** so that they can ensure that their workers are protected.	from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **See Overview of Land Acquisition Process in Appendix C9.** **No residual impact**.

Social Impact Table 15 (Maps 15C) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

• ***Environmental & cultural sites:*** graveyard of religious leader (sih) is a sacred place. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. There is electricity supply (although wires need to be replaced) and a sewerage system. No waste disposal system. • ***Services:*** there is a primary school with 15 teachers and 250 students and a health centre with midwife, doctor, health officer. There are also two mosques, one of which is under construction. • ***Settlement problems:*** poor sewerage system leading to disease, no lyceum (high school), settlement not clean enough, poor profit in produce and interest rates.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include using appropriate channels of communication and media and speaking in requisite languages where some residents do not speak Turkish.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Forestry Loss of a resource used by settlements. Increased expenditure on other fuel sources.	If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.
	Skills and resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements.

Social Impact Table 15 (Maps 15C) (KPs 259.2 – 278.7): Pasinler Plain, Erzurum Province

	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Environmental Impact Table 16 (Maps 16A and 16B) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
In this route section, up to KP 291, soil type continues on from the previous section: • Mesic Coarse-loamy to Coarse-silty Xerochrepts or Xerorthents over alluvium.	Soil related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Other potential impacts include: • reduced soil productivity; • contaminated soils.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed.

Environmental Impact Table 16 (Maps 16A and 16B) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration.	
From KP 291 to the end of this route section Mesic Clayey-skeletal Micro Typic Xerochrepts on scarp. Mesic skeletal Xerochrepts on mesa surface.	Main potential impacts: • soil erosion; • sediment yield. Other potential impacts include: • reduced soil productivity; • contaminated soils.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration.	*MODERATE IMPACT* Impacts will occur at the scarp since it will be difficult to reinstate through standard techniques to its pre-existing condition. Careful attention to final routing and use of site-specific innovative reinstatement techniques will ensure that the impacts are moderate at most.
Landscape and Visual			
The landscape is unremarkable throughout the length of this section. It comprises a continuation of intensive irrigated agriculture on the broad, flat, river plain. Groups of mature trees and a number of massive pylons carrying electricity transmission lines are prominent. Close proximity of industrial area and railway. West of the main Erzurum highway, the route is forced up over the southernmost extremity of the Kargapazari Mountains, a hostile, desolate, treeless, rock-strewn plateau with coarse vegetation. Although much of the RoW of the existing NGP has been incorporated into agricultural fields and has limited visual impact, viewed from the steep slopes west of the road, it is extremely intrusive.	Generally low and short-term construction-related visual impacts, however, potential visual impacts of the NGP, which was not reinstated, may be exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. The route's proximity to road and rail links will make it a prominent in the landscape, especially where it goes up-and-down the mesa's scarp.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and	**INDIRECT POSITIVE IMPACT** Landscape is considered resilient to change due to its existing depleted state. Any commensurate enhancements of the degraded NGP alignment will result in a net improvement to the landscape.

Environmental Impact Table 16 (Maps 16A and 16B) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2).	
Surface Geology and Geohazards			
Faults The route crosses the complex Erzurum Fault Zone, classified as A class. Within this fault zone, the eastern and middle segments comprise two active fault splays whilst the western segment is inactive. The eastern splay is subdivided into three parts that occur across a zone c. 100 m wide. Route crosses the Eastern Segment 1, Eastern Segment 2 and the Eastern Segment reverse faults between KPs 292.0 – 292.7. The Middle Segment is crossed by the route at KP 295.4.	See *Section 8*.	See *Section 8*.	See *Section 8*.
Groundwater			
The majority of the route in this section continues to pass over the Pasinler Plain (an unconfined aquifer). Water samples taken from a well (Well Site No. 4) located over the unconfined aquifer c. 240m west of the route, (286.2 – 287.6) indicate that groundwater quality is Class II.	Potential for moderate and localised impacts to groundwater quality from construction activities.	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including: • No groundwater abstraction within 50m of springs or wells. Groundwater will not be	**MINOR IMPACT** With the application of the specified mitigation measures described, only minor impacts are expected to occur, which will be short-term in nature.

Environmental Impact Table 16 (Maps 16A and 16B) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		abstracted for use as hydrotest water. • No facilities (construction camps, pipe yards, fuel stores etc) will be located within 50m of springs or wells.	
Ecology			
Important Ecological Factors ESA 12 is identified between KP 291.9 and KP 299.5 for eleven globally-threatened plant species (*Centaurea schischkinii, Thlaspi cilicicum, Elymus sosnowskyi, Ballota rotundifolia, Thymus pectinatus var. pectinatus, Thymus canoviridis, Onobyrchis araxina, Fritillaria alburyana, Consolida cornuta, Scrophularia versicolor* and *Pimpinella anisetum*).The ESA continues on to the next map (Map 17B). The IUCN status for these species are given in Table 5.20, Section 5. At KP 291.6, 8 Pale Rock Sparrow (nationally-threatened) were recorded. Four nationally-threatened birds (Shoveler 12, Teal 4, Pintail 1, and Citrine Wagtail 1) were recorded at the lake located c. 1.8km north of the route within the Erzurum Marshes IBA (see Environmental Impact Table 17 and Map 17B for details). The protection status for these species are given in Table 5.21, Section 5.	Habitat destruction of plain steppe may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 12. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW.	**MODERATE IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Environmental Impact Table 16 (Maps 16A and 16B) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Shrubs and dense vegetation along the RoW will be cleared outside the breeding season for the Pale Rock Sparrow.	
Noise			
An Industrial Area (KPs 279.3 – 281.6) is located directly adjacent to the pipeline route. Commercial properties such as offices may be sensitive to noise during pipeline construction. However, these properties are generally considered to be less sensitive to noise than residential dwellings and schools etc.	Noise impacts are expected to occur at properties located adjacent to the Pipeline works during: • soil stripping; • welding/lowering; • backfilling; • bending; • trenching. During works associated with the railroad crossing in this area, noise impacts will also result from excavation and sheet-piling.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see	**MODERATE IMPACT** Due to the proximity of the site to the Pipeline, noise impacts are expected to occur at commercial properties during each phase of construction, despite the use of noise mitigation measures. Where possible, mobile noise barriers will also be used to screen plant.

Environmental Impact Table 16 (Maps 16A and 16B) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Appendix C4).	
Archaeology and Cultural Heritage			
Tetikom Mound (2nd Degree Site*) is situated south-west of Tetikom Hill, to the north of the route. The settlement mound displays Late Calcolithic, Early Bronze Age and Iron Age (Urartian) cultural layers. Illegal excavation pits and regular stone blocks are visible on the surface. The mound was damaged during the construction of NGP. * This site has not yet been registered by the MoC and is provisionally assigned this classification. Tetikom mound has been proposed for registration by the regiona preservation council	Potential for direct impact at this site during pipeline construction through ground disturbance. In addition, indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	The site will be fenced throughout the construction period. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to the temporary disturbance of the site setting and peripheral features.
The fiollowing have been proposed for registration by the regional preservation council: (i) Military shelters 1; (ii) Military shelters 2; (iii) Tetikom Hill			

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

Map 16: PROJECT INFORMATION

There is one pump station (PT2) and one primary construction camp in the area (on the junction of maps 15 & 16). There is no block valve station.
There were two options considered for PT2, Option 2 has been selected. It requires 16.94ha and is on privately owned land.

Map 16: MAP HIGHLIGHTS

- Unclassified roads link local settlements. National highway bisects pipeline.
- Railroad link from industrial area, bisecting pipeline once, and coming within a few meters of it a second time, running broadly parallel to pipeline.
- Pipeline passes through the Kargapazari Mountain.
- The pipeline crosses the Hamam creek.
- There are rainfed crops and irrigated crops cultivated.

Map 16: SURVEYED AND IMPACTED SETTLEMENTS

- ***Impacted:*** 16 settlements on this map will be directly impacted by the pipeline project: 13 will have land intersected by the proposed pipeline (L) (Korucuk, Nenehatun, Pusudere, Golcigez, Buyuktuy, Kaplicalar, Pasabey, Yukari Cakmak, Cicekli, Cogender, Agcalar, Ovakoy, Uzunahmet). None are within 5km of a construction camp (C); and seven are within 5km of a pump station (Yukari Cakmak, Cicekli, Cogender, Agcalar, Ovakoy, Bingol, Yittigasi) (P). None are within 2km of a block valve station (B) or 500m of the pipeline route (D). Settlements impacted by traffic have not yet been identified. One settlement is downstream of a creek crossing (Buyuktuy is 2.5km downstream of the Hamam creek) (R).

- ***Surveyed:*** one settlement (Yukari Cakmak) was surveyed in the field (S) and 11 settlements were surveyed by telephone (T). Settlements within 5km of the pump station and construction camp were surveyed. In addition, consultation meetings were held with settlements within 5km of pump station and the construction camp.
- ***Not surveyed:*** Ezirmik (1.57km north of pipeline), Kaplicaler, Pasabey
- ***Not on map:*** Pasabey, Cogender, Agcalar, Ovakoy, Bingol

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Korucuk (L) (T)			
• ***Demographics:*** 350 inhabitants. • ***Safety****:* the centre of the settlement is 1.1km from pipeline, the nearest house in the settlement is 1km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 70% of land is privately owned by the local residents. No grazing occurs. Seasonal irrigation is undertaken.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

• ***Settlement livelihood:*** agriculture, construction, trade and local government are the main sources of livelihood. • ***Accessibility:*** 16km to Pasinler district centre. The settlement is accessible all year. • ***Information provision:*** 95% of the population is literate. TV and the newspaper are the best information provision techniques. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** poor roads and the need for a Muhtar room.			compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Pusudere (L) (T)			
• ***Demographics:*** 228 inhabitants, with seasonal migration of 1%. • ***Safety****:* the centre of the settlement is situated 1.35km from pipeline and the nearest house in the settlement is 1.15km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 90% of land is privately owned by the local residents. Seasonal grazing and irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, forestry, construction, trade and local government are the main sources of livelihood. • ***Accessibility:*** 22km to district centre. The settlement is accessible all year round. • ***Information provision:*** The best information provision tools include TV, the newspaper and via family members. • ***Environmental & cultural sites:*** park, forest. • ***Infrastructure:*** piped water is available, however its supply is irregular. An artesian well provides an alternative water source. • ***Settlement problems:*** unemployment, poor access to water and low income.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Forest Loss of a resource used by settlements. Increased expenditure on other fuel sources.	If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.
	Accessibility of information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Golcigez (L) (T)			
• ***Demographics:*** 131 inhabitants with seasonal migration of 5%. • ***Safety:*** the centre of the settlement is 4.6km from pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations	Contractor will **consult** with authorities to determine maximum acceptable time	**If irrigation water is disrupted** longer than time considered acceptable by

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

• ***Land ownership & use:*** 70% of land is communally owned by local residents. Grazing and irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture and local government are the main sources of livelihood. • ***Accessibility:*** 16km to district centre. The settlement is accessible all year round. • ***Information provision:*** 95% of the population is literate. • ***Infrastructure:*** piped water is supplied to households however supply is irregular. A settlement fountain provides an alternative water source. • ***Settlement problems:*** inadequate access to water the need for a bridge and watering canals must be rearranged.	of flow from spills or increase in sedimentation. ***Land*** Potential complications in expropriation process. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	for disruption. **See Overview of the Land Acquisition Process in Appendix C9.** ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **See Overview of the Land Acquisition Process in Appendix C9.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Buyuktuy (L) **(T)**			
• ***Demographics:*** 466 inhabitants.	***Land***		

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

• ***Safety**:* settlement is situated 2km from pipeline, the nearest house in the settlement from the pipeline is 1.75km. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 60% of land is communally owned. No grazing. Irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (two households produce honey), education, local government, construction, transport and trade are the main sources of livelihood. • ***Availability & skills:*** previous pipeline experience: Iran-Ankara natural gas project. • ***Accessibility:*** 23km to Pasinler district centre. The settlement is accessible all year round. • ***Information provision:*** 95% of the population is literate. The best information provision tools include TV, newspapers and the telephone. • ***Environmental & cultural site:*** a mausoleum. • ***Infrastructure:*** piped water is not available. A settlement fountain forms the sole water supply. • ***Settlement problems:*** poor access to water and the need for a Muhtar room.	Potential complications in expropriation process. ***Drinking water*** Potential for disruption or contamination of drinking water during construction. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**See Overview of the Land Acquisition Process in Appendix C9.** The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings	**See Overview of the Land Acquisition Process in Appendix C9.** **No residual impact.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

		before and during construction.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Uzunahmet (L) (T)			
• ***Demographics:*** 420 inhabitants with seasonal migration of 10% • ***Safety****:* the centre of the settlement is situated 1.6km from pipeline, the nearest house from the pipeline is 1.4km • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 60% of land is communally owned. No grazing. Seasonal irrigation is undertaken. • ***Settlement livelihood:*** agriculture, construction, trade, education and local government are the main sources of livelihood. • ***Accessibility:*** 17km to Erzurum district centre. The settlement is accessible all year round. • ***Information provision:*** 80% of the population is literate. The best information provision tools include TV, the newspaper and the telephone. • ***Environmental & cultural sites:*** Uzun Ahmet's traces. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** Poor access to water, inadequate access to land and low income.	***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility of information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**See Overview of the Land Acquisition Process in Appendix C9.** Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**See Overview of the Land Acquisition Process in Appendix C9.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITONAL MITIGATION**	**RESIDUAL IMPACTS**
Nenehatun (L) (T)			
• ***Population:*** 280 inhabitants.	***Accessibility of information***	**Communication with**	**Any change can highlight**

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

• ***Safety:*** settlement is situated 2.2km from the pipeline, the nearest house in the settlement is 2.1km from the pipeline. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive. • ***Land ownership & use:*** 60% of land is privately owned by the local residents. There is no irrigation. • ***Settlement livelihood:*** agriculture, mining, construction, transport and local government are the main sources of livelihood. • ***Accessibility:*** 8km to district centre. The settlement is accessible all year round. • ***Information provision:*** 90% of the population is literate. TV, newspaper and the telephone are the best information provision tools. • ***Environmental & cultural sites:*** mausoleum, martyr monument and caves. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** unemployment and poor access to water.	Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc.	**settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yukari Cakmak (L) (P) (T)			
• ***Demographics:*** there is a summer population of 250 people in 40 households. Its winter population is 200 people in 35 households. The seasonal migration of 11%. • ***Safety****:* the centre of the settlement is currently 2.6km from the pipeline and 3.5km from the pump station. The nearest house on the settlement is 2.2km from the pipeline. A new location is planned for the settlement (will be same general area) to distance it from a fault line. • ***Health:*** possible earthquake area as settlement located on a fault line. • ***Project attitude:*** positive and optimistic.	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9. **PUMP STATION**		

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

• ***Local opinion of pump station:*** generally welcoming. • ***Perceived benefits of pipeline and pump station:*** employment opportunities and increased incomes. • ***Perceived problems of pipeline and pumps station:*** risk of damage to settlement social relations and risk of damage to agricultural activities and water canals. • ***Land ownership at actual pump station site:*** Unused private land (belonging to the local residents of Cogender). • ***General land ownership & use:*** primary landownership is communal (50%). There is no irrigation. • ***Settlement livelihood:*** Agriculture, transport, construction and local government are the main sources of livelihood. • ***Information provision:*** 90% of the population is literate. Best information provision tools include TV and the Muhtar. • ***Infrastructure:*** piped water is not available. A settlement fountain provides an alternative water source. There is no waste disposal system, sewerage system or health services. • ***Services:*** there is a primary school with one teacher and 24 students. Students who wish to study further are taken by bus to the district of Pasinler. • ***Settlement problems:*** infrastructure problems and housing problems.	**CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers **PIPELINE IMPACTS:** ***Land*** Potential complications in expropriation process. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working	**Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.** **See Overview of the Land Acquisition Process in Appendix C9.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.	**Low likelihood of significant impacts.** Potential for impacts arising from breaches of rules and procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **See Overview of the Land Acquisition Process in Appendix C9.**

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

		width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	
	Accessibility of information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Cicekli (P) (L) (T)			
• ***Demographics:*** 300 inhabitants with 40 households. • ***Safety****:* the centre of the settlement is situated 3.6km from the pipeline and 4km from the pump station. The nearest house from the pipeline is 3.5km • ***Project attitude:*** generally positive, although local residents are concerned about land costs. • ***Local opinion of pump station:*** generally welcoming. • ***Perceived benefits of pipeline and pump station:*** employment	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land		

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

opportunities and increased incomes. • ***Perceived problems of pipeline and pumps station:*** risk of damage to settlement social relations, risk of damage to agricultural activities and water canals, and safety risks for children. • ***Land ownership at actual pump station site:*** Unused private land (belonging to local residents of Cogender). • ***Land ownership & use:*** 50% of land is privately owned by the local residents. Seasonal grazing and seasonal irrigation takes place. • ***Settlement livelihood:*** agriculture, animal husbandry (400 cattle and 800 sheep), bee keeping (one household produces honey for own consumption), education, local government, fishing, construction, transport and trade are the main sources of livelihood. • ***Accessibility:*** The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. Best local information provision tools are TV and the newspaper. • ***Environmental & cultural sites:*** caves. • ***Infrastructure:*** piped water is available, however it is irregular. A stored water supply forms an alternative water source. • ***Services:*** good electricity supply, telecommunications and sewerage system, a primary school with one teacher and 14 students. • ***Settlement problems:*** need barns on plateau; poor roads.	Acquisition Process in Appendix C9. **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers **PIPELINE IMPACTS:** ***Construction hazards:***	**Monthly community liaison** meetings will be held**.** Preferential employment opportunities. **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.** **Livestock crossings** will be	**Low likelihood of significant impacts.** Potential for impacts arising from breaches of rules and procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **See Overview of the Land Acquisition Process in Appendix C9.** **Potential for accidents**

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

	animals Trench poses safety hazard for livestock.	established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Cogender (P) (L) (T)			
• ***Demographics:*** 395 inhabitants with seasonal migration of 4%. • ***Safety****:* the settlement is situated 4.5km from pipeline and approximately 4km from pump station (visible). The pump station site is owned by local residents within the settlement. • ***Project attitude:*** generally positive. • ***Land ownership at pump station site:*** unused private land belonging to local residents. • ***Local opinion of pump station:*** generally welcoming. Local inhabitants prefer option 2 to avoid loss of agricultural land and to reduce the impacts of traffic through Pasinler (the district centre) and the settlement Bingol. • ***Perceived benefits of pipeline and pump station:*** employment opportunities and increased incomes. • ***Perceived problems of pipeline and pumps station:*** risk of damage to settlement social relations, risk of damage to agricultural activities and water canals, and safety risks for children. • ***General land ownership & use:*** 80% of land is privately owned by the local residents. Seasonal irrigation is undertaken. The water canals will need to be rearranged. Seasonal grazing occurs. • ***Settlement livelihood:*** agriculture, commercial fishing, fishing, transport, trade and local government are the main sources of livelihood. • ***Accessibility:*** The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. Best information provision tools are TV, newspaper and telephones. • ***Environmental & cultural sites:*** a mausoleum. • ***Infrastructure:*** no piped water is available. A settlement fountain provides water. • ***Settlement problems:*** poor access to water and unemployment.	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9. ***Land*** Permanent land expropriation will occur. ***Livelihoods*** Decreased land resources may result in decreased livelihood opportunities. ***Pump Station Construction Hazards: humans*** Working areas pose safety hazards to residents, particularly small children.	Evaluate the possibility of assigning unused state owned pastureland. **See Overview of the Land Acquisition Process in Appendix C9.** **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings** prior to and during construction will include safety briefings.	**See Overview of the Land Acquisition Process in Appendix C9.** **See Overview of the Land Acquisition Process in Appendix C9.** **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from awareness raising. **Additional damage to be**

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

		Consider erecting **protective barrier fencing**.	**compensated for.**
	Pump Station Construction hazards: animals Site poses safety hazard for livestock.	Consider erecting **stock proof fencing.**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	PUMP STATION CONSTRUCTION CAMP IMPACTS: The settlement will be a primary receptor of impacts resulting from construction workers	**Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.**	**Low likelihood of significant impacts.** Potential for impacts arising from breaches of rules and procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

			community investment activities. **See Overview of the Land Acquisition Process in Appendix C9.**
	PIPELINE IMPACTS:		
	Fishing Potential reduction in fisheries yield or damage to fisheries habitats **if** within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given.
	Drinking water Potential for disruption or contamination of drinking water during construction	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	**No residual impact.**

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Agcalar (P) (L) (T)			
• ***Demographics:*** 150 inhabitants with 30 households. • ***Safety:*** the centre of the settlement is located 3.1km from pipeline and 5km from pump station (visible). The nearest house in the settlement from the pipeline is 3km • ***Pipeline attitude:*** generally positive. • ***Local opinion of pump station:*** generally welcoming. • ***Perceived benefits of pipeline and pump station:*** employment opportunities and increased incomes. • ***Perceived problems of pipeline and pumps station:*** risk of damage to agricultural activities and water canals and the potential interruption of water flow from one side of the construction site to the	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9.		

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

other during and after the construction work. • ***Land ownership at actual pump station site:*** unused private land belonging to Cogender local residents. • ***General land ownership & use:*** most land is owned or leased by the local residents with legal titles. The settlement heavily uses water canals of the Alvar plain. • ***Settlement livelihood:*** main economic activities are agriculture (grain, sugar beet, sunflower) and animal husbandry (cattle). • ***Accessibility:*** 15km to district centre. The settlement has low quality asphalt roads. • ***Infrastructure:*** adequate drinking water. • ***Services:*** good electricity, telecommunications and sewerage systems.	**PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers **PIPELINE IMPACTS:** ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.** **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Low likelihood of significant impacts.** Potential for impacts arising from breaches of rules and procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **See Overview of the Land Acquisition Process in Appendix C9.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	complaints procedure. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Ovakoy (P) (L) (T)			
• ***Demographics:*** there is a summer population of 180 inhabitants in 40 households, and a winter population of 160 inhabitants in 25 households. There is a seasonal migration of 29%. • ***Safety****:* settlement is situated 1.7km from pipeline and 5.5 km from pump station (visible). The nearest house in the settlement is 1.6km from the pipeline. • ***Project attitude:*** generally positive. • ***Land ownership & use at actual pump station site:*** Unused private land belonging to Cogender settlement. • ***Perceived benefits of pipeline and pump station:*** high expectations of employment opportunities (direct and indirect) and increased incomes. • ***Perceived problems of pipeline and pumps station:*** risk of damage to settlement infrastructure. • ***General land ownership & use:*** 80% of land is privately owned by the local residents. No settlement land owned at the pump station site, however, seasonal irrigation is undertaken – watering canals will need to be rearranged. There is no seasonal grazing. • ***Settlement livelihood:*** agriculture and local government are the main sources of livelihood. • ***Accessibility:*** The settlement is accessible all year.	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9. ***Water Supply*** Potential for disruption or contamination of water source **PIPELINE IMPACTS:** ***Irrigation*** Potential loss of flow from	The need for an alternative source of water will be evaluated prior to construction, and if necessary, will be provided by the project. Contractor will **consult** with	***No residual impact*** **If irrigation water is**

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

• ***Information provision:*** 100% of the population is literate. Best information provision tools include TV and the telephone. • ***Environmental & cultural sites:*** dome, graveyard. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Services:*** primary school with 22 students. • ***Settlement problems:*** poor access to water.	planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Access to recruitment*** Decreased access to recruitment process.	authorities to determine maximum acceptable time for disruption. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No residual impact expected.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Bingol (P)			
• ***Demographics:*** there is a population of approximately 40 people in five households. There is no change in population throughout the year. • ***Safety:*** settlement is approximately 3.5km from pump station. • ***Pipeline attitude:*** positive. • ***Local opinion of pump station:*** generally welcoming. • ***Perceived benefits of pipeline and pump station:*** employment opportunities and increased incomes. • ***Perceived problems of pipeline and pumps station:*** risk of damage to settlement social relations, risk of damage to agricultural activities and water canals, and safety risks for children. • ***Land ownership at actual pump station site:*** unused private land belonging to Cogender settlement.	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9. **PIPELINE IMPACTS:** ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be

Social Impact Table 16 (Map 16C) (KPs 278.7 – 297.8): Pasinler Plain and Kargapazari Mountain area, Erzurum Province

			compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yigittasi (P)			
• ***Demographics:*** 367 inhabitants with 52 households. There is no seasonal migration. • ***Safety:*** the settlement is located 3.8km from pipeline and 5.5 km from pump station (visible). • ***Pipeline attitude:*** according to the Muhtar respondents are generally positive. • ***Local opinion of pump station:*** generally welcoming. • ***Perceived benefits of pipeline and pump station:*** high expectations of employment opportunities and increased incomes. • ***Perceived problems of pipeline and pumps station:*** risk of damage to settlement social relations, risk of damage to agricultural activities, waterways and water canals on the Alvar Plain which service the local residents, and risk of damage to roads that heavy construction vehicles may cause. • ***Land ownership at actual pump station site:*** unused private land belonging to Cogender settlement. • ***General land ownership & use:*** no land owned near pump station. • ***Accessibility:*** Located on the Erzurum-Agri national highway. • ***Infrastructure:*** good drinking water. • ***Services:*** good electricity, sewerage and communication systems in place.	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9. **PIPELINE IMPACTS:** ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility of recruitment*** Decreased access to recruitment process	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No residual impact expected.**

Environmental Impact Table 17 (Maps 17A and 17B) (KPs 297.8 – 316.7): Erzurum Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
In this route section soils comprise Mesic Coarse-loamy to Coarse-silty Xerochrepts.	Soil related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Other potential impacts include: • soil erosion; • sediment yield; • reduced soil productivity; • contaminated soils; • waterlogged soils.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.

Environmental Impact Table 17 (Maps 17A and 17B) (KPs 297.8 – 316.7): Erzurum Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Support equipment on moveable mats. • Avoid freshly irrigated soils.	
Landscape and Visual			
Here, the route descends onto the broad, flat, plain north of Erzurum. This was formerly marshland and some still remains, but most has been drained and improved to intensive irrigated agriculture, primarily cereals. Concrete-lined trapezoidal canals convey water east to west across the surface, with distribution canals near Cayirtepe and Beypinari. City edge development, settlements, a major new highway, and the airport all contribute to the urban-edge character of the area. A number of large trees are present. The landscape lacks particular merit throughout this section. Although much of the RoW of the natural gas pipeline has been incorporated into agricultural fields and has limited visual impact, there are sections that have not, which are visually intrusive, especially where close to the highway. BVS-016 will be located at KP 300.0 on cultivated land. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 50m in length.	Generally there will be a potential for low and short-term construction-related visual impacts, however, visual impacts of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and	**INDIRECT POSITIVE IMPACT** Landscape is considered resilient to change due to its existing depleted state. Any commensurate enhancements of the degraded NGP alignment will result in a net improvement to the landscape.

Environmental Impact Table 17 (Maps 17A and 17B) (KPs 297.8 – 316.7): Erzurum Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2).	
Groundwater			
The majority of the route passes over the Erzurum Plain, over the confined aquifer. Approximately 2.3km passes over the unconfined aquifer. Water samples were taken from four wells located: • 580m east of route (KPs 303.6 – 309.8) at Well Site No.5 (Dadas K23); • 1.8km east of route (KPs 303.6 – 309.8) at Well Site No.6 (Ciftlik K-5); • 2.1 km east of route (KPs 303.6 – 309.8) at Well Site No.7 (Ciftlik K-13); • 660m east of route (KPs 309.8 – 317.1) at Well Site No.8 (Beypinari Settlement - potable water well). Sample results indicate that groundwater quality at the Dadas K23, Ciftlik K-5 and Beypinari Settlement wells is Class II and groundwater at Ciftlik K-13 is Class III.	Potential for moderate and localised impacts to groundwater quality from construction activities.	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including: • No groundwater abstraction within 50m of springs or wells. Groundwater will not be abstracted for use as hydrotest water. • No facilities (construction camps, pipe yards, fuel stores etc) will be located within 50m of springs or wells.	**MINOR IMPACT** With the application of specified mitigation measures described, only minor impacts are expected to occur, which will be short-term in nature.
Ecology			
Protected Areas The pipeline passes through the Erzurum Plain Important Bird Area (IBA) between for a total length of c. 1.5km.Three areas of the Erzurum Plain - Kosemehmet Marshes (1,000 ha), and Sitavuk and Corak Marshes (together 2,300 ha seasonally) - comprise the IBA (no statutory protection status). Kosemehmet Marshes in the east comprise extensive areas of brackish clay grasslands surrounding a series of small lakes and springheads. Flower-rich hand-cut hay meadows occur near the	See Potential Impacts below.	See Mitigation Measures below.	See Residual Impacts below. There will be no affect on the protection status of the IBA.

Environmental Impact Table 17 (Maps 17A and 17B) (KPs 297.8 – 316.7): Erzurum Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
settlements, but many of these have been ploughed in recent years. Sitavuk and Corak Marshes, to the western part of the plain, are seasonal marshes surrounded by extensive arable and grasslands. The site qualifies for IBA status for its 15 breeding pairs of Common Crane (*Grus grus*) and during migration periods for significant numbers of White-winged Black Tern (*Childonias leucopterus*) (c.15,000) and Ruddy Shelduck (*Tadorna ferruginea*) (max. 1,500).			
Important Ecological Factors The route continues to cross ESA 12 (see Environmental Impact Table 16 and Map 16B for description). Three globally-threatened plant species, (*Pulicaria armena, Hesperis schischkinii* and *Onobrychis araxina*),occur between KP 301.3 and KP 302.7. ESA 13 is identified for these species. The IUCN status for these species are given in Table 5.20, Section 5. Erzurum Plain was once an extensive area of seasonally-flooded marshes and grasslands, but is now much reduced through drainage and reclamation for agriculture and development. A few shallow pools still remain. Despite significant degradation, it still supports good numbers of waterbirds including at least eleven nationally-threatened species. Totals counted on 14-17.06.2001 include - Pintail 1; Teal 4; Garganey 3; Shoveler 12; Black Kite 3; Marsh Harrier 6; Common Crane 2; White-winged Black Tern 4; Long-eared Owl 1; Citrine Wagtail 1; and Whinchat 5. Also present were Night Heron 7; Montagu's Harrier 6; Steppe Eagle1; Black-winged Stilt 40; Lapwing 28; Green Sandpiper 2; Wood Sandpiper 1; Redshank several; Red-necked Phalarope 1; Slender-billed Gull 1; Yellow Wagtail 1; Black-headed Wagtail 70; and Sedge Warbler 1. The protection status for these species are given in Table 5.21, Section 5.	Habitat destruction of wet meadows may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 13. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. • protect the wet meadow through the whole of this ESA from	**MODERATE IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Environmental Impact Table 17 (Maps 17A and 17B) (KPs 297.8 – 316.7): Erzurum Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		heavy equipment by moveable equipment mats plates. The nationally-threatened bird species within the Erzurum Plain IBA utilise a wide variety of habitats from reedbeds (Pintail, Common Crane, etc) to Shrub (Whinchat, etc) to mature woodland (Long Eared Owl). As such, all vegetation clearance throughout this area will be undertaken between August and March, thereby avoiding the critical bird breeding season. Areas of reeds and dense vegetation will be placed out of bounds for construction workers.	
Archaeology and Cultural Heritage			
The route passes through three archaeological sites: • Tasmasor Area (2nd Degree Site*) – southern part of this site is crossed by the route at the beginning of this section. This site has already been disturbed during construction of Iran-Turkey Natural Gas Pipeline. • Cayirca-Beypinari (2nd Degree Site*) – flat settlement. No architectural remains were observed. • Beypinari-Kahramanlar (2nd Degree Site*) – flat settlement. No architectural remains were observed. The majority of this site lies on the following map and is therefore discussed in Environmental Impact Table 18 (see Map 18A). Ortaduzu Settlement is a flat settlement located within the 100m Corridor to the south of the route but is not crossed.	Tasmasor Area, Cayirca-Beypinari settlement and Ortaduzu settlement will be directly impacted and suffer ground disturbance during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of these sites.	The extent of the Tasmasor Area site will be investigated during further field surveys prior to construction. This will determine the need for detailed surface research and/or rescue excavations at this site. Further investigation will be undertaken prior to construction to identify a safe route through Tasmasor Area and Cayirca-Beypinari sites. Specific mitigation to be developed following site investigations.	**MODERATE TO MINOR IMPACTS** Residual impacts cannot be determined precisely for the Tasmasor Area at this stage since the extent of this site is unknown. Archaeological investigations prior to construction will establish the full extent of the site. However, the Tasmasor Area has been already disturbed during construction of the gas pipeline and full reinstatement during construction of the BTC

Environmental Impact Table 17 (Maps 17A and 17B) (KPs 297.8 – 316.7): Erzurum Plain, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
* These sites have not yet been registered by the MoC and are provisionally assigned these classifications. Ortaduzu settlement, Cayirca-Beypinari and Beypinari-Kahramanlar have been proposed for registration by the regional preservation council		The pipeline has been re-routed to avoid impacts to the Ortaduzu settlement. This site will also be fenced. The construction Contractor will adhere to the requirements of the Cultural Heritage Management Plan during construction through these sites.	Pipeline may provide the potential for a positive impact and improve the setting of the site. **MODERATE TO MINOR IMPACTS** Residual impacts cannot be determined precisely for Cayirca-Beypinari settlement at this stage and will be subject to further investigation prior to construction. However as investigations are expected to find a safe route through this site, the ultimate scale of impact is likely to be minor. **MINOR IMPACTS** Assuming the site is fenced, impacts will be limited to the temporary disturbance of the setting of Ortaduzu settlement and its peripheral features.

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

Map 17: PROJECT INFORMATION			
There are no pump stations or construction camps in the area. There is one block valve station.			
Map 17: MAP HIGHLIGHTS			
• The pipeline crosses the Erzurum Plain is an important bird area and Tasmasor Area, an archaeological site. • Unclassified roads link local settlements. • Major town of Erzurum and airport in the area. • The pipeline crosses the Delicay creek. • The pipeline route crosses four land uses, rain fed agriculture, irrigated agriculture, pasture and non agricultural land. • Concrete canals carry water east to west across the surface.			
Map 17: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted:*** 10 settlements on this map will be directly impacted by the pipeline project: they all have land in the intersected by the proposed pipeline (Cayirtepe, Ortaduzu, Mulk, Caylica, Soguk Cermik, Seyh, Dadas, Yesilova, Altinbulak, Beypinari). Two are within 500m of the pipeline route (L) (Beypinari and Cayirtepe). One is within 2km of the block valve station (B) (Cayirtepe). None are within 5km of a construction camp (C) or pump station (P). Settlements impacted by traffic have not yet been identified. No settlements are downstream of a river/ creek crossing (R). • ***Surveyed:*** Three settlements (Cayirtepe, Sogucak, Beypinari) were surveyed in the field (S) and eight settlements were surveyed by telephone (T).			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Cayirtepe (L) (B) (S)			
• ***Demographics:*** 1450 inhabitants with 190 households. ***Safety:*** the centre of the settlement is 750m from pipeline, the nearest house in the settlement is 450m from the pipeline. • ***Health:*** lack of sewerage system with health implications. • ***Disputes:*** over natural resources, economic. No serious tensions between different ethnic groups. • ***Project attitude:*** positive, however there is concern about potential dust arising from construction damaging potato crops and cereals, and some concern about the cultural differences between locals and workers coming from elsewhere. Local residents want workers to be recruited from Erzurum. Also concerned that pipeline must not pass through cemetery. Natural gas pipeline left wires everywhere, hurting	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

children. It also damaged land and produce. There was incomplete reinstatement of land, damage to irrigation channels, and to roads. Expropriation payments were less than the amount spent by local residents on reinstatement of their lands. • ***Land ownership & use:*** 97% of land is privately owned by the local residents. • ***Settlement livelihood:*** main economic activities are agriculture (grain/cereals, sugar beet, fruit trees, potatoes) and animal husbandry for the production of milk. Also bee keeping (three households produce honey), education, local government, transport and trade. In addition, residents of Cayirtepe rely on cockfighting and selling pigeons as an additional source of income. • ***Availability & skills:*** there is pipeline experience. Heavy machine operators, food service, heavy vehicle operators, mechanics, tree fellers, drivers, security personnel and welders are available. 60% of those interviewed would accept a temporary job working on the pipeline construction. • ***Accessibility:*** 127km to Erzurum provincial centre and 8km to Erzurum district centre. • ***Information provision:*** 60% of the population is literate. TV and the telephone are the best information provision tools. • ***Environmental & cultural sites:*** a mausoleum / cemetery. The tomb of Cobandede is also in the area. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. There is electricity supply, however no sewerage or waste systems. • ***Services:*** there is no primary school and no health facilities. • ***Settlement problems:*** lack of water, education, poor health conditions, poor sewerage system leading to disease, and the need for more afforestation.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

		must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Accessibility of information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Skills & resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**Potential positive benefits** to local settlements.
	Block Valve Station See EIA tables and Overview of the Land Acquisition Process in Appendix C9		

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Sogucak (L) **(S)**			
• ***Demographics:*** 900 inhabitants with 145 households. Migration to metropolitan areas of Erzurum, Bursa and Istanbul is occurring. • ***Safety****:* settlement is situated 1.26km from pipeline. • ***Health:*** water from canals makes people sick; and local residents have constructed their own sewer system that passes through the settlement and consists of open water ducts which attract a huge numbers of flies. Earthquake prone area. There is a local spring that is believed to have a curing affect for urethra diseases. • ***Disputes:*** strangers not particularly welcome in settlement. • ***Project attitude:*** mixed, largely negative, as settlement has experienced three previous expropriations: NATO pipeline, auto industrial district and natural gas pipeline. Local residents are frustrated over low expropriation payments, and the fact that they had to spend these payments on reinstating their lands. Also, local residents now have to walk 500m around a road damaged by the natural gas pipeline construction. • ***Land ownership & use:*** most holdings are small-sized lands. 86% of land is privately owned by the local residents. • ***Settlement livelihood:*** main economic activity is working at nearby industrial site, or in local government. A low level of agriculture (grain & sugar beet) and animal husbandry is undertaken. Small sized farming is the dominant form. In addition, construction, transport, trade and education activities are undertaken. • ***Availability & skills:*** 60% of those interviewed would accept temporary employment on the pipeline construction. • ***Accessibility:*** 6.4km to Erzurum district centre. The settlement is located very close to a main road, and to an industrial site. • ***Information provision:*** 80% of the population is literate. TV and the telephone are the best local information provision tools. • ***Irrigation:*** natural water canals are highly contaminated and are not used for irrigation purposes. This is because the sewerage system is	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Conservative settlement*** Construction workers are more likely to offend inhabitants.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. **Construction workers to be remind**ed of the importance of appropriate	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **Low likelihood of significant impacts.** Impacts arising from

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

connected to the canals. • ***Infrastructure:*** piped water is available, however its supply is unreliable. There is also a household well and local spring. There is electricity, but no sewerage or waste disposal systems, although there is a settlement dump. • ***Services:*** there is also an elementary school with five teachers, however the quality of education provided in the settlement is poor. 90% of school-aged children attend; however, this may change if school asks for money to attend. There is also a mosque and affiliated Regional Boarding Koran Course; and a State Hospital in nearby Erzurum. • ***Settlement problems:*** lack of water, low income due to infertile lands, poor roads, dust and interest rates. • ***Other:*** conservative settlement with little freedom of expression for women.	***Negative experience*** Possible **opposition** to project and **increased sensitivity** to any negative impacts.	behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) to be carefully monitored. BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings.**	breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures. Level of residual impact will depend on degree to which concerns are resolved prior to construction.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Ortaduzu (L) (T)			
• ***Demographics:*** 790 inhabitants with seasonal migration of 9%. • ***Safety****:* settlement is situated 2.1km from pipeline, the nearest house in the settlement is 1.9km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** primary landownership is communal land. Seasonal grazing occurs. There is no irrigation.	***Land*** Potential complications in expropriation process. ***Construction hazards: animals***	**See Overview of the Land Acquisition Process in Appendix C9.** **Livestock crossings** will be established at locations	**See Overview of the Land Acquisition Process in Appendix C9.** **Potential for accidents involving livestock.**

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

• ***Settlement livelihood:*** agriculture, trade, construction and local government are the main sources of livelihood. • ***Accessibility:*** 14km from Erzurum district centre. The settlement is accessible all year. • ***Information provision:*** 98% of the population is literate. TV and radio are the best information provision tools. • ***Infrastructure:*** piped water is available, however supply is irregular. Nearby settlements provide an alternative water source. • ***Settlement problems:*** poor access to water and access routes to the plateau are closed.	Trench poses safety hazard for livestock.	agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Mulk (L) (T)			
• ***Demographics:*** 200 inhabitants. • ***Safety:*** the centre of the settlement is situated 1.5km from pipeline, the nearest house in the settlement is 1.4km • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** primary landownership is communal land (60%). Seasonal grazing occurs. There is no irrigation. • ***Settlement livelihood:*** agriculture, trade and local government are the main sources of livelihood. • ***Accessibility:*** 13km to Erzurum district/provincial centre. The settlement is accessible all year round. • ***Information provision:*** 98% of the population is literate. The best information provision tools are TV and via family members. • ***Environmental & cultural sites:*** nearby plateau. • ***Infrastructure:*** piped water is available, however supply is irregular. A settlement fountain provides an alternative water source. • ***Settlement problems:*** poor access to water and poor irrigation.	***Land*** Potential complications in expropriation process. ***Accessibility to information*** Sectors of the population may not have access to	**See Overview of the Land Acquisition Process in Appendix C9.** ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. **Communication with settlement** must take into	**See Overview of the Land Acquisition Process in Appendix C9.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **Any change can highlight and exacerbate existing**

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

	project related information on employment opportunities, potential disruption to utilities, etc. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	account settlement characteristics to ensure equal access to information for all residents. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**divisions** in communities. Mitigation measures will keep this to a minimum. **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Caylica (L) (T)			
• ***Demographics:*** 150 inhabitants. • ***Safety****:* settlement is situated 800m from the pipeline. • ***Health:*** poor drinking water quality. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive. • ***Land ownership & use:*** 90% of land is privately owned by the local residents. Seasonal grazing occurs. There is no irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (one household produces honey in addition to other income sources), education, local government and tourism are the main sources of livelihood. • ***Accessibility:*** 14km to Erzurum district/provincial centre. The settlement has poor accessibility from December to February. • ***Information provision:*** 70% of the population is literate. The best information provision tools include TV, radio, the Muhtar and via family members. • ***Environmental & cultural sites:*** caves • ***Infrastructure:*** piped water is available, however supply is irregular. A settlement fountain provides alternative water source.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals***	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.**

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

A settlement fountain provides alternative water source. • ***Settlement problems:*** inadequate access to land, infrastructure problems and poor drinking water quality.	Trench poses safety hazard for livestock. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified.	Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Accessibility of recruitment*** Decreased access to recruitment process.	**In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Dadas (L) (T)			
• ***Demographics:*** 1,100 inhabitants. • ***Safety****:* settlement is situated 3.75km from pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 50% of land is communally owned. Seasonal grazing and seasonal irrigation occurs. • ***Settlement livelihood:*** agriculture, manufacturing, construction, transport, trade, education and local government are the main sources of livelihood. • ***Accessibility:*** the settlement forms an outer suburb of Erzurum Town.	***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	**See Overview of the Land Acquisition Process in Appendix C9.** Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**See Overview of the Land Acquisition Process in Appendix C9.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

Town. • ***Information provision:*** 70% of the population is literate. The best information provision tools include TV, radio, newspaper and the Internet. • ***Infrastructure:*** piped water is available year round. There is no alternative water source. • ***Services:*** close to the state hospital in Erzurum. • ***Settlement problems:*** unemployment.	***Accessibility of information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of livestock danger.	compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yesilova (L) (T)			
• ***Demographics:*** 137 inhabitants. • ***Safety:*** settlement is situated 2.3km from pipeline. • ***Project attitude:*** generally positive with no major concerns. • ***Land ownership & use:*** 90% of land is privately owned by the local residents. Seasonal grazing occurs and irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (three households produce honey as one of a number of income sources), trade and local government are the main sources of livelihood. • ***Accessibility:*** Settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. The best information provision tools include TV, newspaper, radio and via family members.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **High likelihood of a few accidents involving livestock.** Financial compensation will be given.

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

family members. • ***Environmental & cultural sites:*** caves, park. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** unemployment, poor access to water and inadequate access to land.	***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	erected in areas of danger for livestock. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Altinbulak (L) **(T)**			
• ***Demographics:*** 590 inhabitants. • ***Safety:*** settlement is situated 2.3km from pipeline. • ***Health:*** lack of sewerage system resulting in disease. • ***Disputes:*** economic causes are the main source of disputes. • ***Project attitude:*** generally positive, but little awareness. • ***Land ownership & use:*** 40% of land is privately owned by the local residents. Seasonal grazing occurs and irrigation activities are undertaken.		***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill**	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

undertaken. • ***Settlement livelihood:*** agriculture, tourism • ***Accessibility:*** The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. • ***Infrastructure:*** piped water is available, however supply is irregular. An artesian well provides an alternative water source. • ***Settlement problems:*** poor health conditions, poor sewerage system and low incomes.		settlement to be immediately warned and alternative sources of water to be provided.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Beypinari (L) (D) (S)			
• ***Demographics:*** 672 inhabitants with 100 households. • ***Safety:*** the centre of the settlement is situated 700m from pipeline and the nearest house in the settlement is 300m from the pipeline. • ***Disputes:*** economic causes are the main source of disputes. • ***Project attitude:*** mixed, but largely negative. The natural gas pipeline damaged land and pasture (lands were not reinstated, mud overflow which affected harvests, stock grazing on damaged pastures affected). This was not compensated. In addition, construction cut and blocked water supplied from the mountains, and after construction works, lands turned into swamps. Kurdish people from southeastern Turkey were employed rather than unemployed locals. After paying lawyers fees, little money remaining from compensation. 73% of those interviewed would accept a temporary job working on the pipeline construction.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.
• ***Land ownership & use:*** 65% of land is privately owned by the local residents and 20% is communally owned. Seasonal grazing occurs. There is no irrigation. • ***Settlement livelihood:*** main economic activities are agriculture (predominantly cereals but also vegetables and herbs) and animal husbandry. In addition, manufacturing, construction, trade and education are undertaken. Milk production is also a significant economic activity. Four households work as civil servants in	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards:***	**Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be	**Any additional damage will be compensated for.** **Potential for accidents**

Social Impact Table 17 (Map 17C) (KPs 297.79 – 316.77): Erzurum Plain, Erzurum Province

Erzurum. • ***Availability & skills:*** previous pipeline construction experience. Heavy machine operators, heavy vehicle drivers, tree fellers and security personnel are available. • ***Accessibility:*** 18km to Erzurum provincial centre and 8.32km to district centre. A problem free, smooth road linking the settlement with the district centre in a 15-20 minute drive. • ***Information provision:*** 95% of the population is literate. • ***Environmental & cultural sites:*** bone remains of Armenians from the Armenian genocide believed to be in Timar settlement. Historical bridge with '8 niches' under which there is believed to be buried treasure. • ***Infrastructure:*** piped water is available, however supply is irregular. Each house has access to the water supply system. There is no alternative water source. There is electricity and a sewerage system, however, there is no waste disposal system. • ***Services:*** There is no primary school. There is a health care centre and a nurse. • ***Settlement problems:*** unemployment.	***animals*** Trench poses safety hazard for livestock. ***Skills and resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Previous negative experiences*** Possible **opposition** to project and **increased sensitivity** to any negative impacts.	established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints. BOTAS is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be remind**ed of the importance of appropriate behaviour in daily **briefings.**	**involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Potential positive benefits** to local settlements. Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Environmental Impact Table 18 (Maps 18A and 18B) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Mesic Coarse-loamy to Coarse-silty Xerochrepts.	Soil related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Other potential impacts will include: • soil erosion; • sediment yield; • reduced soil productivity; • contaminated soils; • waterlogged soils.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.

Environmental Impact Table 18 (Maps 18A and 18B) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Support equipment on moveable mats. • Avoid freshly irrigated soils.	
Landscape and Visual			
West of Erzurum, the route crosses gently undulating ground, still agricultural but less intensive with poorer soils and, no longer irrigated, more arid. Settlements are fairly frequent, and a number of electricity lines are prominent in the landscape. The route crosses the Pasayurdu Creek, a small river in a pretty, broad, wet marshy valley – the only area with any significant landscape interest along this map section. At KP328 the route crosses a highway, a spur of which continues parallel to the route for about 10km. BVS-017 will be located at KP 322.1 on cultivated land. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 35m in length.	Generally there is a potential for low and short-term construction-related visual impacts, however, visual impacts of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular,	**INDIRECT POSITIVE IMPACT** Landscape is considered resilient to change due to its existing depleted state. Any commensurate enhancements of the degraded NGP alignment will result in a net improvement to the landscape.

Environmental Impact Table 18 (Maps 18A and 18B) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2).	
Groundwater			
The route passes over short distances of unconfined aquifer throughout this section. Water samples taken from Well Site No.9 (Kayapa Settlement Spring), c. 1km east of the route (KPs 317.1 – 325.7), indicate that groundwater quality is Class II.	Potential for moderate and localised impacts to groundwater quality from construction activities.	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including: • No groundwater abstraction within 50m of springs or wells. Groundwater will not be abstracted for use as hydrotest water. • No facilities (construction camps, pipe yards, fuel stores etc) will be located within 50m of springs or wells.	**MINOR IMPACT** With the application of the specified mitigation measures described, only minor impacts are expected to occur, which will be short-term in nature.
Noise			
Hourly measurements were taken at Karsmanlar and Pasayurdu settlements (Leq values of 50.8 dBA and 59.5 dBA respectively). Values for Karsmanlar settlement are typical of a more rural settlement. Pasayurdu is located c. 127m from the centreline of the Pipeline. Kasmanlar settlement is located c. 364m of the Pipeline and is adjacent to provincial highway crossing.	Noise impacts are expected to occur at Pasayurdu settlement during: • soil stripping; • welding/lowering; • backfilling. Karmanlar settlement will also experience noise impacts	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels;	**MINOR IMPACT** Noise impacts are expected to occur at Pasayurdu during soil stripping and welding/lowering activities. Each individual activity will be short-term in nature, lasting for a few days at a time.

Environmental Impact Table 18 (Maps 18A and 18B) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	during sheet-piling works at the highway crossing in this area.	• all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, (such as the use of acoustic enclosures for stationary plant and the use of noise barriers), for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	Assuming that the mitigation measures described are applied throughout the construction phase, no significant impacts are expected to occur at Pasayurdu during backfilling or at Kasmanlar during piling.
Archaeology and Cultural Heritage			
The following archaeological sites are located within the 100m Corridor: • Alaybeyi Settlement (3rd Degree Site*) - flat settlement, lying south of the route. No architectural remains are visible due to agricultural activities. Poccik Road (3rd Degree Site*) - flat settlement, lying south of the pipeline. No architectural remains are visible due to agricultural activities.Beypinari-Kahramanlar (2nd Degree Site*) is a flat settlement that will be crossed by the BTC Pipeline route. No architectural remains were observed. * These sites have not yet been registered by the MoC and are provisionally assigned these classifications.	All three sites will potentially be directly impacted and suffer ground disturbance during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of these sites.	Further investigation will be undertaken to route a safe path through Beypinari-Kahramanlar settlement. This will determine the need for detailed surface research and/or rescue excavations at this site. The construction Contractor will adhere to the requirements of the Cultural Heritage Management Plan during construction through this site.	**MODERATE TO MINOR IMPACTS** Residual impacts cannot be determined precisely for Beypinari-Kahramanlar settlement at this stage and will be subject to further investigation prior to construction. However as investigations are expected to find a safe route through this

Environmental Impact Table 18 (Maps 18A and 18B) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Beypinari-Kahramanlar, Alabeyli settlement and Poccik Road have been proposed for registration by the regional preservation council		Alabeyli and Poccik Road archaeological sites have been avoided through re-routing of the Pipeline. Potential impacts will therefore be avoided at these sites. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	site, the ultimate scale of impact is likely to be minor. **MINOR IMPACTS** Assuming Alabeyli and Poccik Road sites are fenced, impacts will be limited to the temporary disturbance of the setting of the sites and peripheral features.
The foloowing have been proposed for registration by the regional preservation council: (i) Kahramanlar (Karaz) mound; (ii) Karaz mound; (iii) Kahramanlar cemetery			

Social Impact Table 18 (Maps 18C) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

Map 18: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There is one block valve station.

Map 18: MAP HIGHLIGHTS

- Area contains Karaz Mound, an archaeological site.
- Unclassified roads link local settlements and National Highway crosses the pipeline.
- Railway passes through area.
- The pipeline crosses two creeks.
- The primary land use in most settlements is agriculture.

IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** eight settlements on this map will have land impacted by the pipeline (L) (Cigdemli, Pasayurdu, Kahramanlar, Ebulhindi (Alaybey), Alaca, Gelinkaya, Karsmaniar and Bascakmak). Two settlements are within 500m of the pipeline (D) (Pasayurdu and Karsmaniar (Kahramanlar). One (Ebulhindi/ Alaybey), is within 2km of the block valve station (B). None are within 5km of a construction camp (C) or pump station (P). Settlements impacted by traffic have not yet been identified. Cigdemli is located downstream of the pipeline.

- ***Surveyed:*** one settlement (Cigdemli) was surveyed in the field (S) and 7 settlements surveyed by telephone (T).
- ***Not surveyed:*** Karsmaniar (650m from the pipeline, surrounds the archaeological site of Karaz Mound), Kuscu (1.23km from pipeline), Kayapa (1.5km from pipeline) and Ebulhindi (1.3km from pipeline).
- ***Not on map:*** Kuscu, Gelinkaya and Bascakmak.
- ***Disclosure Meeting Location:*** Kahramanlar, Pasayurdu

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Cigdemli (L) (S)			
• ***Demographics:*** 1,000 inhabitants with 120 households. • ***Safety:*** settlement is situated 2.2km from pipeline. • ***Disputes:*** natural resources, economic, women will liase only with female 'outsiders', not males. • ***Project attitude:*** generally positive. Previous experience with natural gas pipeline. Have expectations of new income-generating activities. 72% of those interviewed have high expectations of direct-employment opportunities and 18% have expectations of land compensation. 54% believe there will be no constraints. 18% think	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 18 (Maps 18C) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

compensation. 54% believe there will be no constraints. 18% think there will be noise and dust impacts, and 18% believe traffic will increase and cause damage to roads. • ***Land ownership & use:*** 60% of the land is privately owned by the local residents. Many title deeds were obtained during natural gas pipeline construction. Grazing occurs and seasonal irrigation activities are undertaken. • ***Settlement livelihood:*** predominantly transportation (there are 60 trucks in the settlement that were used for the natural gas pipeline). Very few households carry out agricultural (grain, vegetables, herbs, sugar beet) and animal husbandry activities. Also some bee keeping (five – six households produce honey), manufacturing, construction, trade, education and local government are the main sources of livelihood. • ***Availability & skills:*** previous pipeline construction and operation experience. Carpenters, heavy machine operators, food service, heavy vehicle operators, drivers, security personnel and welders are available. 91% of those interviewed would accept a temporary job working on the pipeline construction. • ***Accessibility:*** 20km to Erzurum provincial centre and 9km to Ilica district centre. The settlement is accessible all year round. • ***Information provision:*** 100% of the population is literate. • ***Environmental & cultural sites:*** ancient cemetery close to existing pipeline. Also, it is reported that remains from the Byzantine period were excavated during the natural gas pipeline project. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. The settlement is very developed. There is an electricity supply and sewerage system, but no waste disposal system • ***Services:*** there is no primary school, but there is a health centre with three staff including a doctor and a midwife. • ***Settlement problems:*** unemployment, bad roads and dust.	***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Conservative settlement*** Construction workers are more likely to offend inhabitants ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) to be carefully monitored **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be	**Potential positive benefits** to local settlements. **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Low likelihood of significant impacts.** Impacts arising from breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 18 (Maps 18C) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

		discussed at meetings before and during construction.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Pasayurdu (L) (D) (T)			
• ***Demographics:*** 270 inhabitants. • ***Safety****:* the centre of the settlement is 500m from the pipeline, the nearest house in the settlement is 250m from the pipeline.. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive even though the settlement is exceptionally close. • ***Land ownership & use:*** primary landowner is the local residents (70%). Seasonal irrigation is undertaken. There is no grazing. • ***Settlement livelihood:*** agriculture, hunting and local government are the main sources of livelihood. • ***Accessibility:*** 10km to Ilica district centre. The settlement is accessible all year round. • ***Information provision:*** 95% of the population is literate. TV, newspapers, the Internet and family members are the best information provision tools. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** infrastructure problems, low income and unemployment.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Hunting*** Temporary reduction in game due to disturbance during construction.	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** Significance cannot be established at this time.

Social Impact Table 18 (Maps 18C) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kahramanlar (L) (D) (T)			
• ***Demographics:*** 346 inhabitants with seasonal migration of 1%. • ***Safety:*** settlement is situated 376m from pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 45% of land is privately owned by the local residents. No grazing or irrigation occurs. • ***Settlement livelihood:*** agriculture, local government. • ***Accessibility:*** 5km to district centre. The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. Best information provision tools include TV and the newspaper. • ***Infrastructure:*** piped water is available, however supply is irregular. There is also a stored water supply. • ***Settlement problems:*** unemployment, inadequate access to water and infrastructure problems	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison**	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 18 (Maps 18C) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

and infrastructure problems.	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**meetings held** during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Ebulhindi (Alaybey) (L) (T)			
• ***Demographics:*** 305 inhabitants with seasonal migration of 47%. • ***Safety:*** the settlement is situated 1.5km from pipeline, and the nearest house in the settlement is 1.3km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 70% of land is privately owned by the local residents. There is no grazing. Seasonal irrigation occurs. • ***Settlement livelihood:*** agriculture, local government. • ***Accessibility:*** The settlement is accessible all year round. • ***Information provision:*** 60% of the population is literate. TV, radio and the newspaper are the best information provision tools. • ***Infrastructure:*** piped water is not available. Water supply is irregular. A local spring is used as a water source. • ***Settlement problems:*** poor access to water, low incomes and unemployment.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Accessibility of recruitment*** Decreased access to recruitment process.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected.**

Social Impact Table 18 (Maps 18C) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

	Drinking water Potential for disruption or contamination of drinking water during construction	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	**No residual impact.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Alaca (L) **(T)**			
• ***Demographics:*** 520 inhabitants. • ***Safety:*** settlement is situated 4km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** all land is privately owned by local residents. Seasonal irrigation occurs. • ***Settlement livelihood:*** agriculture, tourism and local government are the main sources of livelihood. • ***Accessibility:*** 13km to district centre. The settlement is accessible all year. • ***Information provision:*** 98% of the population is literate. TV and radio are the best information provision tools. • ***Environmental & cultural sites:*** martyr monument. • ***Infrastructure:*** piped water is supplied to households, however, supply is irregular. A stored water supply provides an alternative water source. • ***Settlement problems:*** inadequate access to water, low incomes and unemployment.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Gelinkaya (L) **(T)**			
• ***Demographics:*** 630 inhabitants with seasonal migration of 5%. • ***Safety:*** the centre of the settlement is 3.4km from pipeline.	***Land*** Potential complications in	**See Overview of the Land**	**See Overview of the Land**

Social Impact Table 18 (Maps 18C) (KPs 316.7 – 335.7):
Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

• ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive. • ***Land ownership & use:*** 50% of land is communally owned. There is no irrigation or grazing. • ***Settlement livelihood:*** agriculture, bee keeping (two households produce honey for their own consumption), local government. • ***Accessibility:*** 18km to district centre. The settlement is accessible all year round. • ***Information provision:*** 90% of the population is literate. The best information provision tools include TV, newspaper, family and the Muhtar. • ***Environmental & cultural sites:*** castle, caves. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. A settlement fountain provides an alternative water source. • ***Settlement problems:*** poor roads, poor health care and infrastructure problems.	expropriation process. ***Special site*** Refer to Environmental Impact Tables.	**Acquisition Process in Appendix C9.** ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**Acquisition Process in Appendix C9.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Bascakmak (L) (T)			
• ***Demographics:*** 1,510 inhabitants with seasonal migration of 5%. • ***Safety:*** the centre of the settlement is 4.8km from pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 50% of land is privately owned by local residents and 50% is communally owned. Seasonal grazing occurs and irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (five households produce honey), transport, construction, trade and local government are the main areas of livelihood. • ***Accessibility:*** 20km to district centre. The settlement is accessible all year. • ***Information provision:*** 99% of the population is literate. TV, the	***Land*** Potential complications in expropriation process ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	**See Overview of the Land Acquisition Process in Appendix C9.** Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**See Overview of the Land Acquisition Process in Appendix C9.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 18 (Maps 18C) (KPs 316.7 – 335.7): Karsmanlar Settlement to West of Pasayurdu Settlement, Erzurum Province

newspaper and via family members are the best information provision tools. • ***Environmental & cultural sites:*** area around barrage. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. A stored water supply provides an alternative water source.	***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Environmental Impact Table 19 (Maps 19A and 19B) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soils up to KP 340 comprise Mesic Coarse-loamy to Coarse-silty Xerochrepts.	Soil related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Other potential impacts include: • soil erosion; • sediment yield; • reduced soil productivity; • contaminated soils; • waterlogged soils.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.

Environmental Impact Table 19 (Maps 19A and 19B) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Support equipment on moveable mats. • Avoid freshly irrigated soils.	
Soils from KP 340 comprise: • Mesic Fine-loamy to Loamy-skeletal Shallow Typic Xerochrepts on sloping lands. • Possible Xerofluvents on some valley bottom sites near stream and river channels. • Typic Xerorthents on most valley bottoms.	Potential soil productivity and other negative impacts of the NGP accrue to the BTC Pipeline wherever their RoWs lie closely parallel. For the BTC Pipeline other potential impacts include: • soil erosion; • sediment yield; • soil productivity.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.

Environmental Impact Table 19 (Maps 19A and 19B) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Sediment interception. • Bio-restoration. • Channel stabilisation - see typical drawings.	
Landscape and Visual			
Generally unremarkable agricultural landscapes, predominantly under cereals. Major highway runs parallel to route until KP 338. From hereon degraded and eroded steppe occurs intermittently with cereals and pastureland on low, rounded, undulating hills. It crosses the Karasu, a wide, fast-flowing river in a broad shingle bed with grass banks, much overgrazed by cattle. Its meanders create visual interest within this exposed landscape. At KP 345 the broad, very wet, marshy valley of the Hoskadem River is crossed providing a further local focus of interest. Industrial and military areas add to the settled character of the area. Irrigated agriculture occurs close to the rivers. BVS-018 and BVS-019 will both be located within cultivated land at KP 344.4 and KP 346.6, respectively. Approximately 350m^2 of permanent landtake required for each site. A new access road will be constructed to BVS-018 of 65m in length and to BVS-019 of c. 45m.	Generally low and short-term construction-related visual impacts, however, visual impacts of the gas pipeline, which was not reinstated, are potentially exacerbated by the BTC Pipeline, wherever their RoWs lie closely or parallel. The marshland either side of the Hoskadem River will be vulnerable to insensitive use of plant and damage will be highly visible. Potential impacts and their	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to	**INDIRECT POSITIVE IMPACT** where the BTC and NGP corridors are successfully reinstated.

Environmental Impact Table 19 (Maps 19A and 19B) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	management during BVS construction will be the same as those during pipeline construction.	ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Near the Hoskadem River, measures to reduce the impact of heavy machinery will include route narrowing, and use of moveable equipment mats to spread vehicle weight and avoid deep rutting. Construction will be undertaken at the driest (July to September) time of the year. Removal/replacement of turfs will be necessary if schedules dictate work during wetter periods (April to June).	
Surface Waters			
The route crosses Karasu River (Kandilli) (KPs 340.5 – 341.8), which supports a major proportion of the aquatic life in the region. River channel is irregular and meandering, with alternating bars and a trapezoidal cross-section. Width of crossing is 35m, with a bank-full width of 29m and a floodplain of between 35 and 175m. Bed consists of sand and gravel and the flow is perennial of a pool and riffle type. Bank-side vegetation comprises shrubs and riparian vegetation is absent. Water quality samples taken 60m upstream of the crossing point indicate that this river is a Class IV river.	Disturbance directly through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in already poor water quality. Therefore, potential for short-term sedimentation and turbidity.	Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, for the protection of surface waters, including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench.	**MINOR IMPACT** Disturbance will be limited to the immediate working area. Sedimentation of Karasu River (Kandilli) will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.

Environmental Impact Table 19 (Maps 19A and 19B) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	Potential impacts on downstream ecology and water abstraction for human use.	Assess need for alternative water supply for downstream communities and provide where necessary if sedimentation and turbidity persist for more than 3 days at the community.	
Ecology			
Important Ecological Factors 5 nationally-threatened bird species were recorded in this section - Black Kite (14 at Karasu River crossing (KP 345.6) and 21 at KP 347.2), Bluethroat 3, Barred Warbler 1, and Whinchat 1 (all at Hoskadem River crossing, KP 348.0) and Booted Eagle (1 near KP 352.6). The protection status for these species are given in Table 5.21, Section 5. Only fish species of medium commercial value (see EMMP, Appendix C1) breed in the Karasu River, and include chub (*Leuciscus cephalus*), from April to June, nose carp (*Chondrostoma regium*), from March to May and transcaucasian barb (*Capoeta capoeta angorae*), from May to June.	Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss at the Hoskadem River crossing, if construction is undertaken during the breeding season (ie between April and July inclusive, although the Black Kite and Booted Eagle breed from as early as March). July can remain sensitive for late and second broods. Temporary disturbance to breeding fish species and aquatic plants providing spawning sites for these species during construction across the Karasu River.	Clearance of potential breeding habitat of the Bluethroat and Barred Warbler (ie riverside trees, shrubs and thickets) in advance of the construction of the Karasu and Hoskadem River crossings to be undertaken outside the April to July period. Preconstruction surveys will establish the presence of potential nesting sites for the Booted Eagle and Black Kite within 500m of the pipeline route. If nesting sites are identified, avoidance of construction activity from March to July. Preconstruction survey for evidence of past Black Kite nesting sites. If nesting sites are found within the RoW these will be removed prior to March and after July; where those within 250m of the RoW are observed in April and if nesting is occurring, construction will be avoided until July.	**MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to March, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACTS** at most for all fish species if construction takes place during July to February inclusive. At other times of year (varying by species), impacts will generally be **MINOR** on the basis of the rigid application of water crossing mitigation measures.

Environmental Impact Table 19 (Maps 19A and 19B) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Shrubs and dense vegetation along the RoW will be cleared outside the breeding season for the Whinchat (April to July). For construction activity to be permitted during the breeding season of fish species with medium commercial value, the Contractor will be required to submit specific mitigation measures to avoid impacting breeding fish to BOTAŞ for approval. Such measures might include, but not be limited to, the following: preconstruction survey results indicating that spawning grounds are avoided, the provision of fish passages, etc, in addition to the generic mitigation measures that are required at all river crossings.	
Archaeology and Cultural Heritage			
The following has been proposed for registration by the regional preservation council: (i) Abdalcik mound; (ii) Abdalcik Cemetery			

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

Map 19: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There are two block valve stations.

Map 19: MAP HIGHLIGHTS

- Unclassified roads link local settlements.
- There are two national highways in the area, one bisects pipeline and one travels parallel to pipeline, c. 2m away from it.
- The pipeline route crosses two rivers.
- The primary land use for most settlements is animal husbandry and agriculture.

MAP 19: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** seven settlements on this map will be directly impacted by the pipeline project (Caykoy, Karabiyik, Abdalcik, Gulludere, Tazegul, Merdiven and Ortabahce). They will all have land intersected by the proposed pipeline (L) and all are within 500m of the pipeline route except Tazegul, Merdiven and Ortabahce (D). One (Karabiyik) is within 2km of the block valve stations (B). None are within 5km of a construction camp (C) or a pump station (P). Settlements impacted by traffic have not yet been identified. There are no settlements downstream of a river/ creek crossing.

- ***Surveyed:*** two settlements (Caykoy and Kandilli) were surveyed in the field (S) and three settlements surveyed by telephone (T).

SITES SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Caykoy (L) (D) (S)			
• ***Demographics:*** 745 inhabitants with 142 households. • ***Safety:*** the centre of the settlement is 1km from pipeline and the nearest house in the settlement is 900m from the pipeline. • ***Health:*** drinking water has been correlated with ill health. • ***Disputes:*** the settlement is divided into 2 groups – those supporting the school principal and those supporting the Muhtar. Also, there are land conflicts between families. Women have no freedom of expression. • ***Project attitude:*** largely positive, however, this settlement will be experiencing expropriation for the 6th time with the BTC project. The State Hydraulic Works, BOTAŞ and other infrastructure related companies have undertaken construction in the settlement, causing damage each time. Past amounts promised for land acquisition were not paid. Different amounts paid for adjacent fields. Local residents	***Conflicts over land boundaries*** Exacerbation of existing conflicts.	**Land boundaries to remain clearly demarcated** at all times. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative	**No significant residual impacts.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

have a preference for the land owner, not the Muhtar to participate in the determination of land prices. 91% of those interviewed believe there will be direct-employment benefits of the project. 72% believe there will be no conflict and 9% believe there will be noise, dust and road traffic impacts. • ***Land ownership & use:*** 90% of the land is privately owned by residents. Land ownership is small-sized. Grazing occurs. Seasonal irrigation is undertaken on some lands. • ***Settlement livelihood:*** main economic activities are agriculture (cereals and sugar beet) and animal husbandry. • ***Availability & skills:*** previous pipeline experience. 82% of those interviewed would accept a temporary job working on the pipeline construction. • ***Accessibility:*** 40km to Erzurum provincial centre and 12km to Askale district centre. The settlement is located on a main road and is accessible all year round. The road is currently being re-asphalted. • ***Information provision:*** 99% of the population is literate. • ***Environmental & cultural sites:*** yes, there are old settlement ruins on the Serceme river on the north of the settlement. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. Household wells provide an alternative water source. Serious infrastructure problems. There is a sewerage system that does not work and there is no waste disposal system and frequent breakdowns in electricity network. • ***Services:*** there is a primary school, and there is a health care centre. Traditional health techniques are also used. • ***Settlement problems:*** predominantly unemployment, also no profit in produce, low incomes, poor roads and dust.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	sources of water to be provided. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include using appropriate channels of communication and media. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Karabiyik (L) (D) (B) (T)			
• ***Demographics:*** 130 inhabitants. • ***Safety:*** the centre of the settlement is 1km from pipeline, the nearest	***Construction hazards: human***	**Road safety training will be**	**Continued attention** to

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

house in the settlement is 700m from the pipeline. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive. • ***Land ownership & use:*** 75% of the land is privately owned by the local residents. Seasonal grazing is undertaken and irrigation occurs. • ***Settlement livelihood:*** agriculture, hunting, construction, education and local government are the main sources of livelihood. • ***Availability & skills:*** previous experience with Iran-Ankara natural gas project. • ***Accessibility:*** 16km to Askale district centre. The settlement is accessible all year. • ***Information provision:*** 80% of the population is literate. The best information provision tools include the newspaper and via family. • ***Environmental & cultural sites:*** nearby hills • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** debt, low income and unemployment.	Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance during construction	**held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger to livestock. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior to construction.	mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. Significance cannot be established at this time**.**

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

		Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Block Valve Station*** See EIA tables and Overview of the Land Acquisition Process in Appendix C9	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kandilli (S)			
• ***Demographics:*** 3,000 inhabitants (1,800 military personnel and 1,200 civilians) in 255 households (175 military residences and 80 civilian). Most civilian residents migrate to Erzurum during winter and return to the settlement for the harvest season. • ***Safety:*** the centre of the settlement is 2.5km from pipeline, the nearest house in the settlement is 1.9km from the pipeline.	***Land*** Potential complications in expropriation process. ***Irrigation***	**See Overview of the Land Acquisition Process in Appendix C9.** Contractor will **consult** with	**See Overview of the Land Acquisition Process in Appendix C9.** **If irrigation water is**

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

• ***Disputes:*** this is an area where terrorist organisations conduct activities. • ***Project attitude:*** mixed – there is concern about a 3rd pipeline being constructed near their settlement as previous projects led to roads being damaged and there is a history of low expropriation payments. Also, during the natural gas pipeline construction, locals were informed that 'no other expropriation would be made in the future and that the area expropriated for the natural gas pipeline would be used for future works'. • ***Land ownership & use:*** 55% of land is privately owned by the local residents and 20% is communally owned. There is a concentrated land ownership structure. The mobile population tends to own larger areas of land than the permanent population. Grazing occurs. Seasonal irrigation is undertaken, however, irrigation facilities are limited. • ***Settlement livelihood:*** main economic activities are agriculture (grain -predominantly cereals with some lentils, vegetables, herbs, sugar beet), animal husbandry, trade and public services. In addition, bee keeping, fishing, hunting is undertaken. Very mobile population. Half of population are soldiers. Military facilities and the Koy-Tur poultry facilities provide payment for water, thus further contributing to income of Kandilli municipality. • ***Availability & skills:*** previous pipeline and construction experience. 55% of those interviewed would accept a temporary job working on the pipeline construction. • ***Accessibility:*** 38km to Erzurum provincial centre and x km to district centre. A 20km poor quality local access road links the settlement with the main road. The settlement is, however, accessible all year. • ***Information provision:*** 90% of the population is literate. TV is the best local information provision tool. • ***Environmental & cultural site:*** Karabizik Inn. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. There is no sewerage system, however there is a waste disposal system and a settlement dump.	Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility of recruitment*** Decreased access to recruitment process. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Hunting*** Temporary reduction in game due to disturbance during construction.	authorities to determine maximum acceptable time for disruption. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects	**disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No residual impact expected.** **Potential positive benefits** to local settlements Significance cannot be established at this time***.***

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

• ***Services:*** there is a primary school and a health centre with a midwife and a doctor. • ***Settlement problems:*** unemployment, no profit in produce and low incomes.	***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	complaints procedure. **Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Abdalcik (L) (D) (T)			
• ***Demographics:*** 430 inhabitants. • ***Safety:*** settlement is situated 650m from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 60% of land is privately owned by the local residents. There is no irrigation and no grazing. • ***Settlement livelihood:*** Agriculture, tourism. • ***Accessibility:*** the settlement is 8.6km from the district centre. • ***Information provision:*** 90% of the population is literate. TV and via family members are the best information provision tools. • ***Infrastructure:*** there is no piped water supply. Instead a local spring provides water. • ***Settlement problems:*** poor access to water, poor roads and unemployment.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. ***Groundwater***	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **If there is any long term**

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

		During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**impact on water sources**, appropriate alternatives to be provided by the Project.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Gulludere (L) (D) (T)			
• ***Demographics:*** 600 inhabitants with 85 households. Extensive migration to Izmir occurred in the 1950s. • ***Safety:*** the centre of the settlement is situated 1km from pipeline and the nearest house in the pipeline is 900m from the pipeline. • ***Disputes:*** political instability. • ***Project attitude:*** males are against the pipeline, women have mixed feelings. Any construction will need to be undertaken in a more sensitive manner than that undertaken for the natural gas pipeline; and in undertaking the cadastral survey in the early 1990s. Any tree removed during construction should be replaced. Roads must not be damaged. • ***Land ownership & use:*** all households in the settlement have land. Medium and large-sized farming is dominant. 40% of land is privately owned by the local residents. A renewed cadastral survey is needed to correct the existing situation whereby there are erroneous deeds. (only 7 acres out of 50 acres are cadastred). Seasonal grazing occurs. There is no irrigation. • ***Settlement livelihood:*** main economic activities are agriculture (potatoes, wheat, barley, clover, sugar beet, beans, animal feeds & vegetables) and animal husbandry (directed towards milk production). However, in last three years, there has been a serious decline in	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

available water for irrigation. In addition, bee keeping (1 household produces honey for own consumption), construction, local government activities are undertaken. • ***Available Skills:*** previous experience with Iran-Ankara natural gas project. • ***Accessibility:*** 70km to Erzurum provincial centre and 8km to Askale district centre. The road to the district centre is poorly constructed and not suitable for transportation, however it is open during the winter, and is accessible all year. A new road is being constructed. • ***Information provision:*** 98% of the population is literate. The best information provision tools include TV, family and the newspaper. • ***Environmental & cultural sites:*** plateau; an old Armenian settlement, however, people are afraid to talk about its history due to allegations surrounding the Armenian genocide. South of settlement is the Tomb of Meram Baba, the remnant of a castle from the Seljukian period. Excavation works are carried out and gold is extracted. • ***Infrastructure:*** piped water is available, however supply is irregular (ie only available for two hours per day). A stored water supply provides an alternative water source. There has been a decline in the amount of underground water originating in the mountains. Due to poor rainfall droughts occur. • ***Services:*** problems with telephone network. Poor water supply. All local residents go to the Askale marketplace on Mondays. There is a primary school with two teachers (four more expected) and 90 students. Parents do not allow girls to attend the 8-year school after 5 years. There is also an un-staffed health centre. • ***Settlement problems:*** poor access to water, political instability and poor irrigation.	***Forest*** Loss of a resource used by settlements. Increased expenditure on other fuel sources. ***Negative experience*** Possible **opposition** to project and **increased sensitivity** to any negative impacts. ***Land*** Potential complications in expropriation process.	for livestock. If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure. BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be remind**ed of the importance of appropriate behaviour in daily **briefings.** **See Overview of the Land Acquisition Process in Appendix C9.**	facilitated by the Projects complaints procedure. **Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement. Level of residual impact will depend on degree to which concerns are resolved prior to construction. **See Overview of the Land Acquisition Process in Appendix C9.**

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Conservative settlement Construction workers are more likely to offend inhabitants	**Construction workers will be reminded** of the importance of appropriate behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) to be carefully	**Low likelihood of significant impacts.** Potential for impacts arising from breeches of rules and procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures.

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

		monitored	
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
Tazegul (L) **(T)**			
• ***Demographics:*** 450 inhabitants with 30% seasonal migration. • ***Safety:*** the centre of the settlement is 3.8km from pipeline and the nearest house in the settlement is 3.5km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 99% of land is privately owned by local residents. Irrigation is not undertaken. • ***Settlement livelihood:*** agriculture, transport, construction, education and local government are the main sources of livelihood. • ***Accessibility:*** The settlement is accessible all year. • ***Information provision:*** 100% of the population is literate. The best	***Accessibility to recruitment*** Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

information provision tools include TV and the newspaper. • ***Environmental & cultural site:*** dome, plains. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. There is also a stored water supply. • ***Settlement problems:*** inadequate access to water, low income and housing problem.			
Ortabahce (L) (T)	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
• ***Demographics:*** 976 inhabitants. • ***Safety:*** the centre of the settlement is 5.6km from pipeline and the nearest house in the settlement is 5.2km. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive with no major concerns. • ***Land ownership & use:*** 50% of land is communally owned. Seasonal grazing occurs and irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, transport, education and local government are the main sources of livelihood. • ***Accessibility:*** The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. The best information provision tools include TV, the Muhtar and family members. • ***Environmental & cultural sites:*** tumulus, plateau, lake and Gedik region. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. A stored water supply provides an alternative source. • ***Settlement problems:*** low income, poor drinking water quality and poor irrigation.	***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Accessibility of information*** Sectors of the population	**See Overview of the Land Acquisition Process in Appendix C9.** Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Livestock crossings** will be established at locations agreed with the community. **Communication with settlement** must take into	**See Overview of the Land Acquisition Process in Appendix C9.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Any change can highlight and exacerbate existing**

Social Impact Table 19 (Map 19C) (KPs 335.7 – 359.1): East of Pasa Creek to West of Gulludede Settlement, Erzurum Province

	may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	account settlement characteristics to ensure equal access to information for all residents.	**divisions** in communities. Mitigation measures will keep this to a minimum.
Merdiven (L) (T)	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
• ***Demographics:*** 770 inhabitants. • ***Safety:*** the centre of the settlement is 3km from pipeline. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive. • ***Land ownership & use:*** 70% of land is privately owned by local residents. Seasonal grazing occurs and irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, trade, education and local government are the main sources of livelihood. • ***Accessibility:*** 11km to district centre. There is poor accessibility from September to February. • ***Information provision:*** 99% of the population is literate. The best information provision tools include TV, radio, the newspaper, family members and the Muhtar. • ***Environmental & cultural sites:*** mausoleum, plateau, caves. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. Stored water supply provides an alternative source. • ***Settlement problems:*** infrastructure problems, inadequate childcare facilities.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Accessibility to recruitment*** Decreased access to recruitment process.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No residual impact expected.**

Environmental Impact Table 20 (Maps 20A and 20B) (KPs 359.1 – 381.5): Kilickaya Mountains, Erzurum/Erzincan Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Fine-loamy to Loamy-skeletal Shallow Typic Xerochrepts on sloping lands. • Possible Xerofluvents on some valley bottom sites near stream and river channels • Typic Xerorthents on most valley bottoms. • Disturbed parent material. • Mesic Clayey-skeletal to Loamy-skeletal Typic Xerochrepts.	Soil related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Other potential impacts include: • soil erosion; • sediment yield; • soil productivity; • altered drainages.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.

Environmental Impact Table 20 (Maps 20A and 20B) (KPs 359.1 – 381.5): Kilickaya Mountains, Erzurum/Erzincan Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	
Landscape and Visual			
As the pipeline route moves west from Askale, it begins to ascend the southern foothills of the Otlukbeli Mountains – a series of rolling hills covered with patchy oak scrub woodlands and degraded steppe used for grazing. Small areas of farming occupy the valley-bottom. Minor streams and rivers are often incised, with channel relief increasing with discharge. The route follows the main highway through a winding valley. The landscapes are unremarkable and have been degraded further by the un-reinstated NGP.	Visual liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures	**INDIRECT POSITIVE IMPACT** Landscape is considered resilient to change due to its existing depleted state. Any commensurate enhancements of the degraded NGP alignment will result in a net improvement to the landscape.

Environmental Impact Table 20 (Maps 20A and 20B) (KPs 359.1 – 381.5): Kilickaya Mountains, Erzurum/Erzincan Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2).	
Surface Waters			
The pipeline route crosses Degirmen Creek near KP 375.4, which is also a tributary of Tuz Creek. BVS-020 will be located at KP 376.2, c. 120m from Degirmen Creek. A new access road will be constructed to the BVS site of c. 135m in length.	Existing RoW of the NGP contributes to the sediment load in the channel. Sediment obstructs the river bed. Potential for short-term sedimentation and turbidity of Degirmen Creek and Tuz Creek, during pipeline construction and construction activities associated with BVS-020.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor at this watercourse crossing impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2).	**INDIRECT POSITIVE IMPACT** where the Degirmen Creek crossing previously disturbed during construction of the NGP is reinstated. **MINOR IMPACTS** Although the water quality classification for Dergirmen Creek is unknown, only minor impacts are expected during construction of both the Pipeline and BVS, as disturbance will be limited to the immediate working area. Sedimentation of Degirmen Creek will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.

Environmental Impact Table 20 (Maps 20A and 20B) (KPs 359.1 – 381.5): Kilickaya Mountains, Erzurum/Erzincan Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, for the protection of surface waters, including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench.	
Ecology			
Important Ecological Factors ESA 14 is identified between KP 359.9 and KP 360.4 for one nationally-threatened plant species, *Tchihatchewia isatidea*. The IUCN status for this species is given in Table 5.20, Section 5. ESA 15 begins at KP 380.4 and continues onto the next map. This ESA is discussed in Environmental Impact Table 21 (see Map 21B). Near KP 359.4, 2 Whinchat (nationally- threatened) were recorded. The protection status for this species is given in Table 5.21, Section 5.	Habitat destruction of plain steppe may result in the loss of individuals from populations of nationally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 14 & 15. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during	**MINOR IMPACT** Short-term disturbance to nationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Environmental Impact Table 20 (Maps 20A and 20B) (KPs 359.1 – 381.5): Kilickaya Mountains, Erzurum/Erzincan Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		until replacement during reinstatement of the RoW. Shrubs and dense vegetation along the RoW will be cleared outside the breeding season for the Whinchat.	
Noise			
Catalbayir settlement in Askale District, Erzurum Province is located c. 96m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Catalbayir settlement during soil stripping, welding/lowering and backfilling activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be	**MODERATE IMPACT** Due to the proximity of the site to the Pipeline, noise impacts are likely to occur during soil stripping, welding/lowering and backfilling despite noise mitigation measures. However, noise impacts will be short-term occurring for one to two days during each phase of construction. Mobile noise barriers will be utilised to screen plant.

Environmental Impact Table 20 (Maps 20A and 20B) (KPs 359.1 – 381.5): Kilickaya Mountains, Erzurum/Erzincan Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		minimised to the maximum extent possible as part of the PPP (see Appendix C4).	

Social Impact Table 20 (Map 20C) (KPs 359.1 – 381.2): Kilickaya Mountains, Erzurum/Erzincan Border

Map 20: PROJECT INFORMATION			
There are no pump stations or construction camps in the area. There is a block valve station.			
Map 20: MAP HIGHLIGHTS			
• Pipeline runs along the Kilickaya Mountains. • Several creeks cross the pipeline. • The National Highway runs along the path of the pipeline. • Primary land uses are animal husbandry, particularly for milk production, and agriculture (wheat, barley, wild vetch, clover and animal fodder).			
IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted:*** six settlements on this map will be directly impacted by the pipeline project (Yenikoy, Hacihamza, Kukurtlu, Catalbayir, Musatafabey, and Hacibayram). They will all have land intersected by the proposed pipeline (L). Three are within 500m of the pipeline route (Catalbayir, Hacihamza, Kukurtlu) (D). None are within 5km of a construction camp (C) or pump station (P). Two (Musatafabey and Golkdere) are within 2km of a block valve station. Settlements impacted by traffic have not yet been identified. • ***Surveyed:*** 13 settlements were surveyed by telephone (T). • ***Not surveyed:*** Allombasikomi, Musatafabey (1.6km from the pipeline), Gokdere (1.4km from the pipeline), Rizabey Komu (1.1km from the pipeline), Hacibayram (1.75km from the pipeline), Rikanoglu Komu (1.45km from the pipeline), Cinar. • ***Not on map:*** Allombasikomi, Cinar, Agaclar, Gaziler, Gunesken, Kaynak and Senpinar. • ***Disclosure Meeting Location:*** Yenikoy			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Yenikoy (L) **(T)**			
• ***Demographics:*** 2,000 inhabitants in 180 households with seasonal migration of 10%. • ***Safety:*** settlement is situated 1.25km from pipeline, the nearest house in the settlement is 1km from the pipeline. • ***Settlement conflicts:*** very conservative settlement with no female participation. A number of different political parties supported within the settlement. • ***Project attitude:*** positive, however, promises made during construction of natural gas pipeline were not kept. Fields were destroyed, payment for lands was low, and land inherited but not	***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 20 (Map 20C) (KPs 359.1 – 381.2): Kilickaya Mountains, Erzurum/Erzincan Border

destroyed, payment for lands was low, and land inherited but not legally owned caused problems. In addition, lands were not levelled or reinstated, trees were felled, and soil was dumped into creeks, destroying them. • ***Land ownership & use:*** 70% of land is owned communally, although the Muhtar noted that 90% of householders have land. There is some livestock grazing and no irrigation. • ***Settlement livelihood:*** main economic activities are agriculture (wheat, barley, rye & animal feed), animal husbandry and local government are the main sources of livelihood. In addition, some bee keeping (two households produce honey as one of a number of income sources), construction, and trade activities are undertaken. • ***Accessibility:*** 67km to Erzurum provincial centre and 12km to Askale district centre. The settlement is located 3-4km from main road and is accessible all year. • ***Information provision:*** 50% of the population is literate. The best information provision tools include TV and via family members. • ***Environmental & cultural sites:*** castle, caves. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. A settlement fountain provides an alternative water source. • ***Services:*** there is an elementary school with eight teachers and a health clinic. • ***Settlement problems:*** inadequate access to water, low income and unemployment.	***Land*** Potential complications in expropriation process. ***Accessibility of information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Conservative*** Construction workers are more likely to offend inhabitants	**See Overview of the Land Acquisition Process in Appendix C9.** ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) to be carefully	**See Overview of the Land Acquisition Process in Appendix C9** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Low likelihood of significant impacts.** Impacts arising from breeches of rules and procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures.

Social Impact Table 20 (Map 20C) (KPs 359.1 – 381.2): Kilickaya Mountains, Erzurum/Erzincan Border

	Negative experience Possible **opposition** to project and **increased sensitivity** to any negative impacts.	monitored BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings.**	Level of residual impact will depend on degree to which concerns are resolved prior to construction.
Hacihamza (L) (D) (T)	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
• ***Demographics:*** 56 inhabitants with seasonal migration of 20% • ***Safety:*** the centre of the settlement is 1km from pipeline and the nearest house in the settlement is 800m from the pipeline. . • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** all land is privately owned by the local residents. There is no irrigation and no seasonal grazing. • ***Settlement livelihood:*** agriculture, education and local government are the main sources of livelihood. • ***Available Skills:*** previous experience with NGP project. • ***Accessibility:*** 9km to Askale district centre. Poor accessibility from December to February. • ***Information provision:*** 50% of the population is literate. The best information provision tools include TV and the newspaper.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.**

Social Impact Table 20 (Map 20C) (KPs 359.1 – 381.2): Kilickaya Mountains, Erzurum/Erzincan Border

• ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** unemployment, low income and inadequate childcare facilities.	***Accessibility to information*** Decreased access to recruitment process. ***Accessibility of recruitment*** Decreased access to recruitment process.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected.**
Kukurtlu (L) (D) (T)	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
• ***Demographics:*** 200 inhabitants with 30% seasonal migration. • ***Safety:*** the centre of the settlement is 600m from pipeline. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive. • ***Land ownership & use:*** 85% of land is privately owned by the local residents. There is no grazing and no irrigation. • ***Settlement livelihood:*** agriculture, construction, trade and local government are the main sources of livelihood. • ***Accessibility:*** 14km to Askale district centre. The settlement is accessible all year round. • ***Information provision:*** 80% of the population is literate. The best information provision tools include TV and the family. • ***Environmental & cultural site:*** a mausoleum. • ***Infrastructure:*** piped water is not available. A settlement fountain provides water.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.**

Social Impact Table 20 (Map 20C) (KPs 359.1 – 381.2): Kilickaya Mountains, Erzurum/Erzincan Border

• ***Settlement problems:*** inadequate access to water, low income and unemployment.	affected if mitigation measures not fully implemented. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Accessibility of recruitment*** Decreased access to recruitment process.	immediately following construction will identify any additional land that has been affected. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected.**
Catalbayir (L) (D) (T)	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
• ***Demographics:*** 60 inhabitants with 19% seasonal migration. • ***Safety:*** the settlement is situated 250m from pipeline and the nearest house in the settlement is 100m from the pipeline. • ***Project attitude:*** mixed – the natural gas pipeline affected the local residents badly and they are concerned that this will happen again. • ***Land ownership & use:*** 60% of land is privately owned by the local residents. There is no irrigation. • ***Settlement livelihood:*** animal husbandry, hunting, local government. • ***Accessibility:*** 16km to Askale district centre. The settlement is accessible all year.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 20 (Map 20C) (KPs 359.1 – 381.2): Kilickaya Mountains, Erzurum/Erzincan Border

• ***Information provision:*** 90% of the population is literate. The best information provision tools include TV, radio and family members. • ***Environmental & cultural sites:*** mausoleum, plateau and caves. • ***Infrastructure:*** piped water is not available. Settlement fountain provides water source. • ***Settlement problems:*** inadequate access to water, low income and construction problems.		settlement is within 500 m of construction work.	
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	Significance cannot be established at this time***.***
	Drinking water Potential for disruption or contamination of drinking water during construction	The need for an **alternative source of water** will be evaluated prior to construction, and if	**No residual impact.**

Social Impact Table 20 (Map 20C) (KPs 359.1 – 381.2): Kilickaya Mountains, Erzurum/Erzincan Border

	Negative experience Possible **opposition** to project and **increased sensitivity** to any negative impacts.	necessary will be provided by the project. BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings.**	Level of residual impact will depend on degree to which concerns are resolved prior to construction.
Agaclar (T)	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
• ***Demographics:*** 315 inhabitants. • ***Safety:*** the centre of the settlement is 3.1km from pipeline and the nearest house in the settlement is 3km from the pipeline. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive. • ***Land ownership & use:*** 60% of land is privately owned by local residents. Seasonal irrigation is undertaken. • ***Settlement livelihood:*** agriculture, trade and local government are the main sources of livelihood. • ***Available Skills:*** previous experience in water canals construction project.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 20 (Map 20C) (KPs 359.1 – 381.2): Kilickaya Mountains, Erzurum/Erzincan Border

• ***Accessibility:*** 15km to district centre. The settlement is accessible all year round. • ***Information provision:*** 98% of the population is literate. The best information provision tools include TV and the telephone. • ***Environmental & cultural sites:*** castle. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** inadequate access to water and poor roads.			
Gaziler (T)	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
• ***Demographics:*** 315 inhabitants. • ***Safety:*** the centre of the settlement is 4km from pipeline. • ***Health:*** earthquake area. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 65% of land is privately owned by the local residents . Seasonal irrigation activities are undertaken. There is no grazing. • ***Settlement livelihood:*** agriculture, bee keeping (10 households produce honey as one of a number of income sources), fishing (one household), hunting, trade and local government are the main source of livelihood. • ***Accessibility:*** 15km to district centre. The settlement is accessible all year. • ***Information provision:*** 98% of the population is literate. The best information provision tools include TV and the telephone. • ***Environmental & cultural sites:*** mausoleum, plateau. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. A settlement fountain provides an alternative water source. • ***Settlement problems:*** insufficient vehicles for transportation and inadequate health care facilities.	***Hunting*** Temporary reduction in game due to disturbance during construction. ***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats if within 2 km downstream of a river crossing.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. **Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be	**Significance cannot be established at this time.** **No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.

Social Impact Table 20 (Map 20C) (KPs 359.1 – 381.2): Kilickaya Mountains, Erzurum/Erzincan Border

	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	compensation will be facilitated by the Projects complaints procedure. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
Gunesken (T)	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
• ***Demographics:*** 375 inhabitants. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 80% of land is communally owned. Seasonal grazing occurs. There is no irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (four households produce honey as one of a number of income sources) and local government are the main sources of livelihood. • ***Accessibility:*** 16.5km to district centre. The settlement is accessible all year.	***Land*** Potential complications in expropriation process. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**See Overview of the Land Acquisition Process in Appendix C9.** **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger	**See Overview of the Land Acquisition Process in Appendix C9.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be

Social Impact Table 20 (Map 20C) (KPs 359.1 – 381.2): Kilickaya Mountains, Erzurum/Erzincan Border

all year. • ***Information provision:*** 100% of the population is literate. The best information provision tools include TV and radio. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** inadequate access to water and housing problems.		for livestock.	facilitated by the Projects complaints procedure.
Kaynak (T)	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
• ***Demographics:*** 202 inhabitants, with 11% seasonal migration. • ***Safety:*** settlement is situated 710m from pipeline. • ***Project attitude:*** no information collected. • ***Land ownership & use:*** primary landownership is communal (60%). There is no grazing and no irrigation. • ***Settlement livelihood:*** agriculture and bee keeping (six households produce honey, as one of a number of income sources) are the main sources of livelihood. • ***Accessibility:*** The settlement is accessible all year round. • ***Information provision:*** 98% of the population is literate. The best information provision tools include TV and the telephone. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** the settlement needs a bridge and has inadequate access to land.	***Accessibility of recruitment*** Decreased access to recruitment process. ***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**No residual impact expected.** **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.**

Social Impact Table 20 (Map 20C) (KPs 359.1 – 381.2): Kilickaya Mountains, Erzurum/Erzincan Border

Senpinar (T)	ADDITIONAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
• ***Demographics:*** 184 inhabitants. • ***Safety:*** settlement is situated 4.1km from pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 55% of land is privately owned by the local residents. Seasonal irrigation is undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (6 households produce honey, for own consumption), education and local government are the main sources of livelihood. • ***Accessibility:*** 13km to district centre. The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. The best information provision tools are TV and the telephone. • ***Environmental & cultural sites:*** mausoleum, forest. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** unemployment and low profits.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Forest*** Loss of a resource used by settlements. Increased expenditure on other fuel sources.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.

Environmental Impact Table 21 (Maps 21A and 21B) (KPs 381.5 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Disturbed parent material: • Mesic Clayey-skeletal to Loamy-skeletal Typic Xerochrepts; • Mesic Loamy Xerorthents or Calcixerolls on valley alluvium; • Mesic Xerochrepts associating with Xerorthents and channel gravels on fluvial lands.	Potential soil productivity liabilities of the NGP are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. For the BTC Pipeline other potential impacts include: • soil erosion; • sediment yield; • soil productivity; • altered drainages.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.

Environmental Impact Table 21 (Maps 21A and 21B) (KPs 381.5 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	
Landscape and Visual			
The low-sensitivity landscape is characterised by hilly over-grazed steppe interspersed with arable land and numerous small streams feeding the Euphrates River. West of Tercan the route descends to agricultural land on the broad, flatter river terraces of the Karasu River. Trees are much more in evidence here, often forming field boundaries and clumps along the stream banks. Eroded jagged mountains form a backdrop.	Visual liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management.	**INDIRECT POSITIVE IMPACT** Low sensitivity landscape is considered resilient to change. Any commensurate enhancements of the degraded NGP alignment will result in a net improvement to the landscape.

Environmental Impact Table 21 (Maps 21A and 21B) (KPs 381.5 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2).	
Surface Waters			
Route crosses Karamansi Creek at KP 381.1, which is a tributary of Tuz Creek and flows into the reservoir inlet of the existing Tercan Reservoir. Confluence with Tuz Creek is upstream of Yaylacik settlement. Kayaoglu Creek is crossed by the route at KP 389.1. This watercourse flows through Tercan settlement before joining with Tuzla River, which flows into the reservoir inlet of the existing Tercan Reservoir. Route crosses Sor Creek between KPs 389.1 – 391.9, Kislaginsuyu River between KPs 392.6 – 393.3 and Yoncalarin Creek between KPs 393.5 – 396.0. All three watercourses are tributaries of Tuzla River, which then flows into the reservoir inlet of the existing Tercan Reservoir. Kislaginsuyu River and Yoncalarin Creek are crossed by the route and are also tributaries of the Tuzla River, which discharges into the reservoir inlet of the existing Tercan Reservoir.	Existing RoW of the NGP contributes to the sediment load in the channel. Sediment obstructs the river beds. Disturbance, directly through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Therefore, potential for short-term sedimentation and turbidity.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor at these watercourse crossings impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, to avoid sedimentation and turbidity including measures to protect surface waters, such as sediment	**INDIRECT POSITIVE IMPACT** where the watercourse crossings in this section previously disturbed during construction of the gas pipeline are reinstated. **MINOR IMPACTS** Although the water quality classifications for these five watercourses are unknown, only minor impacts expected, as disturbance will be limited to the immediate working area. Sedimentation of all watercourses crossed in this section will only be visible for less than 3 weeks after construction, with no obscuration of the river bed. The impacts of any sediment mobilised during pipeline construction will not be transmitted as far as the Tercan Reservoir.

Environmental Impact Table 21 (Maps 21A and 21B) (KPs 381.5 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		filters/trapping devices, settling ponds and trench de-watering.	
Ecology			
Important Ecological Factors ESA 15 is identified between KP 380.4 and KP 402.0 for twelve globally-threatened plant species (*Gypsophila tuberculosa, Carduus acanthoides spp. sintenisii, Cousinia sintenisii, Tanacetum albipannosum, Hesperis berviscapa, Isatis erzurumica, Stachys subnuda, Astragalus trachytricus, Glaucium cappadocicum, Acantholimon spirizianum var. multiflorum, Thesium stellerioides* and *Verbascum heterodontum*)and four nationally-threatened species (*Helichrysum arenarium var. erzincanicum, Alyssum anatolicum, Tchihatchewia isatidea* and *Acantholimon kotschyi sp. laxispicatum*). A further globally-threatened plant (*Achillea sintenisii*) occurs just outside the 500m Corridor. The IUCN status for these species are given in Table 5.20, Section 5. ESA 15 spans a length of c. 21.6km of the pipeline route and occupies short stretches of Maps 20B and 22B and all of Map 21B. This ESA comprises one of the most sensitive stretches of montane steppe habitat along the route. The Grey Wolf was recorded at KP 388.5. This species is not globally-threatened and has no protection in Turkey, although it is protected under CITES, the Bern Convention and the EU Habitats Directive. At KP 382.1, 4 Pale Rock Sparrow (nationally-threatened) were recorded. The protection status for this species is given in Table 5.21, Section 5.	Habitat destruction of plain steppe may result in the loss of individuals from populations of globally-threatened plants. Potential for minor temporary impacts to wolves as hunting of this species is permitted in Turkey. However, this species is nomadic during spring and summer, which are the optimum months during which pipeline construction is likely to occur. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 15 (entire map). Diligence will be exercised in searching inside the corridor for those species known to occur just outside of the corridor. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. In areas where the presence of	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for wolves with the application of the specified mitigation measures. **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Environmental Impact Table 21 (Maps 21A and 21B) (KPs 381.5 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		wolves has been confirmed, education of workers to be alert and aware of the potential for interactions will include refuse management on sites (particularly where construction camps are located). Furthermore, workers must not wander alone in areas where wolves may be present, especially at night. The hunting of wolves or any other wildlife by the BTC Project Personnel or contractors will be strictly forbidden and rigorously enforced. Shrubs and dense vegetation along the RoW will be cleared outside the breeding season for the Pale Rock Sparrow.	

Erzincan Socio-Economic Overview

Demographics:
Erzincan is the third smallest of the surveyed provinces in terms of population (280,000), with 14% of this overall population located within the pipeline corridor. Almost 50% of the province population live in rural areas and density levels are relatively low at 34 people per km2. Out-migration is experienced by rural and, to a lesser extent, urban areas. Population levels have increased due to high birth rates and the return of inhabitants during the rebuilding phase following the 1992 earthquake in the province. The largest religious mix along the pipeline is found here with 44% of surveyed households Alevi Muslim, 37% Sunni Muslim and 19% Shafi Muslim.

Land:
According to the State Institute for Statistics (SIS), 37% of agricultural land in the province is irrigated, resulting in diverse agricultural production, including fruits and industrial crops. In the surveyed settlements, land is primarily owned privately by villagers (and is relatively evenly distributed) and secondly is communally owned. Along with Adana and Kahramanmaras, it is one of the highest crop producing provinces along the pipeline.

Livelihoods:
Economically, settlements in the province are similar to other Eastern Anatolian rural settlements and are generally based on agriculture and animal husbandry. Villagers are poor compared to western regions. Residents indicated that State agricultural policies have brought additional problems to the economic situation. Nevertheless, the province was ranked the second most affluent of the surveyed provinces in terms of average household income and assets.

Infrastructure & Services:
There are insufficient infrastructure facilities and services in most settlements. However, the electricity, water and telephone availability was rated as being of moderate to good regularity. Some settlements have primary schools, however in others, children have to travel daily to neighbouring settlements or district centres. Average literacy rates are high (87%) and 72% of respondents have received at least primary or secondary education. Only 2% of respondents have attended university. The settlements have no health centres and generally have to go to the nearest district or town centre for medical treatment.

Key Problems:
Low income is the main problem identified by residents in the settlements. This has been recently exacerbated by increased expenditure on agricultural inputs (e.g. diesel oil, fertilizers). Unemployment is another key problem in these settlements, attributed by participants to a shortage of agricultural opportunities.

Project Attitude:
Villagers are generally negative towards the pipeline, notably due to previous experience (of the East Anatolian Natural Gas Pipeline Project). They perceive that infrastructure will be damaged and no compensation will be given. Villagers are keen to participate in the construction phase and are particularly keen for their younger generations to be involved. Local traders expect the project to increase demand for regional raw materials (e.g. rocks, sand, gravel), manufactured goods (e.g. foodstuffs, cement, bricks) and regional services (e.g. transportation).

Source: Household and Settlement Survey (2001)

Social Impact Table 21 (Map 21C) (KPs 381.2 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

MAP 21: PROJECT INFORMATION

There are no pump stations, construction camps or block valve stations in the area.

MAP 21: MAP HIGHLIGHTS

- Mixed rolling and hilly terrain devoted to grazing.
- Undulating plains support rainfed cereals and irrigated crops.
- The pipeline crosses the Kislaginsuyu River, the Kavaoglu Creek, the Karamanasi Creek and the Yoncalarin Creek.
- Low living standards compared to western regions.
- Rising settlement population levels following an increase in birth rate and return of inhabitants following the 1992 earthquake.
- This province has experienced the NGP.

MAP 21: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** four settlements (Tercan, Aktas, Topalhasan, Begendik) will be directly impacted by the pipeline project. All of these have land intersected by the proposed pipeline (L) and two settlements (Topalhasan, Begendik) are within 500m of the pipeline route (D). No settlements are within 5km of a construction camp (C) or pump station (P), or within 2km of a block valve station (B). Settlements impacted by traffic have not yet been identified. There are three settlements downstream of a river/creek crossing (Topalhasan is downstream on the Kislaginsuyu River, Tercan is downstream of the Kayaoglu Creek and Catakdere is downstream of the Yoncalarin Creek) (R).

- ***Surveyed:*** one settlement (Tercan) was surveyed in the field (S) and four settlements (Aktas, Topalhasan, Karacaviran, Begendik) were surveyed by telephone (T).

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Tercan (L) (district centre) (T/S)			
• ***Demographics:*** 10,898 inhabitants with 1,424 households. There is no reported change in population and there is no seasonal migration. • ***Safety:*** the centre of the settlement is 1.5km from the pipeline. • ***Health:*** there are health problems due to the condition of water including goitre and kidney dysfunctions. • ***Project attitude:*** inhabitants would welcome a construction camp. The general attitude towards the pipeline is positive and supportive. The key concerns relate to issues of compensation, damage restoration, information availability, equal employment opportunity, employee treatment and immediate response to complaints.	***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 21 (Map 21C) (KPs 381.2 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

• ***Land ownership & use:*** 60% of land is owned by villagers and 40% is state owned. The landowners have title deeds. There is cultivation of cereals, sugar cane, sugar beet and vegetables. There is also irrigation using permanent channels. There grazing all year round and the main livestock are cattle, sheep and poultry. There is fishing but no hunting. • ***Settlement livelihood:*** agriculture, animal husbandry, bee keeping (ten households, one of many sources of income), fishing (six households, for their consumption) manufacturing, education, trade are the main economic activities. 10% of inhabitants are unemployed (for more than a year), 10% have regular paid jobs and 60% of inhabitants are farmers. • ***Availability & skills:*** there has been previous experience of a pipeline project. The experience has been negative due to the damage that was done to roads and land, but the revenues brought into the district in general seem to have resulted in a more positive attitude. 4 of the 24 possible construction skills including pipe laying, heavy machinery drivers, operators and security personnel are available. 46% of the inhabitants are willing to accept temporary jobs. In addition, there are local resources available including soil and stone quarries. • ***Accessibility:*** the settlement is the district centre, it has good quality asphalt roads that are available all year round. • **Information provision:** Literacy rate is 90%. The main local sources of information are family, friends and neighbours. The main national sources are TV, radio, and newspapers. • ***Environmental & cultural sites:*** religious building and graves. • ***Services:*** phone and mobile services present. Other services include a market, library, bank, police, post office and coffee houses. There are primary and secondary schools with 200 teachers. Health facilities are present, and there are midwives, doctors and a state hospital. • ***Infrastructure:*** there is a regular supply of piped water. There is electricity infrastructure and a sewerage system present but there is no formal waste system.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation. ***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing. ***Skills & Resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Sensitive vegetation used by bees*** Dust may affect yields of	**Information is highlighted to Contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. **Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure. **Information will be highlighted to Contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. **Effectiveness of dust suppression** methods to be	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full **Potential positive benefits** to local settlements **No significant impacts** predicted if dust suppression

Social Impact Table 21 (Map 21C) (KPs 381.2 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

no formal waste system. • ***Settlement problems:*** the settlement life standard is deteriorating due to general economic problems. Low income, problems together with agricultural quotas and unemployment are the other key problems.	vegetation (e.g. grey clover) essential for nectar production.	monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Aktas (L) (T)			
• ***Demographics:*** 180 inhabitants. There has been an increase in the population. 1% of the population migrates seasonally. • ***Safety:*** the settlement centre is 1.8km from the pipeline. • Project attitude: a construction camp would be welcome. There is general awareness of the pipeline and there are no major concerns. • ***Land ownership & use:*** 65% of land is owned by villagers. There is seasonal grazing and temporary irrigation. There is also hunting, bee keeping and fishing. • ***Settlement livelihood:*** agriculture, hunting and trade. Fishing (six households, for their own consumption) and bee keeping (four households, one of many sources of income) also takes place. 90% of inhabitants are family labourers. • ***Availability & skills:*** there is previous experience of the Iran - Ankara natural gas. • ***Accessibility:*** the settlement is not accessible all year round. The settlement is 4km from the district centre. • ***Information provision:*** Literacy rate is 95%. The local sources of information are TV, family, Muhtar and the national sources are TV and the Muhtar. • ***Environmental & cultural sites:*** none • ***Infrastructure:*** there is piped regular water supply. The settlement fountain is an alternative source of water.	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance during construction.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of construction danger to livestock. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Significance cannot be established at this time.**

Social Impact Table 21 (Map 21C) (KPs 381.2 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

• ***Settlement problems:*** inadequate access to water, poor roads and housing problems.		subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport need to be **taken into account** in the recruitment strategy.	**No residual impact expected.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Topalhasan (L) (D) (T)			
• ***Demographics:*** 30 inhabitants. There has been a recent increase in population. 25% of the population migrates. • ***Safety:*** the settlement centre is 900m from the pipeline. • ***Project attitude:*** a construction camp would be welcome. There is general awareness of the pipeline project, and there are no major	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison**	**Continued attention** to mitigation measures will be critical to prevent injury.

Social Impact Table 21 (Map 21C) (KPs 381.2 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

general awareness of the pipeline project, and there are no major concerns. • ***Land ownership & use:*** 70% of land is owned by villagers. There is seasonal grazing and temporary irrigation. • ***Settlement livelihood:*** agriculture and bee keeping (three households, as one of two sources of income). There are no fisheries. 100% of the inhabitants are farmers. • ***Availability & skills:*** no previous experience. • ***Accessibility:*** the settlement is not accessible and the distance from the settlement to the district centre is 4km. • ***Information provision:*** Literacy rate is 98%. The local sources of information are TV, family, newspapers and the national sources are TV, newspaper and family members. • ***Infrastructure:*** there is a piped although irregular supply of water. A settlement fountain serves as the alternate source of water. • ***Settlement problems:*** housing problems, inadequate water access and infrastructure problems	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	**meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of construction danger to livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300 meters from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original	**Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of

Social Impact Table 21 (Map 21C) (KPs 381.2 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

		position for 15-20 days prior to moving back close to their original location.	compensation will be facilitated by the Projects complaints procedure.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. In event of a spill settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
	Sensitive vegetation used by bees Dust may affect yields of vegetation (e.g. grey clover) essential for nectar	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 21 (Map 21C) (KPs 381.2 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

	production.	**Community liaison meetings:** issue to be discussed at meetings before and during construction.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Karacaviran (T)			
• ***Demographics:*** 90 inhabitants. There has been an increase in population. 25% of the population migrates. • ***Safety:*** 2km from the pipeline. • ***Project attitude:*** a construction camp would be welcome. There is a general awareness about the project, and there are no major concerns. • ***Land ownership & use:*** villagers privately own all the land. There is seasonal grazing. There is no fishing, bee keeping or irrigation. • ***Settlement livelihood:*** agriculture is the main source of livelihood. 15% of inhabitants have been unemployed for more than a year and 50% are farmers. • ***Availability & skills:*** no previous experience. • ***Accessibility:*** the settlement is accessible between March & August. The settlement is 6km to Tercan district centre. • ***Information provision:*** Literacy rate is 99%. The local sources of information are TV, radio, newspapers and the national sources are TV, newspaper and family members. • ***Infrastructure:*** there is a piped regular supply of water, stored water is the alternative water source. • ***Settlement problems:*** inadequate access to water, inadequate childcare facilities, poor roads.	***Accessibility to recruitment*** Decreased access to recruitment process ***Construction hazards: animals*** Trench poses safety hazard for livestock.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of construction danger for livestock.	**No residual impact expected** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 21 (Map 21C) (KPs 381.2 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Begendik (L) (D) (T)			
• ***Demographics:*** 840 inhabitants. There has been a recent increase in population. 50% of the population migrate. • ***Safety:*** the settlement centre is 926m from the pipeline. • ***Project attitude:*** a construction camp would be welcome. There is a general awareness about the project, and there are no major concerns. • ***Land ownership & use:*** 80% of land is owned by villagers. There is seasonal grazing. There is no fishing, bee keeping or temporary irrigation. • ***Settlement livelihood:*** agriculture is the main source of income. 90% of inhabitants are farmers. • ***Availability & skills:*** no previous experience. • ***Accessibility:*** It is 8km to the district centre. • ***Information provision:*** Literacy rate is 99%. The local and national sources of information are TV, radio and newspapers. • ***Infrastructure:*** there is a piped although irregular supply of water. Spring water is the alternative water source. • ***Settlement problems:*** unemployment, housing problems and inadequate access to water.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Accessibility to recruitment*** Decreased access to recruitment process.	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations as agreed with the community. Stock proof fencing will be erected in areas of construction danger for livestock. Winter road closures, seasonal migration and poor transport need to be **taken into account** in the recruitment strategy.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No residual impact expected**

Social Impact Table 21 (Map 21C) (KPs 381.2 – 401.1): Karamansi Creek to South of Corgu Creek, Erzincan Province

		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
Aktas (T)	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
• ***Demographics:*** 224 inhabitants. • ***Safety:*** settlement is situated 1.75km from pipeline. • Project attitude: according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 80% of land is privately owned by the villagers. Seasonal grazing occurs. There is no irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (five households produce honey for own consumption) and local government are the main sources of livelihood. • ***Accessibility:*** The settlement is accessible all year round. • ***Information provision:*** 70% of the population is literate. The best information provision tool is TV. • ***Environmental & cultural sites:*** mausoleum, forest. • ***Infrastructure:*** piped water is not available. A local spring is the settlement water source. • ***Settlement problems:*** poor access to water, poor roads and animal farming should be supported by State.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Drinking water*** Potential for disruption or contamination of drinking water during construction ***Special site*** Refer to the Environmental Impact Tables.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the project.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact.**

Environmental Impact Table 22 (Maps 22A and 22B) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Clayey-skeletal to Loamy-skeletal Xerochrepts on slopes; • Mesic Loamy Xerorthents or Calcixerolls on valley alluvium; • Mesic Xerochrepts associating with Xerorthents and channel gravels on fluvial lands.	Potential soil productivity liabilities of the NGP are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Other potential impacts include: • soil erosion; • sediment yield; • soil productivity.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.

Environmental Impact Table 22 (Maps 22A and 22B) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration.	
Landscape and Visual			
The route falls into the flat low sensitivity landscape of the Tercan Plain, which is cultivated intensively and irrigated in places. Trees, particularly poplars, are much in evidence, often planted as windbreaks. The route crosses the Karasu River for the second time. The river here is braided, and the valley is broad comprising numerous shingle ridges and pools, heavily vegetated with willow trees. Further west, the route crosses the Harmantepe Creek, a more scenic, marshy valley with dense willow clumps. The NGP is visible in non-agricultural land. The main highway runs more or less parallel to the route for 6 – 7km. BVS-021 and BVS-022 will both be located within cultivated land at KP 409.2 and KP 411.9, respectively. Approximately 350m^2 of permanent landtake required for each site. A new access road will be constructed to BVS-021 of 40m in length and to BVS-022 of c. 80m.	Marsh either side of the Harmantepe Creek will be vulnerable to damage from insensitive use of heavy machinery. Visual liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline in non-agricultural surroundings. Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil	**INDIRECT POSITIVE IMPACTS** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Loss of trees and bushes at the Harmantepe Creek will leave gaps in the landscape, although this is unlikely to last more than one year after construction.

Environmental Impact Table 22 (Maps 22A and 22B) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Near the Harmantepe Creek, measures to reduce the impact of heavy machinery will include use of moveable equipment mats to spread vehicle weight and avoid deep rutting. Furthermore, construction will be undertaken at the driest time of the year (June to September). Removal / replacement of turfs will be necessary if the construction schedule dictates work during wetter periods (ie April to May).	
Surface Waters			
The route crosses Karasu River (Yesilova), which supports a major proportion of the aquatic life in the region. River channel is anastomose, with mid-channel bars and a parabolic cross-section. Width of crossing is 50m, with a bank-full width of 38m and a total floodplain width of 180m at the crossing point. Bed consists of sand and gravel and the flow is perennial of a pool and riffle type. Long ponded reaches exist between riffles near mid-channel bars. Sand bed is rippled. Bank-side vegetation comprises grass, flora and shrubs with fragmentary riparian vegetation present. Water quality samples taken 1.5km downstream of the crossing point indicate that this river is a Class IV river. Yesilova Quarter is located upstream of the sampling point.	Disturbance, directly through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Potential for short to medium-term sedimentation and turbidity. Potential impacts to downstream bankside communities, where water is abstracted.	Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, for the protection of surface waters, including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench. Assess need for alternative water supply for downstream communities and provide where necessary if sedimentation and	**MINOR IMPACT** Disturbance will be short-term and limited to the immediate working area. Sedimentation of Karasu River (Yesilova) will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.

Environmental Impact Table 22 (Maps 22A and 22B) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		turbidity persist for more than 3 days at the community.	
Ecology			
Important Ecological Factors ESA 15 continues for c. 900m on this map. ESA 16 is identified between KP 419.8 and KP 420.5 for one globally-threatened plant species – *Cousiana sintenisii* and comprises c. 1km of the pipeline route. The IUCN status for this species is given in Table 5.20, Section 5. The globally-threatened Grey Hamster was recorded near KPs 419.6 – 420.5. The protection status for this species is given in Table 5.21, Section 5. Nationally-threatened birds were observed south of the Karasu River crossing in on a very broad, shingle river plain with islands and marshy areas supporting a rich diversity of riverine and riparian bird life. At least three nationally-threatened species - Great Egret 1, Oystercatcher 2, and White-winged Black Tern 35 were recorded during the bird survey. Also of note was stone-curlew, a species regarded as Vulnerable in a European context, which may have been breeding. One or more of these species is likely to be at or near the BTC Pipeline crossing point upstream. The protection status for these species are given in Table 5.21, Section 5. The European Pond Turtle, a globally-threatened reptile, was recorded at Karasu River. The Tree Frog, a globally-threatened amphibian species, is likely to be found on the banks of this river. The protection status for these species are given in Table 5.21, Section 5. Only fish species of medium commercial value (see EMMP, Appendix C1) breed in the Karasu River, and include chub (*Leuciscus cephalus*), from April to June, nose carp (*Chondrostoma regium*), from March to May and transcaucasian barb (*Capoeta capoeta angorae*), from May to June.	Habitat destruction of plain steppe or areas peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. No seasonal sensitivities were identified for the Grey Hamster. Potential for direct disturbance to nationally-threatened birds at the Karasu River crossing during nesting, feeding or indirectly, through habitat loss, if construction is undertaken during the breeding season (ie between April and July inclusive, although the Black Kite begins breeding as early as March). July can remain sensitive for late and second broods. Temporary local disturbance to globally-threatened reptile species between May and September inclusive. The European Pond Turtle	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 15 and 16. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly. • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Clearance of riverside reedbeds and other dense vegetation in advance of the construction of Karasu River crossing to be undertaken outside the breeding	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACTS** only to globally-threatened reptile and amphibian species, if the construction period avoids the seasonal sensitivity.

Environmental Impact Table 22 (Maps 22A and 22B) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	typically mates in May, with eggs (up to 10 per clutch) laid amongst the roots of waterside vegetation in June. Incubation period is dependent upon variable by temperature, but is generally in the order of 70 days. Hatchlings emerge August – September. Temporary local disturbance during spawning between May and June to the Tree Frog. Temporary disturbance to commercially important fish species and aquatic plants providing breeding sites for these species during construction across the Karasu River.	undertaken outside the breeding season for birds between April to July period. Areas of reeds and dense vegetation will be placed out of bounds for construction workers. In advance of construction works associated with the Karasu River crossing, riverside vegetation will be cleared between beginning of October and end of April, ie outside of the breeding season for the European Pond Turtle. Preconstruction walkover surveys will establish the presence of appropriate spawning locations for the Tree Frog within the RoW of the route; translocation of species to be undertaken in those parts of the route where construction is scheduled to be undertaken between May and June. For construction activity to be permitted during the breeding season of fish species with medium commercial value, the Contractor will be required to submit specific mitigation measures to avoid impacting breeding fish to BOTAŞ for approval. Such measures might	**MINOR IMPACTS** at most for all fish species if construction takes place during July to February inclusive. At other times of year (varying by species), impacts will generally be **MINOR** on the basis of the rigid application of water crossing mitigation measures.

Environmental Impact Table 22 (Maps 22A and 22B) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		include, but not be limited to, the following: preconstruction survey results indicating that spawning grounds are avoided, the provision of fish passages, etc, in addition to the generic mitigation measures that are required at all river crossings.	
Noise			
Gozeler settlement is located c. 250m from the pipeline centreline and is located adjacent to a National highway crossing.	Noise impacts are expected to occur at Gozeler settlement during sheet-piling associated with the highway crossing.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures for the duration of these activities, monitor their effectiveness and	**MODERATE IMPACT** Noise impacts are expected to occur at Gozeler during works associated with the highway crossing. The works will last for three to four weeks. Mobile noise barriers will be used to screen dwellings from construction plant.

Environmental Impact Table 22 (Maps 22A and 22B) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	
Archaeology and Cultural Heritage			
Tasinonu Area Settlement (3rd Degree Site*) is a flat settlement that will be crossed by the route. However, no architectural remains are visible due to prior agricultural activities. * This site has not yet been registered by the MoC and is provisionally assigned this classification. It has been proposed for registration by the regional preservation society	Potential for site to experience direct impacts, such as ground disturbance, during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	The site will be delineated to avoid accidental damage during construction and fenced throughout the construction period. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Assuming the site is fenced, impacts will be limited to the temporary disturbance of the site setting and peripheral features.
(i) Kucuktepe settlement has been proposed for registration by the regional preservation society			

Social Impact Table 22 (Map 22C) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

MAP 22: PROJECT INFORMATION			
There are no pump stations or construction camps in the area. There are two block valve stations.			
MAP 22: MAP HIGHLIGHTS			
• Majority of land use is irrigated agriculture, rain fed agriculture, pasture and meadow. • Undulating plains support rain fed cereals and irrigated crops. • The pipeline crosses a national highway, a railroad, the Karasu River and the Cadirkaya and Kuyubasi Creeks.			
MAP 22: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted**:* six settlements on this map will be directly impacted by the pipeline project. Four settlements (Cadirkaya, Piriz (Caykent), Cayirli Merkez, Harmantepe) have land intersected by the proposed pipeline (L) and no settlements are within 5km of a pump station. Three settlements (Harmantepe, Gozeler and Yesilova) are within 500m of the pipeline route (D), and two (Gozeler and Yesilova) are within 2km of the block valve stations (B). Settlements impacted by traffic have not yet been identified. There are two settlements downstream of a river/ creek (Harmantepe is downstream of the Asku River and Piriz is downstream of the Karasu River). • ***Surveyed**:* three settlements (Cadirkaya, Cayirli, Harmantepe) were surveyed in the field (S) and two settlements (Piriz (Caykent) and Cayirli Merkez) were surveyed by telephone (T). • ***Not surveyed:*** Mirciga (1.6km from the pipeline), (Gozeler and Yesilova 500m from the pipeline).. • ***Not on the map:*** Cayirli Merkez • ***Disclosure Meeting Location:*** Cadirkaya			
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Cadirkaya (L) (S)			
• ***Demographics**:* 450 inhabitants with 60 households. There has been an increase in population. • ***Safety:*** the settlement centre is 1.7km from the pipeline. • ***Project attitude:*** a construction camp would be welcomed. During a previous pipeline project, fields were damaged, expropriation costs were not paid, water canals and roads were damaged and fields were contaminated. As a result, locals request written commitments regarding land compensation, not just verbal promises. In general the inhabitants are not hostile towards the project. 45% of the inhabitants believe they will benefit from direct employment. • ***Land ownership & use:*** 25% of land is owned by local residents,	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Land*** Potential complications in	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of construction danger for livestock. **See Overview of the Land**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land**

Social Impact Table 22 (Map 22C) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

25% is communal and 40% is state owned. There is seasonal grazing in Spring, Summer and October. The main livestock are cattle, sheep, poultry. There is cultivation of cereals, sugar cane and sugar beet, and there is seasonal irrigation. There is no fishing, hunting or bee keeping. • ***Settlement livelihood:*** agriculture and animal husbandry. Residents of Gozeler neighbourhood work as seasonal workers for owners of large properties or in metropolitan areas. 100% of inhabitants are family labourers. • ***Availability & skills:*** previous pipeline experience. Only one of 24 possible construction skills is available in the settlement (welding). 82% of inhabitants are willing to accept a temporary job. • ***Accessibility:*** the settlement is accessible from March to December. The distance from the settlement to the district centre is 18km. • ***Information provision:*** The literacy rate is 97%. • ***Infrastructure*****:** there is an irregular supply of piped water. It is the only source. There is electricity infrastructure, but there are no sewerage or waste systems. • ***Services***: phone and mobile services present. There is a primary school but no health facilities are available. • ***Settlement problems***: state support in animal husbandry and the quota being imposed on sugar cane by the government.	expropriation process. ***Irrigation*** Loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility to recruitment*** Decreased access to recruitment process ***Negative experience*** Possible **opposition** to the Project and **increased sensitivity** to any negative impacts.	**Acquisition Process in Appendix C9** Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these	**Acquisition Process in Appendix C9** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected** Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Social Impact Table 22 (Map 22C) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

		communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings.**	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Caykent (L) **(T)**			
• ***Demographics****:* 1320 inhabitants. There has been an increase in population. 50% of the population migrates. • ***Safety:*** the settlement centre is 2km from the pipeline, and the nearest residence is 1.75km • ***Project attitude:*** a construction camp would be welcome. There is general awareness of the project and there are no major concerns or benefits perceived. • ***Land ownership & use:*** 60% of land is owned by local residents. There is seasonal grazing and temporary irrigation. There is fishing, hunting and bee keeping. • ***Settlement livelihood:*** agriculture, bee keeping (three households, as one of two sources of income), education, fishing (182 households, for their own consumption), hunting, manufacturing, construction, transport, education, trade. 40% of inhabitants have regular paid jobs and 60% are farmers. • ***Availability & skills:*** no previous experience. • ***Accessibility:*** the settlement is accessible year round. the distance from settlement to district centre is 10.3km. • ***Information provision:*** Literacy rate is 95%. The main local and national sources of information are TV, newspapers, Internet and family members.	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of construction danger for livestock. **Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** if there is compensation for any reduction in yields, if and habitat restoration measures are implemented in full.

Social Impact Table 22 (Map 22C) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

• ***Environmental & cultural sites:*** waterfalls. • ***Infrastructure*****:** there is a piped regular supply of water. Stored water is the alternative source. • ***Settlement problems***: inadequate access to water, infrastructure problems and poor irrigation.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	Significance cannot be established at this time.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Asking residents or workers to translate as necessary.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility to recruitment	Winter road closures, seasonal migration and poor	**No residual impact expected**

Social Impact Table 22 (Map 22C) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

	Decreased access to recruitment process ***Special sites*** Refer to Environmental Impact Assessment Tables.	transport will be **taken into account** in the recruitment strategy.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Cayirli Merkez (L) **(T)**			
• ***Demographics****:* 4800 inhabitants, with 700 households. There has been an increase in population and 35% of the population migrates. • ***Safety:*** the settlement centre is 3km from the pipeline, the nearest house in the settlement to the pipeline is 2.5km. • ***Project attitude:*** a construction camp would be welcome. There is general awareness of the project and no major concerns or benefits are perceived. • ***Land ownership & use:*** 25% of land is communal and 70% of land is owned by local residents. There is seasonal grazing and temporary irrigation. There is a diverse livestock and cultivation of herbs, vegetables, sugar beet, fruit trees. There is no fishing or bee keeping. • ***Settlement livelihood:*** agriculture, hunting, transport, trade and education. • ***Availability & skills:*** no previous experience, 8 out of 14 construction skills. • ***Accessibility:*** good accessibility as is the district centre. • ***Information provision:*** Literacy rate is 70%. The main sources of information are TV, family members and newspapers. • ***Environmental & cultural sites:*** according to the Muhtar*,* there is a park, waterfalls and a pond. • ***Services:*** there is a primary school midwife, health centre, and doctor. • ***Infrastructure*****:** there is a piped regular supply of water. Stored water	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of construction danger for livestock. **See Overview of the Land Acquisition Process in Appendix C9** Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Significance cannot be established at this time**

Social Impact Table 22 (Map 22C) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

is the alternative source. Electricity and waste systems are present. • ***Settlement problems***: unemployment, financial problems, inadequate access to water and poor drinking water quality.	during construction. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility to recruitment*** Decreased access to recruitment process	to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Harmantepe (L) (D) (S)			
• ***Demographics****:* 1,200 inhabitants with 180 households. There has been an increase in population due to a high birth rate. • ***Safety:*** the settlement centre is 800m from the pipeline and the nearest house is 300m from the pipeline.	***Construction hazard: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison**	**Continued attention** to mitigation measures will be critical to prevent injury.

Social Impact Table 22 (Map 22C) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

• ***Project attitude:*** there is a mixed reaction to the possibility of having a construction camp, near the settlement. The overall attitude is negative due to damage experienced in a previous project. Concerns include damage to irrigation canals and fields, lack of road reinstatement, route changes not compensated for, broken water mains, material left in the fields, expanded construction area and low expropriation payments. There is a concern that determination of land value may not be impartial due to the ethical and political structure of the region. Local residents will be hostile if damages caused during the current project are not restored immediately. 27% of inhabitants believe they will benefit from direct employment and a few of the inhabitants (9%) have concerns of noise, dust and traffic. • ***Land ownership & use:*** 60% of land is owned by local residents and 25% is communal. The landowners have title deeds. Main livestock are cattle. Sheep, poultry are bred for own consumption. Seasonal grazing is important for cattle and sheep. Key crops are grain, herbs, sugar beet. There is seasonal irrigation, with permanent channels. • ***Settlement livelihood:*** arable agriculture and cattle sheep breeding are the main sources of livelihood. Cereals, sugar cane and legumes are grown mainly for subsistence whereas sugar cane is sold in local markets. Cattle and sheep breeding. 70% of inhabitants are family labourers. • ***Availability & skills:*** previous experience, 12 out of 24 construction skills, including welders, drivers, security personnel, food service personnel, woodcutters. 73% are willing to accept temporary jobs. • ***Accessibility:*** roads of low quality asphalt and loose binder dust. Accessible all year. The distance from settlement to district centre is 4km. • ***Information provision:*** Literacy rate is 90%. • ***Services***: mobile and phone services available. Sports facilities, a library and a primary school are available. There is also a health centre, however there are insufficient health personnel. • ***Infrastructure*****:** there is an irregular supply of piped water. There is no alternative source. Electricity supply, sewerage and waste systems are present. Garbage is mixed with fertiliser.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Irrigation*** Loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation. ***Skills and Resources***	**meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of construction danger for livestock. Contractor will **consult** with authorities to determine maximum acceptable time for disruption **Information is highlighted**	**Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Potential positive benefits**

Social Impact Table 22 (Map 22C) (KPs 401.1 – 420.4): Tercan Plain, Erzincan Province

systems are present. Garbage is mixed with fertiliser. • ***Settlement problems***: general settlement life standard is deteriorating due to general economic conditions, and irrigation is problematic due to the lack of water. The sugar factories have been privatised, the government has decreased the sugar beet quota, and as a result the government buys only a limited amount resulting in a decrease in the prices of sugar beet, impacting upon farmers.	Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Negative experience*** Possible **opposition** to project and **increased sensitivity** to any negative impacts.	**to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings.**	to local settlements. Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Environmental Impact Table 23 (Maps 23A and 23B) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Clayey-skeletal to Loamy-skeletal Xerochrepts on slopes; • Mesic Loamy Xerorthents or Calcixerolls on valley alluvium; • Mesic Xerochrepts associating with Xerorthents and channel gravels on fluvial lands.	Soil productivity liabilities of the NGP are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. For the BTC Pipeline other potential impacts include: • soil erosion; • sediment yield; • soil productivity.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and gas pipeline corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.

Environmental Impact Table 23 (Maps 23A and 23B) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration.	
Landscape and Visual			
Passing north of Cayirli, the pipeline route keeps to flat, mostly irrigated, agricultural land passing between settlements with their characteristic poplar screens, framed by distant jagged mountain peaks. It weaves along the fairly narrow arid valley of the Aksu River, a broad fast-flowing, shingle-bedded river which it crosses twice, before this opens out into a wide, flat-bottomed, valley with a maze of streams and ditches with bushes and trees, where the route crosses the Aksu for a third time. Landscapes are generally unremarkable although with locally distinct areas along the Aksu River. Numerous settlements lie close to the route. BVS-023 will be located at KP 432.4 over the unconfirmed aquifer. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 30m in length.	Visual liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWS lie adjacent or closely parallel, especially through unfarmed sections. Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil	**INDIRECT POSITIVE IMPACT** Landscape is of generally low sensitivity, although with locally more distinctive pockets. Any commensurate enhancements of the degraded NGP alignment will result in a net improvement to the landscape.

Environmental Impact Table 23 (Maps 23A and 23B) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2).	
Surface Waters			
Aksu River is crossed by the route three times – near KP 420.8, near KP 422.5 and between KPs 425 – 430. Width of first crossing [Aksu (Cayirli)] is 30m and the river channel is sinuous. The river has a parabolic cross-section and pool and riffle bars. There is no floodplain. Bed consists of sand and gravel and flow is perennial of a pool and riffle type. Bank-side vegetation comprises shrubs and trees and riparian vegetation has been disturbed. Width of second crossing [Aksu (Balikli)] is 25m and the river channel is sinuous. The river has a parabolic cross-section and pool and riffle bars. There is no floodplain. Bed consists of sand and gravel and flow is perennial of a pool and riffle type. There is no bank-side vegetation and riparian vegetation has been disturbed. Width of third crossing [Aksu (Yesilkaya)] is 25m and the river channel is sinuous. The river has a parabolic cross-section and pool and riffle bars. Floodplain is <250m at the crossing point. Bed consists of cobbles and boulders and flow is perennial of a pool and riffle type. Bank-side vegetation has been artificially cleared and riparian vegetation comprises trees. Water quality samples taken at the three Aksu River crossing points – 110m upstream of the first crossing point, 200m upstream of the second and 660m upstream of the third indicate that this river is a Class IV river. Yesilkaya settlement is located upstream of the third sampling point. Aksu River is a right-bank tributary of Karasu River. Route crosses Doganyuva Creek west of KP 435. Bank-side vegetation has been artificially cleared. The BTC Pipeline crossing lies adjacent and	Disturbance to both watercourses, directly through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Potential for short-term sedimentation and turbidity. The NGP lies adjacent and parallel to both watercourses. Potential impacts on downstream communities, ie Yesilkaya settlement, where water is abstracted for human use.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor at these watercourse crossings impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, for the	**INDIRECT POSITIVE IMPACT** where the Aksu River and Doganyuva Creek crossings previously disturbed during construction of the NGP are reinstated. **MINOR IMPACTS** only expected, as disturbance will be limited to the immediate working area. Sedimentation of Aksu River and Doganyuva Creek crossings will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.

Environmental Impact Table 23 (Maps 23A and 23B) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
parallel to the existing NGP. The channel is disturbed and has lost the majority of its natural features. Construction of the NGP has caused increased narrowing, which will probably widen with time.		protection of surface waters, including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench. Assess need for alternative water supply for downstream communities. Provide where necessary if sedimentation and turbidity persist for more than 3 days at the community.	
Ecology			
Important Ecological Factors ESAs 17 and 18 occur between KP 424.1 and KP 424.6 and between KP 430.8 and KP 431.3, respectively. These ESAs have been identified for the following globally-threatened plant species, *Cousinia sintenisii* within ESA 17 and *Trigonosciadium intermedium* within ESA 18. The IUCN status for these species are given in Table 5.20, Section 5. Nationally-threatened birds recorded are Oystercatcher (2 at KP 422.2 and 4 at Aksu River crossing); Bluethroat (2 c. 1km north-east of KP 422 and 2 at Buyuk River crossing); Barred Warbler (4 at Aksu River crossing and 3 at Buyuk River crossing (KP 438.1); Honey Buzzard (1 at Aksu River crossing); Booted Eagle (1 at KP 428.4); and Whinchat (1 at KP 428.4 and 1 at Buyuk River (KP 438.1). The protection status for all species identified are given in Table 5.21, Section 5. Aksu River supports chub (*Leuciscus cephalus*), a fish species of medium commercial value breeding in this river between April and June.	Destruction of habitat peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive, although the Booted Eagle begins breeding as early as March). July can remain sensitive for late and second broods.	Threatened plant species will be identified and located during pre-construction surveys, particularly ESAs 17 and 18. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). If little or no tree-felling and scrub clearance is feasible at the Aksu River, then impacts will be minor. **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction

Environmental Impact Table 23 (Maps 23A and 23B) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	The Honey Buzzard (*Pernis apivorus*) is a migrant in Turkey and is not thought to breed. This species inhabits woodland areas. Temporary disturbance to commercially important fish species and aquatic plants providing breeding sites for these species during construction across the Aksu River.	sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Clearance of riverside reedbeds and other dense vegetation in advance of the construction of Aksu River crossing to be undertaken outside the April – July period for Oystercatchers. Areas of reeds and dense vegetation will be placed out of bounds for construction workers. Shrubs and dense vegetation along the RoW will be cleared outside the Whinchat's breeding season. Clearance of riverside trees, shrubs and thickets in advance of the construction of the Aksu and Buyuk River crossings to be undertaken outside the April – July period for the Bluethroat and Barred Warbler. Preconstruction survey will establish the presence of potential Booted Eagle nesting sites within 500m of the pipeline route. If nesting sites are identified, avoidance of construction activity	schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April (March for the Booted Eagle), and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACTS** at most for chub if construction takes place outside of the breeding season between April and June inclusive. At other times of year, impacts will generally be **MINOR** on the basis of the rigid application of water crossing mitigation measures.

Environmental Impact Table 23 (Maps 23A and 23B) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		from March to July. Potential nesting sites within the RoW will be removed outside the breeding period. For construction activity to be permitted during the breeding season of fish species with medium commercial value, the Contractor will be required to submit specific mitigation measures to avoid impacting breeding fish to BOTAŞ for approval. Such measures might include, but not be limited to, the following: preconstruction survey results indicating that spawning grounds are avoided, the provision of fish passages, etc, in addition to the generic mitigation measures that are required at all river crossings.	
Noise			
Yaylakent Sub-District Centre in Cayirli District, Erzincan Province, is located c. 26m from the centreline of the pipeline route. Yesilkaya is located c. 400m from the pipeline and the Aksu River crossing.	Noise impacts are expected to occur at Yaylakent Sub-District Centre during all phases of pipeline construction including: • soil stripping; • backfilling; • bending; • trenching • welding/lowering;	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior	**MAJOR IMPACT** The application of mitigation measures will reduce the potential for disturbance at Yaylakent, but due to the proximity of the edge of the settlement to the pipeline route, noise impacts are expected to occur during all phases of construction. Stockpiling of spoil, where

Environmental Impact Table 23 (Maps 23A and 23B) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	• pipe stringing. Noise impacts will also be experienced at Yesilkaya during sheet-piling works associated with the Aksu River crossing.	with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings and where possible, utilising existing screening, including that arising from the stockpiling of materials. The Construction Contractor will develop site-specific noise mitigation measures for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	possible, and mobile noise barriers will be used to screen nearby dwellings from construction works to the maximum extent possible. However, those nearest may still be exposed to temporary construction noise levels that exceed 70dB(A). It is important to emphasise this is a cautious assessment. The construction programme will make provision for a further assessment based on the true numbers of receptors affected and separation distances of receptors from noise sources and take whatever actions are necessary to reduce impacts to an acceptable level. Assuming that the mitigation described is applied to sheet-piling activities at the Asku River crossing, only minor noise impacts are expected to occur at Yesilkaya.
Archaeology and Cultural Heritage			
The following archaeological sites lie within the 100m Corridor. Yesilkaya 2 and Algiz settlement are crossed by the route: • Balikli-1 and Balikli-2 (3rd Degree Sites*) – flat settlements, located to the north of the pipeline route near Balikli Settlement. No architectural remains are visible as a result of agricultural activities. • Algiz Settlement (3rd Degree Site*) – flat settlement, located to the south	Potential for sites to experience direct impacts, such as ground disturbance, during pipeline construction. Indirect impacts may arise	The pipeline has been re-routed to avoid the sites Balikli-1 and Balikli-2. Yesilkaya 2 and Algiz settlement will be delineated to avoid	**MINOR IMPACT** Assuming Yesilkaya 2 and Algiz settlement are fenced, impacts will be limited to the temporary disturbance of the setting of the sites and

Environmental Impact Table 23 (Maps 23A and 23B) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
of the pipeline route. No architectural remains are visible due to agricultural activities. • Yesilkaya 2 (3rd Degree Site*) – flat settlement, located to the south of the pipeline route. No architectural remains are visible due to agricultural activities. * These sites have not yet been registered by the MoC and are provisionally assigned these classifications. Balikli 1, Balikli 2, Algiz settlement and Yesilkaya have been proposed for registration by the regional preservation council The following have been proposed for registration by the regional preservation council: (i) Algiz mound; (ii) Yesilkaya mound; (iii) Yaylakent	from construction activities that will affect the visual/historical setting of these sites.	accidental damage during construction and fenced throughout the construction period. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	peripheral features. **MINOR IMPACTS** at most at Balikli-1 and Balikli-2, which will be limited to the temporary disturbance of the setting of the sites and peripheral features.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

MAP 23: PROJECT INFORMATION			
There are no pump stations or construction camps in the area. There is a block valve station.			
MAP 23: MAP HIGHLIGHTS			
• Irrigated agricultural land is the predominant land use. • The pipeline crosses the Asku river, the Buyuk river and the Doganyuva creek.			
MAP 23: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted:*** four settlements will be directly impacted by the pipeline project, two settlements (Yaylakent, Baliki) have land intersected by the proposed pipeline (L). Four settlements (Yaylakent, Yesilkaya, Baliki and Pulk) are within 500m of the pipeline route (D). One settlement (Espeverek Verimli) is within 2km of the block valve station (B). No settlements are within 5km of a pump station (P) or construction camp (C). Settlements impacted by traffic have not yet been identified. Two settlements are downstream of a river/ creek (Sebke is at the Asku River pipeline crossing; Yaylakent is downstream of the Buyuk River). • ***Surveyed****:* four settlements (Yaylakent, Yeslikaya, Espeverek (Verimli), Cayirli and Baliki) were surveyed in the field (S). Komga (Doganyuva) was surveyed by telephone (T). • ***Not surveyed:*** Pulk (400m from the pipeline), Komga (Doganyuva) (1.35km from the pipeline). • ***Not on map:*** Pulk • ***Disclosure Meeting Location:*** Yesilkaya			
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yaylakent (D) (L) (S)			
• ***Demographics****:* 350 inhabitants with 75 households, increase in population, due to the return of people who emigrated after the 1992 earthquake and in-migration of individuals seeking employment. • ***Safety:*** the settlement centre is 200m from the pipeline, the nearest house in the settlement is 50m. • ***Project attitude:*** a construction camp would not be welcome (minority three out of 11 inhabitants interviewed). Overall attitude is negative since the pipeline will pass through a new settlement area, which is still under development. Previous project damaged land, and compensation towards damages was low. 27% of inhabitants believe they will benefit from direct employment and a few inhabitants (18%) are concerned about noise, dust and traffic.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

• ***Land ownership & use:*** 60% of land is privately owned by local residents, 25% used by local residents, and 15% owned by the state. Land owners have land deeds. There is cattle breeding and seasonal grazing. The key crops are grain, herbs, sugar and beet. There is seasonal irrigation using permanent channels. • ***Settlement livelihood:*** agriculture and bee keeping are important sources of livelihood. Cultivation of cereals, sugar cane and legumes for subsistence. Cattle breeding. 100% of inhabitants are family labourers. • ***Availability & skills:*** no previous experience and limited construction experience only heavy machinery drivers, drivers, and food service personnel are available. 73% of inhabitants are willing to accept a temporary job. • ***Accessibility:*** settlement is accessible throughout the year. Roads are of low quality asphalt and soil. The settlement is 21km from the nearest district centre. • ***Information provision:*** Literacy rate is 100%. • ***Environmental & cultural sites:*** a tree to the south of the settlement was highlighted as an important site. • ***Services***: phone, mobile systems, Gendarmerie, agricultural cooperatives, a market, and coffee houses. There is also a primary school, with three teachers. There is a health centre and a midwife. • ***Infrastructure*****:** there is a regular supply of piped water. Electricity and sewerage systems are present. There is no waste system and some garbage mixed with fertilisers. • ***Settlement problems***: low income and insufficient social services.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees***	construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of construction danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	Any additional damage will be compensated fo***r.*** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

	Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Skills Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**Potential positive benefits** to local settlements.
	Negative experience: Possible **opposition** to project and **increased sensitivity** to any negative impacts.	BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these	Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

	Settlement opposed to construction camp. Nearby construction camp would not be welcomed by some/all settlements.	communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be remind**ed of the importance of appropriate behaviour in daily **briefings.** Additional consultation to be carried out by the project prior to constructing a camp within 5km. Camp will not be located within 5km if against the wishes of the settlement. **Any** interaction between construction workers and communities (eg use of local shop) to be carefully monitored.	**Likelihood of significant impacts dependent on distance of settlement from camp.** Potential impacts arising from breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Baliki (L) (D) (S)			
• ***Demographics****:* 800 inhabitants with 150 households. There has been an increase in population. • ***Safety:*** the settlement centre is 350m from the pipeline and the nearest residence is 300m from the pipeline. • ***Project attitude:*** a construction camp would ***not*** be welcome (by a minority 2 out of 10 inhabitants interviewed). The overall attitude is negative due to a previous project experience where damage was	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

negative due to a previous project experience where damage was incurred, and the compensation was low. There is a preference for the pipeline to pass through Saritas (Ipekyolu) – Yesilaka which are not fertile lands. They want the pipeline route to change, if not they said they would be very hostile. There is also a preference for Alarko (Tasoren) not to be involved in the BTC project as reportedly did not adopt an impartial attitude in the compensation of damage. They are very concerned about the small river passing through the settlement from which they fish, if the river were to be impacted, it would cause hostility. • ***Land ownership & use:*** 40% of land is used by local residents and 50% of land is communal. There is seasonal grazing and temporary irrigation. • ***Settlement livelihood:*** agriculture, cattle herding and bee keeping. All respondents are family labourers. • ***Availability & skills:*** previous experience. No construction skills are available, although one respondent worked in the installation of a pipeline. 46% of inhabitants are willing to take on temporary jobs. • ***Accessibility:*** roads of low quality asphalt, accessible all year. • ***Information provision:*** Literacy rates are 90%. • ***Services***: there are phone services. There is a primary school and there is also a midwife, health centre. • ***Infrastructure*****:** there is a piped regular supply of water. There are electricity and sewerage systems. There is no waste system and waste is disposed of by recycling and mixing with fertilizers. • ***Settlement problems***: general economic problems, low sugar beet prices and reduction in the sugar beet quota.	Land beyond that compensated for may be affected if mitigation measures not fully implemented ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be	**Any additional damage to be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

		discussed at meetings before and during construction.	
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9**.	**See Overview of the Land Acquisition Process in Appendix C9**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Fishing Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, if and habitat restoration measures are implemented in full.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Negative experience*** Possible **opposition** to project and **increased sensitivity** to any negative impacts.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be remind**ed of the importance of appropriate behaviour in daily **briefings.**	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. Level of residual impact will depend on degree to which concerns are resolved prior to construction.
	Settlement opposed to construction camp. Nearby construction camp would not be welcomed by some/all settlements.	Additional consultation to be carried out by the project prior to constructing a camp within 5km. Camp will not be located within 5km if against the wishes of the settlement. **Any** interaction between construction workers and	**Likelihood of significant impacts dependent on distance of settlement from camp.** Impacts arising from breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

		communities (eg use of local shop) to be carefully monitored	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yeslikaya (L) (S)			
• ***Demographics**:* 500 inhabitants with 75 households. The settlement experienced a decrease in population recently due to emigration. • ***Project attitude:*** a construction camp would **not** be welcome by all inhabitants (11). During the consultation meeting, the general attitude towards the project was negative, due to damages caused by a previous project. Pipeline should pass through Gocyolu not fertile lands. Written commitments required, preference for Alarko (Tasoren) not to be involved in the BTC project as they did not adopt an impartial attitude in the compensation of damages. The key concerns were noise, dust and traffic (18%), the key benefits perceived were direct (18%) and indirect employment (18%). • ***Land ownership & use:*** 98% of land is privately owned by villagers and 2% is communal. Landowners have title deeds. Key crops are grain, sugar beet and cereals. There is temporary irrigation with channels in the same place. Seasonal grazing in Spring, Summer and Autumn. • ***Settlement livelihood:*** agriculture, cultivation of cereals and grain for subsistence. No livestock. 100% of inhabitants are family labourers. • ***Availability & skills:*** previous experience. 0 out of 24 construction skills. 64% of inhabitants are willing to accept temporary jobs. Soil available for construction. • ***Accessibility:*** the roads are low quality asphalt and soil. The settlement is, however, accessible all year. • ***Information provision:*** Literacy rate is 100%. • ***Environmental & cultural sites:*** graves.	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Negative experience*** Possible **opposition** to project and **increased sensitivity** to any negative impacts.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of construction danger for livestock. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0):
East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

• ***Services***: agricultural credit cooperatives present. No schools, but health facilities including a midwife, and a health centre. • ***Infrastructure*****:** there is a piped, regular supply of water. Electricity and sewerage systems are present. No waste system. Waste is disposed of by recycling and mixing with fertilisers. • ***Settlement problems***: standard of live is deteriorating people feel the settlement has been impacted by the national economic downturn.		rapidly identified. **Construction workers to be remind**ed of the importance of appropriate behaviour in daily **briefings.**	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Verimli (L) (D) (S)			
• ***Demographics****:* 350 inhabitants with 100 households. No change in population. • ***Safety:*** the settlement centre is 900m from the pipeline and the nearest house is 750m from the pipeline. • ***Project attitude:*** a construction camp would be welcomed. There is no hostility towards the pipeline, and no major concerns or expectations. • ***Land ownership & use:*** 83% of land is owned by local residents and 15% is share cropped. Key crops grown are grain, herbs, sugar, beet. Seasonal grazing takes place between Spring and November. There is permanent irrigation. • ***Settlement livelihood:*** agriculture and bee keeping are important activities. 100% of inhabitants are family labourers. • ***Availability & skills:*** no previous experience and no available construction skills. 91% of inhabitants are willing to accept temporary jobs. • ***Accessibility:*** the settlement is accessible, all year round. The distance from the settlement to the district centre is 12.4km. • ***Information provision:*** Literacy rate is 100%. • ***Services***: there are schools and a health centre. • ***Infrastructure*****:** there is a piped, regular water supply.. Electricity and sewerage systems are present. There is no waste system and waste is primarily disposed of by recycling.	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.**

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

• ***Settlement problems***: low income levels.		affected.	
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hive them to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Komga (Doganyuva) (L) (T)			
• ***Demographics**:* 190 habitants. There has been a decrease in population over the past five years. There is no seasonal migration. • ***Safety:*** the settlement centre is 1.5km from the pipeline, and the closest house is 1.3km from the pipeline. • ***Disputes*****:** 'other' • ***Project attitude:*** a construction camp would be welcome. There is general awareness of the project and there are no major concerns. • ***Land ownership & use:*** 80% of land is owned by local residents. There is seasonal grazing and temporary irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (five households, as one of two sources of income), education, hunting, fishing (eight households, for their own consumption), transport and trade. 95% of inhabitants are farmers. • ***Availability & skills:*** no previous experience. • ***Accessibility:*** no roads but settlement is accessible all year round *(to be clarified).* The distance from settlement to district centre is 15.6km. • ***Information provision:*** Literacy rate is 80%. The main local and regional sources of information are TV, written announcements and newspapers. • ***Environmental & cultural sites:*** the Muhtar mentioned a nearby plateau of significance. • ***Infrastructure*****:** there is a piped, regular supply of water. There is no alternative water source. • ***Settlement problems***: inadequate childcare facilities, inadequate energy supply, poor roads	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Road safety training in** schools and for wider community prior to construction. **Community liaison meetings** prior to construction to include safety. **Community liaison meetings** during and immediately following construction to identify any land that has been affected. Consider erecting protective barrier fencing. **Fisheries mitigation measures** will be implemented including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Additional damage to be compensated for.** **No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**Significance cannot be established at this time**
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Turnacayiri (P) **(S)**			
• ***Demographics:*** Turnacayirli has a winter population of 10 local residents in two households. There is winter migration to the Cayirli district centre. • ***Safety:*** the settlement is located 5km from the pump station and 2km from the pipeline; the nearest house is 1.9km from the pipeline. • ***Project attitude:*** very positive. • ***Land ownership & use at pump station location:*** state owned land that is not currently used. Surrounding land is privately owned or leased, or communal land that sustains grain and cattle grazing. • ***Local opinion of the pump station:*** generally welcomed. • ***Perceived benefits of the pipeline and pump station:*** employment opportunities on pipeline construction, and potential for improvements in trade and infrastructure. • ***Perceived problems of pipeline and pump station:*** risk of damage to settlement social relations, and risk of damage to land. • ***Settlement livelihood:*** animal husbandry is the main economic activity and agriculture the second activity. • ***Information provision:*** 75-90% of households are literate. • ***Infrastructure:*** electricity and piped water supplied, however there are occasional cuts in the latter and the settlement fountain is then used. There is also a waste disposal system and a primary school but limited health services and poor sanitary conditions.	***Irrigation*** Loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc. ***Accessibility to recruitment*** Decreased access to	***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Communication with settlement ***must take into account settlement characteristics to ensure equal access to information for all residents.*** Winter road closures,	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 23 (Maps 23C) (KPs 420.4 – 440.0): East of Balikli Settlement to Yaylakent Settlement, Erzincan Province

	recruitment process	seasonal migration and poor transport will be taken into account in the recruitment strategy.	No residual impact expected

Environmental Impact Table 24 (Maps 24A and 24B) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Loamy Xerorthents or Calcixerolls on valley alluvium; • Mesic Xerochrepts associating with Xerorthents and channel gravels on fluvial lands; • Mesic Clayey-skeletal to Loamy-skeletal Xerochrepts on slopes below about 2,000m; • Mesic Xerorthents or Xerofluvents near low-lying channels; • Sandy-skeletal Cryochrepts, which may be lithic, on upland slopes; • Cryorthents on upland valleys; • Channel boulders, cobbles, and gravel on fluvial lands. PT3 will be located at KP 444.2. The site has only recently been selected as the preferred location for this pump station. Baseline soil quality information is therefore absent at this stage.	Soil productivity liabilities of the NGP are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Other potential impacts: • soil erosion, particularly at temporary off-site areas associated with the proposed PT3 site; • potential for existing soil contamination at the PT3 site; • sediment yield; • channel alteration.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.

Environmental Impact Table 24 (Maps 24A and 24B) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Crushed rock. • Permanent erosion control devices. Particular attention will be given to erosion control during construction of PT3 due to the location of this site in an area of relatively steep terrain. • An additional survey to record existing baseline soil conditions will be undertaken at the PT3 site to identify any areas of existing soil contamination. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Schedule construction to avoid early spring (April to May).	
Landscape and Visual			
West of KP 435 the route rises along the tributary valleys of the Aksu. The landscape is characterised by largely semi-arid areas with subsistence crops and sheep-grazing. As the route climbs sharply into the Otlukbeli Mountains north of Erzincan the diversity of landform increases with striking broadly-rounded and deeply-dissected hills, almost plateau-like with grassy sub-alpine meadows and montane steppe, used in places for summer grazing. Scattered trees and patches of degraded forest are present. The landscapes here have been badly scarred by the natural gas pipeline, which diverges to the south-west from the BTC route around KP 446. Further west, the land rises further exceeding 2,000m, and the pipeline	High elevation grasslands in the eastern part of the Otlukbeli Mountains are vulnerable to long-term damage because of their poor shallow soils, and harsh climatic conditions will delay reinstatement. Visual liabilities of the NGP, which was not reinstated, are	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures	**INDIRECT POSITIVE IMPACTS** where the landscape scars from the NGP are successfully reinstated. **MODERATE IMPACT** High elevation grasslands may prove difficult to re-instate. Even with care, visual impact can be expected to

Environmental Impact Table 24 (Maps 24A and 24B) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
route encounters a series of north-flowing drainage. Sparse shrubs, small forests, and bare rock characterise the area. The PT3 site occupies a mid-slope position c. 1.3km due south of the settlement of Baskoy and will require a permanent landtake of 18.6ha. In addition, there will be two temporary campsites during the construction period, which will occupy a total of c. 13.4ha. A small road lies c. 250m east of the pump station. The facility will be largely screened to the west by hilly terrain with views only from the tops of hills. Landscape value is considered to be low.	potentially exacerbated by the BTC Pipeline in non-agricultural surroundings. The site at PT3 is predicted to be visible for up to c. 4km predominantly to the north and south. The high sensitivity viewers that will experience the potential impacts during construction are residents in the settlement of Baskoy, particularly those on the southern edge of the settlement whose view will not be screened by other houses. The southern edge of Baskoy is c. 1.25km from PT3.	prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2).Carefully remove, store, nurture, and replace turfs. PT3 has been located within the rural environment to minimise its impact on residential properties. In addition, the locally varied terrain around PT3 will offer some natural screening potential during construction. Mitigation measures in Section 6.3, including: • minimising the removal of mature trees prior to construction, will also be applied; • full reinstatement of all areas of non-permanent landtake, such as temporary construction camps.	remain for several years. **MODERATE IMPACTS** Moderate visual impacts on residential properties with medium distance views of PT3. However, this impact will occur for a limited period during construction (see Section 7.2.2 for an assessment of operational landscape and visual impacts).

Environmental Impact Table 24 (Maps 24A and 24B) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Surface Geology and Geohazards			
Landslides Route crosses the toe area of the active landslide area of Gulluce between KPs 455.1 – 455.7. This is a major deep-seated earth flow and debris slide complex, c. 400m wide that occupies the valley floor and extends upslope for c. 1.5km.	Pipeline construction adds to the risk of a landslide along this section of the route. Potential physical damage to pipeline, landscape and watercourses.	Permanent erosion control devices. The pipeline will be buried to extra depth, sufficient to bury it into stable ground, for a 200m length under the toe of the landslide to avoid any interactions during operation. See *Detailed Engineering Pipeline Risk Assessment*.	**MINOR IMPACT** Landslides pose a potential threat to the Pipeline. Construction and reinstatement activities will be undertaken in such a way so as not to add to the risk of a landslide.
Surface Waters			
The pipeline route crosses Cilhoroz Creek near KP 450.0. Turnacayiri settlement is 2.2km downstream of the crossing point. The proposed DSI Cayirli Dam is proposed to be located downstream of Cilhoroz Creek. This project will provide irrigation water to agricultural fields in the vicinity, over an area of approximately 13,000ha.	Disturbance to Cilhoroz Creek, directly through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Potential for long-term sedimentation and turbidity. The NGP lies adjacent and parallel to the creek. Potential for indirect disturbance at Cayirli Dam, resulting in a reduction in water quality.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor at this watercourse	**INDIRECT POSITIVE IMPACT** where the Cilhoroz Creek crossing previously disturbed during construction of the NGP is reinstated. **MINOR IMPACTS** Although the water quality classification for Cilhoroz Creek is unknown, only minor impacts expected, as disturbance will be limited to the immediate working area. Sedimentation of Cilhoroz Creek will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.

Environmental Impact Table 24 (Maps 24A and 24B) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		crossing impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, to avoid sedimentation and turbidity at the Cilhoroz Creek crossing point, including measures to protect surface waters flowing into the reservoir, such as sediment filters/trapping devices, settling ponds and trench de-watering.	
Ecology			
Important Ecological Factors ESA 19 is identified between KP 445.5 and KP 447.9 for five globally-threatened plant species (*Onosma liparioides, Campanula hedgei, Isatis cappadocica sp. alyssifolia, Astragalus elbistanicus* and *Haplophyllum cappadocicum*). ESA 20 is identified between KP 451.7 and 458.4 for seven globally-threatened plant species (*Onosma liparioides, Helichrysum arenarium spp. Erzincanicum, Jurinea brevicaulis, Alyssum lepidoto-stellatum, Galium hypoxylon, Galium papilliferum* and *Thesium aureum*) and one nationally-threatened species (*Acer divergens var. trilobium*). The IUCN status for these species are given in Table 5.20, Section 5. At KP 448.1, Whinchat (nationally-threatened) were recorded. The protection status for this species is given in Table 5.21, Section 5. The PT3 site will be located at KP 444.1 on the edge of ESA 19. Ecological surveys undertaken in mid-2002, indicated that the site of PT3 is	Habitat destruction of montane steppe may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 19 and 20. Since *Onosma liparioides* occurs within both ESAs 19 and 20, diligence will be exercised in searching for it between these two areas. Similarly, other globally-threatened plants were found along the previous route corridor – a search for these species along the current route will also be made prior to construction. The feasibility of translocating species will be	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction

Environmental Impact Table 24 (Maps 24A and 24B) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
ecologically degraded due to high human activity in the area.	broods.	assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Shrubs and dense vegetation along the RoW will be cleared outside the breeding season for the Whinchat. At the PT3 site, preconstruction surveys will determine the need to apply the following measures: • extra care will be taken at this site to ensure the area affected by construction activities is minimised where practicable and the location of laydown and staging areas will be determined	schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Environmental Impact Table 24 (Maps 24A and 24B) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		in consultation with ecological advisors to avoid sensitive species as far as practicable. • any particularly sensitive areas near the PT3 site, as determined by botanical specialists, will be fenced or clearly demarcated and will be off-limits to all construction personnel.	
Noise			
Cilhoroz settlement in Cayirli District, Erzincan Province is located c. 141m from the centreline of the Pipeline, and is near to a crossing of the NGP. Baskoy is located c. 418m from the centreline, and is also located near to a crossing of the NGP.	Short-term noise impacts are expected to occur at Cilhoroz settlement during soil stripping, excavation works and welding/lowering. In addition, sheet piling works associated with the NGP crossings will give rise to noise impacts at Cilhoroz and Baskoy.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for	**MODERATE IMPACT** Due to the proximity of the Cilhoroz to the Pipeline, noise impacts are expected to occur during soil stripping, welding/lowering and piling activities. Soil stripping and welding/lowering activities will be short-term in nature. However, works at the NGP will take three to four weeks to complete. Application of the mitigation measures described will minimise the potential for disturbance at Baskoy during piling and at Cilhoroz during excavation works.

Environmental Impact Table 24 (Maps 24A and 24B) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	
Archaeology and Cultural Heritage			
The site at PT3 has only recently been selected as the preferred location for PT3. The archaeological potential in the vicinity of the PT3 site has not been assessed. Baseline archaeological investigations will be undertaken of surface features at the site and surrounding areas prior to construction to confirm the presence, or potential presence, of archaeological features.	To be determined once an archaeological investigation of the site has been undertaken prior to construction.	To be determined as appropriate.	To be determined as appropriate.

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

MAP 24: PROJECT INFORMATION			
There is a pump station in this area (PT3). It requires 18.58ha of non-cultivated land, located on mountainous, largely barren terrain. Due to the terrain it will be constructed on nine levels. Adjacent to the pump station is its temporary construction camp (13.44ha). This camp is split into two sections on either side of a ridge. There are no block valve stations in the area.			
MAP 24: MAP HIGHLIGHTS			
• The majority of the route passes through pasture land. • The route crosses two irrigated agricultural areas. • Undulating plains support rainfed cereals and irrigated crops. • The pipeline crosses the Kozoglu creek and the Cilhoroz creek. • The Cayirli dam intersects with the pipeline corridor to the south.			
MAP 24: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted****:* six settlements will be directly impacted by the pipeline project, two of these (Baskoy and Cilhoroz) have land intersected by the proposed pipeline (L) and three settlements (Baskoy, Peyler (Esendoruk), Orensehir) are within 5km of the pump station (P). Three of the settlements are within 500m of the pipeline route (Baskoy, Verimli, Cilhoroz) (D). No settlements are within 2km of a block valve station (B). Settlements impacted by traffic have not yet been identified. • ***Surveyed****:* five settlements (Baskoy, Orensehir, Esendoruk, Yaylacik and Ulucak) were surveyed in the field (S). • ***Not surveyed:*** Cilhoroz (300m from the pipeline), Deliktas (950m from the pipeline). • ***Not on the map:*** Orensehir, Yaylacik and Ulucak.			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Baskoy (L) (P) (D) (S)			
• ***Demographics:*** summer population of 200 inhabitants with 50 households and a winter population of 50 people in 20 households. There has been an increase in population, following the 1992 earthquake due to people returning from Istanbul. Winter migration occurs to the Cayirli district centre. • ***Safety:*** Baskoy is located 1km from the pump station (visible). The settlement centre is 750m from the pipeline and the nearest house is 500m from the pipeline. • ***Health:*** contagious diseases occur occasionally. • ***Project attitude:*** a construction camp would be welcome. General opinion is positive, provided no damage occurs. In a previous project	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9.		

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

opinion is positive, provided no damage occurs. In a previous project local residents reported that damage was caused to most of the land, and the spring water. No payments were made in return for pastures taken away from the settlements. • ***Land ownership at pump station:*** the proposed site will occupy 18.58ha of state owned land. • ***Land ownership at pump station construction campsite:*** the campsite is immediately adjacent to the pump station. It will be 13.44ha in size, all of which is registered land, privately owned by Baskoy local residents. • ***Land ownership & use:*** surrounding land is privately owned or leased, or communal land that sustains grain and cattle grazing (40% of land is privately owned by local residents, 45% is used by local residents but not owned, and 5% of land is state owned). Landowners have title deeds. State owned land that is not currently used. The key crops are grain, sugar and beet. There is seasonal irrigation using permanent channels. There is sheep and cattle breeding with seasonal grazing in Spring, Summer, October and November. • ***Local opinion of the pump station:*** generally welcomed. • ***Perceived benefits of the pipeline and pump station:*** employment opportunities on pipeline construction and potential for improvements in trade and infrastructure. • ***Perceived problems of pipeline and pump station:*** risk of damage to settlement social relations, and risk of damage to land. • ***Settlement livelihood:*** animal husbandry is the main economic activity and agriculture the second activity. Cultivation of cereals, and sugar cane is mainly for subsistence. Sheep and cattle breeding is becoming unprofitable. 50% of inhabitants are family labourers. • ***Availability & skills:*** previous pipeline experience. Two construction skills out of 24 including drivers and repairmen. 92% are willing to accept temporary jobs. • ***Environmental & cultural sites:*** graves • ***Accessibility:*** Baskoy is located next to the pump station road (the old Erzincan Highway). The roads are made from soil and are in a	***Traffic*** The road that would be used to access the site would pass through Baskoy. Potential impacts due to traffic. ***Land*** Permanent land expropriation of 18.58ha will occur. ***Livelihoods*** Decreased land resources may result in decreased livelihood opportunities. ***Pump Station Construction hazards: humans*** Working areas pose safety hazards to residents, particularly small children.	Measures to assure the safety of and reduce the nuisance to the inhabitants to be incorporated. (refer to Section 6) Evaluate the possibility of assigning unused state owned pastureland. **See Overview of the Land Acquisition Process in Appendix C9.** **See Overview of the Land Acquisition Process in Appendix C9.** **Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**No residual impacts** Potential loss of land. **See Overview of the Land Acquisition Process in Appendix C9.** **See Overview of the Land Acquisition Process in Appendix C9.** **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

old Erzincan Highway). The roads are made from soil and are in a very bad condition but are usable in the winter. The district centre is 27km from the settlement. • ***Information provision:*** 75-90% of households are literate. • ***Infrastructure:*** electricity and piped water supplied, however there are occasional cuts in the latter and the settlement fountain is then used. There is also a waste disposal system, Garbage is mixed with fertilisers. • ***Services:*** there is a primary school but limited health services and poor sanitary conditions. • ***Settlement problems***: unemployment, there is a danger from flooding, and the people need a new settlement location. Deteriorating life standard due to general economic conditions and animal breeding becoming unprofitable and a lack of services including sewerage.	***Pump Station Construction hazards: animals*** Site poses safety hazard for livestock. **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers ***Land*** Temporary land expropriation (13.44ha) will occur.	***Consider erecting*** *stock proof fencing* ***in areas of danger for livestock.*** **Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.** Evaluate the possibility of assigning unused state owned pasture land.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **See Overview of the Land Acquisition Process in Appendix C9.**

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

	PIPELINE IMPACTS:		
	Construction hazards: animals Trench poses safety hazard for livestock	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Construction hazards: humans Working areas pose safety hazard to residents, particularly small children	**Road safety training in** schools and for wider community prior to construction. **Community liaison meetings** prior to construction to include safety.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from awareness raising.
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** during and immediately following construction to identify any land that has been affected. Consider erecting protective barrier fencing.	**Additional damage to be compensated for.**
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Irrigation Potential loss of flow from planned/ accidental	Contractor will **consult** with authorities to determine	**If irrigation water is disrupted** longer than time

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

	disruption. Contaminations of flow from spills or increase in sedimentation.	maximum acceptable time for disruption.	considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc.	Communication with settlement must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
	Health Potential health impacts on construction workers.	**Information is highlighted to contractor** so that they can ensure that their workers are protected.	**No residual impact.**
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

		provided.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yaylalar (P) **(S)**			
• ***Demographics:*** Yaylalar has a summer population of 100 people in 20 households and a winter population of 60 people. 40 local residents with 13 households. There is winter migration to Cayirli district centre. • ***Safety:*** Yaylalar is located 2.7km from the pipeline and 6km from the pump station (visible). • ***Project attitude:*** very positive. Villagers believe that the project will bring some prosperity at both the local and the national level. • ***Land ownership & use at pump station location:*** the proposed site will occupy 18.58ha of state owned land. • ***Local opinion of the pump station:*** inhabitants generally would welcome a pump station. • ***Perceived benefits of the pipeline and pump station:*** employment opportunities on pipeline construction, and potential for improvements in trade and infrastructure. • ***Perceived problems of pipeline and pump station:*** risk of damage to infrastructure, and concern that land will not be restored and cleaned up appropriately. There is also concern regarding the potential increase in traffic flow in the settlement and resultant safety implications of high-speed construction vehicles. • ***Settlement livelihood:*** animal husbandry is the main economic activity. • ***Information provision:*** 75-90% of households are literate. • ***Infrastructure:*** both settlements have their own water, electricity and telecommunications systems, but no sewerage system, school or health care centre.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc Accessibility to recruitment Decreased access to recruitment process	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected**

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Orensehir (P) **(S)**			
• ***Demographics:*** there is a winter population of 10 local residents in three households and a summer population 15 people. Winter migration occurs to Cayirli district centre. • ***Safety:*** Osensehir is located 3.6km from the pipeline and 6km from the pump station. • ***Project attitude:*** very positive. Inhabitants believe that the Project will bring some prosperity at both the local and the national level. • ***Land ownership & use at pump station location:*** the proposed site will occupy 18.58ha of state owned land. • ***Local opinion of the pump station:*** inhabitants generally would welcome a pump station. • ***Perceived benefits of the pipeline and pump station:*** employment opportunities on pipeline construction, and potential for improvements in trade and infrastructure. • ***Perceived problems of pipeline and pump station:*** risk of damage to infrastructure, and concern that land will not be restored and cleaned up appropriately. There is also concern regarding the potential increase in traffic flow in the settlement and resultant safety implications of high-speed construction vehicles. • ***Settlement livelihood:*** animal husbandry is the main economic activity. • ***Accessibility:*** 37.6km to district centre of Pinarbasi. • ***Information provision:*** 75-90% of households are literate. • ***Infrastructure:*** the settlement has their own water, electricity and telecommunications systems, but no sewerage system, school or health care centre.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc. ***Accessibility to recruitment*** Decreased access to recruitment process.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. **Winter road closures, seasonal migration and poor transport** will be taken into account in the recruitment strategy.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impacts expected.**

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Payler (Esendoruk) (P) (S)			
• ***Demographics**:* there is a summer population of 100 people in 20 households and a winter population of 28 people in seven households. Winter migration to Cayirli district centre occurs. The population is slowing increasing. • ***Safety:*** the settlement centre is 2.1km from the pipeline and 2km from the pump station. • ***Disputes:*** there is a dispute in the settlement over use of pasture land. • ***Project attitude:*** very positive, although the local residents are concerned that the negative impacts experienced during construction of the natural gas project may be repeated. • ***Land ownership & use at pump station location:*** the proposed site will occupy 18.58ha of state owned land. • ***Local opinion of the pump station:*** inhabitants generally welcome a pump station. • ***Perceived benefits of the pipeline and pump station:*** employment opportunities on pipeline construction and in the construction camps; indirect employment opportunities ie provision of goods & services; and potential for improvements in trade and infrastructure. • ***Perceived problems of pipeline and pump station:*** risk of damage to settlement social relations, risk of damage to land, and potential for increased traffic in and nearby the settlement. • ***Settlement livelihood:*** animal husbandry is the main economic activity and agriculture (grain & herbs) the second activity. 1% of the population have a regular paid job. • ***Accessibility:*** the settlement is 29km from the district centre. It is inaccessible during winter (December, January, February). • ***Information provision:*** 75% of the population is literate. • ***Infrastructure:*** no piped water, no regular supply, local spring alternative source.	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of the Land Acquisition Process in Appendix C9. **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers	**Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training.**	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

• ***Services:*** no electricity supply or telephone service in the settlement, although there is a basic sewerage and a waste disposal system. No primary school, poor health services and poor sanitary conditions. • ***Settlement problems***: transportation and lack of electricity	**PIPELINE IMPACTS:** ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility to recruitment*** Decreased access to recruitment process ***Drinking water*** Potential for disruption or contamination of drinking water during construction	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Asking residents or workers to translate as necessary and emphasising oral communication where literacy is low. Winter road closures, seasonal migration and poor transport need to be **taken into account** in the recruitment strategy. The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	community investment activities. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected** **No residual impact.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yaylacik (S)			
• ***Demographics****:* 300 inhabitants with 70 households. No change in population. • ***Safety:*** the settlement centre is 3.1km from the pipeline.	No additional impacts identified.		

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

• ***Project attitude:*** a construction camp would be welcomed and there is no hostility towards the project although the general attitude is partially positive since the existing pipeline passes through pastures. There are no major concerns, except traffic impacts (18%), and 36% felt that they would benefit from direct employment. • ***Land ownership & use:*** 60% of land is owned privately by local residents, 25% is communal and 15% is by share cropping. Landowners have title deeds. A diverse range of livestock is kept, with seasonal grazing in May and November. The inhabitants mentioned that the land was unproductive. Key crops are grain, herbs. There is no temporary irrigation. • ***Settlement livelihood:*** agriculture is the main source. Cultivation of cereals and legumes for subsistence. Beekeeping tales place. 100% of inhabitants are family labourers. • ***Availability & skills:*** previous experience. Only a few skills are available (two of 24 possible construction skills) including laying pipes and driving. 64% of inhabitants are willing to accept temporary jobs. • ***Accessibility:*** settlement roads of poor quality asphalt and loose binder dust, but can be used in winter. The distance from settlement to district centre is 10km. • ***Information provision:*** Literacy rates are 100%. • ***Environmental & cultural sites:*** none • ***Services***: there are schools and there are no health facilities. • ***Infrastructure*****:** there is a piped, regular supply of water. Electricity and sewerage systems are present. No waste system and waste is disposed of by burning, recycling, mixed with fertilisers. • ***Settlement problems***: lack of water, water mains are insufficient, roads need to be asphalted, a bridge is needed over the stream flowing through the settlement, and life standards are deteriorating due to the national economic downturn.			

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Ulucak (S)			
• ***Demographics**:* 150 inhabitants with 28 households. No change in population. Migration of families to Istanbul during winter months. • ***Safety:*** 1.9km from the pipeline • ***Project attitude:*** while a construction camp would be welcomed, attitude to the project is **very negative** due to previous damage to land and water ducts during construction of the natural gas pipeline. Damaged irrigation canals were not reinstated by subcontractor firm Serefoglu during the natural gas pipeline construction. Trees cut down and not compensated for, water resources damaged and not compensated, land not reinstated, expropriation costs were low and promises were not kept by BOTAŞ during the construction of the pipeline. *"if necessary I will lie down in front of the bulldozers"*, they do not want their lands acquired and demand a monthly salary for use of their lands. 18% of inhabitants believe they will benefit from direct employment. • ***Land ownership & use:*** 100% of land is privately owned by local residents and landowners have title deeds. Cattle breeding takes place with seasonal grazing in Spring, Summer and Autumn. There is seasonal irrigation with permanent channels. • ***Settlement livelihood:*** agriculture, cultivation of cereals and grain and cattle breeding. Cultivation mainly for subsistence. Beekeeping takes place. 14% of inhabitants have regular jobs (paid), 22% are family labourers. • ***Availability & skills:*** no previous experience. No construction skills are present. 36% of inhabitants are willing to accept temporary jobs. Stones are available for construction. • ***Accessibility:*** the settlement is accessible throughout the year. There is an auxiliary road connecting the settlement to main road, which is constructed out of low quality asphalt, and the roads within the settlement are constructed out of soil, and available in the winter. The distance from settlement to district centre of Refahiye is 6.3km	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility to recruitment*** Decreased access to recruitment process ***Negative experience*** **Possible opposition** to project and **increased sensitivity** to any negative impacts.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Communication with settlement must take into account settlement characteristics to ensure equal access to information for all residents. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected** Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Social Impact Table 24 (Map 24C) (KPs 440.0 – 463.1): Otlukbeli Mountains, Erzincan Province

6.3km. • ***Information provision:*** Literacy rate is 100%. • ***Environmental & cultural sites:*** cultural site, grave of a notable person within the community. • ***Services***: there is no school, the nearest one is 9km away. There are no health facilities. • ***Infrastructure*****:** there is a piped, regular supply of water. Electricity, sewerage systems are present, the latter is lacking in some places. No waste system, and the source of waste disposal is recycling and mixing garbage with fertilisers. • ***Settlement problems***: income, relatively poor settlement, due to increasing costs for cultivation, and the potential land cannot be evaluated to a full extent.		any negative impacts are rapidly identified. **Construction workers to be remind**ed of the importance of appropriate behaviour in daily **briefings.**	

Environmental Impact Table 25 (Maps 25A and 25B) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Clayey-skeletal to Loamy-skeletal Xerochrepts on slopes below about 2,000m. • Mesic Xerorthents or Xerofluvents near low-lying channels. • Sandy-skeletal Cryochrepts, which may be lithic, on upland slopes, along the spine of ridges. • Cryorthents on upland valley bottoms and lower slopes. • Channel boulders, cobbles, and gravel on fluvial lands.	Potential soil productivity liabilities of the NGP are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel Other potential impacts include: • soil erosion; • sediment yield; • saturated soils; • channel alteration.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and gas pipeline corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.

Environmental Impact Table 25 (Maps 25A and 25B) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Schedule construction to avoid early spring (April to May).	
Landscape and Visual			
The route continues to ascend across the summits of the narrow, prominent ridges that dominate the landscape. High relief forces the Pipeline to rise and fall through numerous canyons. The route crosses through c. 1-2km of sections of Guzyurdu Forest. Small settlements occupy valley bottoms where these widen out. Shrubs dominate slope vegetation, with forests occupying only scattered slopes; grassland covers U-shaped and gently sloping valley bottoms, with coarser, riparian vegetation along stream banks. Valley bottoms near settlements are farmed. Bare ground on steep slopes is common. Landscape sensitivity is moderate.	High elevation grasslands in the eastern part of the Otlukbeli Mountains are vulnerable to long-term damage because of their poor shallow soils, and harsh climatic conditions will delay reinstatement. However diverse landform offers opportunities to screen the route.	• Optimise landform screening effects. • Carefully remove, store, nurture, and replace turfs.	**MODERATE IMPACT** High elevation grasslands may prove difficult to re-instate. Even with care, visual impact can be expected to remain for several years.
Ecology			
Important Ecological Factors ESA 21is identified between KP 468.9 and KP 472.5 for five globally-threatened plant species (*Hypericum scabroides, Astragalus crinitus, Alchemilla ciminensis, Alchemilla erzincanensis* and *Bupleurum eginense*) and one nationally-threatened species (*Acer divergens var. trilobium*). ESA 22 is identified between KP 476.5 and KP 481.8 for three globally-threatened species (*Onosma sintenisii, Paracaryum lithospermifolium var.*	Habitat destruction of montane steppe and mixed forest may result in the loss of individuals from populations of globally-threatened plants. The pipeline route skirts the	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 21 & 22. The feasibility of translocating species will be assessed prior to construction. Where only a few	**MODERATE IMPACT** Short-term disturbance to internationally important flora and possibly fauna. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the

Environmental Impact Table 25 (Maps 25A and 25B) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
erectum and *Veronica montbretii*) and one nationally-threatened species (*Campanula ptarmicifolia var. ptarmicifolia*). The IUCN status for these species are given in Table 5.20, Section 5. Guzyurdu Forest is possibly the most important area for large mammals along the route, although the forest has no protection status, and includes notably Wild Goat, Chamois (both globally-threatened), Brown Bear, Grey Wolf and Roe Deer. The smaller mammals that attract attention within this forest are Eurasian Otter, Forest Dormouse (both globally-threatened), Beech Marten, European Pine Marten and Eurasian Badger. The protection status for these species are given in Table 5.21, Section 5. BVS-024 will be located at KP 463.4 within montane steppe habitat. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 1,088m in length. BVS-025 will be located at KP 468.9 within ESA 21 and BVS-026 at KP 480.1 in ESA 22, both sites within montane steppe habitat. Approximately 350m^2 of permanent landtake required for each BVS. New access roads will be constructed to BVS-025 and BVS-026 of c. 35m in length.	edge of low grade forest and therefore only minor temporary disturbances are expected to globally-threatened mammals during seasonal sensitivities (see EMMP, Appendix C1): • hibernation and peak spring feeding periods for brown bears between November to April and March to June, respectively; • breeding season for wild goats between October and December and during birthing between March and April; • breeding season for Turkish Chamois is in the autumn, with young are born in March and April; • breeding season for the Eurasian Otter is year round in Turkey, with a tendency towards the spring period in cooler regions; • breeding season for the Forest Dormouse is between May and August, but in warmer areas the season may extend beyond this period.	individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. The RoW within Guzyurdu Forest and ESA 21 will NOT be fenced off temporarily during construction to ensure free passage of large mammals. In addition, the RoW within Guzyurdu Forest will be narrowed to 22m. If any significant length of trench, in terms of interrupting normal paths or passage used by the various species, needs to be left open for more than a few days (72 hours), points of passage will be provided across it at regular intervals (500m).	ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACT** at most to mammals during the construction period where the specified mitigation measures are applied for the seasonal sensitivities identified for each species. **MINOR IMPACTS** Based on the mitigation measures described, the location of BVS-024 away from an ESA and the temporary nature of construction activities, it is predicted that only minor impacts on the biological environment will occur during construction of the access road to BVS-024. This assessment will be confirmed by the site-specific surveys prior to construction. **MINOR IMPACT** Based on the mitigation measures described, the small area of habitat affected in each ESA and the temporary nature of

Environmental Impact Table 25 (Maps 25A and 25B) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	In severe weather, bears hibernate in underground dens or caves. During this hibernation period, the females give birth to one or two cubs (rarely three) in January or February. Following hibernation, bears enter a period of peak feeding in order to recover weight lost during the winter months. During such periods they are known to wander over wide areas and are most likely to come into conflict with human habitation, particularly in remote areas. Females with cubs are at their most aggressive at this time. Potential for disturbance due construction of the new access road for BVS-024 as this length has not be subject to detailed vegetation and faunal surveys. Permanent loss of 350m^2 of montane steppe habitat within each ESA.	Specific requirements have been established in relation to human interaction with the Eurasian Brown Bear – see Section 4.14 of the Mammals Species Dossier (Appendix B1). In the late summer/early autumn, in areas from which bears have been recorded, preconstruction ground surveys will be undertaken to establish the presence of potential hibernation places. If found, construction activity will be restricted to periods outside the hibernation season. Furthermore, in areas where the presence of bears has been confirmed by these surveys, the specific requirements outlined in Section 4.14.5 of Appendix B1 shall be implemented, including education of workers to be alert and aware of the potential for human/bear interactions. Such education will include refuse management on sites (particularly where construction camps are located) and awareness of sensitive periods of the year described previously. The hunting of bears or any other wildlife by the BTC Project personnel or contractors will be strictly forbidden.	construction activities, it is predicted that only minor impacts on the biological environment will occur as a result of construction activities at BVS-025 and BVS-026. This assessment will be confirmed by site-specific surveys prior to construction.

Environmental Impact Table 25 (Maps 25A and 25B) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		The preconstruction survey will establish the presence and local distribution of Wild Goats and Turkish Chamois in the areas from which they have been recorded. Depending on the outcome of these surveys, actions may range from avoidance of construction activity during sensitive periods at specific locations to worker training regarding non-disturbance of nearby herds. Preconstruction surveys of the RoW in the vicinity of river crossings will aim to identify the location and extent of otter holts within the vicinity (250m) of intended river crossings. If discovered these may be cleared in the late summer months under the close supervision of an ecologist approved by BOTAŞ. Preconstruction surveys for the Forest Dormouse of dense woodland in the RoW; if present route clearance will be undertaken during the autumn or winter period. Site-specific vegetation and faunal (including birds) surveys will be	

Environmental Impact Table 25 (Maps 25A and 25B) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		undertaken along the new access road to BVS-024 prior to construction. Based on the findings of this survey, mitigation measures will be identified and implemented as appropriate. However, as BVS-024 is not located within or close to an ESA, it is anticipated that no threatened species will be found. Prior to construction of BVS-025 and BVS-026, a site-specific survey will be undertaken by an ecological specialist to identify and locate threatened species at the site and at any surrounding areas potentially affected by construction activities. Based on the findings of this survey, appropriate mitigation will be determined. The area of sensitive habitat in ESAs 21 and 22 affected by construction activities will be minimised to the minimum necessary for safe working.	

Social Impact Table 25 (Map 25C) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

MAP 25: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There are two block valve stations.

MAP 25: MAP HIGHLIGHTS

- The pipeline crosses a creek.
- There are numerous access roads that link settlements.
- The pipeline passes the Otlukbeli Mountains.
- Pipeline passes through pasture lands, and small zones of rain fed agriculture and irrigated agriculture land. Approximately 4km of the pipeline route passes through a severely eroded area.

MAP 25: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** four settlements on this map will be directly impacted by the pipeline project (Gunbatur, Guzyurdu, Akdag and Yeniyol) and have land intersected by the pipeline (L). Three of these settlements (Akdag, Guzyurdu and Gunbatur) are also within 500m of the pipeline route, and both Gunbatur and Guzyurdu are located within 2km of the block valve stations. Settlements impacted by traffic have not yet been identified. No settlements are immediately downstream of the pipeline.

- ***Surveyed:*** four settlements (Gunbatur, Guzyurdu, Bindal, Akdag) were surveyed in the field (S) and one settlement (Yeniyol) was surveyed via telephone (T).
- ***Not surveyed:*** Karacaoren (2km north-west of pipeline) was not surveyed.
- ***Disclosure Meeting Location:*** Yeniyol

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Gunbatur (L) (D) (B) (S)			
• ***Demographics:*** 130 inhabitants with 27 households. 20% are Alevi Muslim. • ***Safety****:* the centre of the settlement is situated 500m from pipeline and the nearest house in the settlement is 300m from the pipeline. • ***Project attitude:*** generally positive attitude. Local residents hope that they will benefit from temporary jobs in the construction phase. All people interviewed would like a construction camp to be established close to the settlement. Direct employment is the most likely expected benefit of the pipeline. • ***Land ownership & use:*** 80% of land is privately owned by the local residents and 20% of land is communally owned. Land ownership conflicts have been observed between local residents. Grazing occurs	***Construction hazards: humans.*** Working areas pose safety hazard to residents, particularly small children.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 25 (Map 25C) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

conflicts have been observed between local residents. Grazing occurs throughout the year. • ***Settlement livelihood:*** agriculture and forestry are the main sources of livelihood. Key crops include grain and vegetables. Land is irrigated. • ***Availability & skills:*** food services, vehicle drivers, tree fellers, drivers and heavy machinery drivers. 70% of inhabitants would accept a temporary job. • ***Accessibility:*** Roads are of relatively poor quality. They are open year round except for 4-5 days in February and March. • ***Information provision:*** 70% of the population is literate. Best local information provision mechanisms are TV and the Muhtar. • ***Environmental and cultural sites:*** forest. • ***Services:*** there are no sewerage systems and no health care facilities. There is a Gendarme's office and a primary school with one teacher. • ***Infrastructure:*** piped water is supplied to households, however, water supply is irregular. There is no alternative water source. • ***Settlement problems:*** unemployment, poor education and lack of a sewerage system.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment	construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. Livestock crossings will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **See Overview of the Land Acquisition Process in Appendix C9.** Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will

Social Impact Table 25 (Map 25C) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

	on employment opportunities, potential disruption to utilities, etc.	equal access to information for all residents. This should include emphasising oral communication where literacy is low.	keep this to a minimum.
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Conflict over land boundaries Exacerbation of existing conflicts.	**Land boundaries to remain clearly demarcated** at all times.	**No significant residual impacts.**
	Forestry Loss of a resource used by settlements. Increased expenditure on other fuel sources.	If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.
	Block Valve Station See Environmental Impact Tables and Overview of the Land Acquisition Process in Appendix C9		
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Guzyurdu (L) (D) (B) (S)			
• ***Demographics:*** there are 450 inhabitants in 100 households.	***Construction hazards: humans***	**Road safety training** will be	**Continued attention** to

Social Impact Table 25 (Map 25C) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

• ***Safety:*** the centre of the settlement is situated 650m from the pipeline. • ***Health:*** the poor sewerage system has negative implications on health. • ***Disputes:*** there are no disputes. • ***Project attitude:*** the community is generally positive towards the pipeline, although they are also suspicious. In addition, they do not want the pipeline project to interfere with their planned irrigation construction, and they do not want it to pass through the forestry areas near the settlement, they have asked for a change in the pipeline route. • ***Land ownership & use:*** all land is owned privately by local residents. Seasonal grazing takes place in Spring, Summer and Autumn. • ***Settlement livelihood:*** bee keeping is the main economic activity. Animal husbandry and agriculture are also undertaken. Key crops include barley, wheat, legumes and sugar beet. Irrigation occurs, with water sourced from a natural resource north-east of the settlement. • ***Availability & skills:*** the following skills are available; heavy vehicle drivers, tree fellers, drivers and welders. 73% of inhabitants would accept a temporary job. • ***Accessibility:*** 70km to provincial centre. Roads are open except in January, February and March. • ***Information provision:*** 80% of the population is literate. Best information provision techniques are the newspaper and the Muhtar. • ***Environmental & cultural sites:*** forest, thermal spring and graves (graveyard, kurgan, sarcophage, memorial, tomb or gravestone). • ***Services:*** there is no sewerage or waste system. Electricity, water and telephone networks are available. There are no health facilities. There are coffee houses and also a primary school. • ***Infrastructure:*** piped water is available, although supply is not regular. There is no alternative water source. • ***Settlement problems:*** unemployment, education, poor sewerage resulting in spread of disease and lack of markets. • ***Other:*** local residents are very conservative. Caution should be taken by construction workers to avoid inappropriate behaviour.	Working areas pose safety hazard to residents, particularly small children. Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 25 (Map 25C) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Forest Loss of a resource used by settlements. Increased expenditure on other fuel sources.	If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility to information Sectors of the population may not have access to project related information on employment	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 25 (Map 25C) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

	opportunities, potential disruption to utilities, etc.	for all residents.	
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Conservative settlement Construction workers are more likely to offend inhabitants.	**Any interactions** between construction workers & communities (eg use of local shop) to be carefully monitored. Construction workers to be reminded of the importance of appropriate behaviour in **daily briefings.**	**Low likelihood of significant impacts.** Potential for impacts arising from breeches of rules and procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures.
	Block Valve Station See Environmental Impact Tables and Overview of the Land Acquisition Process in Appendix C9		
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Bindal (S)			
• ***Demographics:*** 300 inhabitants with 50 households • ***Safety****:* the centre of the settlement is situated 2500m from pipeline. • ***Project attitude:*** there is generally a positive attitude towards the pipeline, although the local residents are concerned that construction activities will damage their road. They are also concerned about accidents occurring during construction, especially involving children. All nine households surveyed would like a construction camp to be	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be

Social Impact Table 25 (Map 25C) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

All nine households surveyed would like a construction camp to be established close to the settlement. Direct employment is the most widely expected benefit of the pipeline. • ***Land ownership & use:*** all land is privately owned by local residents. Seasonal grazing of livestock takes place during Spring, Summer and November. • ***Settlement livelihood:*** predominantly agriculture, with grain, herbs, sugar beet and fruit trees grown; and a small amount of bee keeping. Some land is irrigated. • ***Availability & skills:*** available skills are food services personnel, heavy vehicle drivers, tree fellers and drivers. 55% of people are willing to accept a temporary job. • ***Accessibility:*** 50km to provincial centre. Roads are always open and are of relatively good quality. • ***Information provision:*** 75% of the population is literate. The most commonly used sources of information are TV, newspaper, and via telephone. • ***Environmental & cultural sites:*** there is a mausoleum, a thermal spring and a forest. • ***Infrastructure:*** piped water is available year round. There is no alternative water source. Electricity, and telephone networks are available. There is no sewerage system • ***Services:*** the settlement has a primary school and one teacher, but no health facilities. • ***Settlement problems:*** unemployment.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Akdag (L) (D) (S)			
• ***Demographics:*** 150 inhabitants with 40 households. • ***Safety****:* the centre of the settlement is situated 900m from pipeline and the nearest house in the settlement to the pipeline is 350m. • ***Project attitude:*** there is no hostility to pipeline and there is a positive attitude towards the project, although the local residents do not want	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison**	**Continued attention** to mitigation measures will be critical to prevent injury.

Social Impact Table 25 (Map 25C) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

the pipeline to affect their pasture land, forestry areas or their roads. The majority (10/11) of people interviewed would like a construction camp to be established near to the settlement. Direct employment is the most expected benefit of the pipeline. • ***Land ownership & use:*** mainly private ownership (80%). Wheat and barley are cultivated and irrigation occurs. Seasonal grazing occurs in Spring and Summer. • ***Settlement livelihood:*** bee keeping is the main economic activity. Considerable agriculture also occurs. • ***Available skills:*** main skills available are food service personnel, heavy vehicle drivers, tree fellers, drivers and welders. 46% of people would be willing to accept a temporary job. • ***Settlement accessibility:*** 40km to provincial centre and 40km to district centre. The roads are always open and are in a relatively good state of repair. • ***Information provision:*** 95% of the population is literate. • ***Services:*** electricity networks available. No waste disposal system, nor any health facilities. There is a primary school with one teacher. • ***Infrastructure:*** piped water is supplied to households. The supply is regular. There is no alternative water source. • ***Settlement problems:*** waste disposal	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	**meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move them to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original	**Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects

Social Impact Table 25 (Map 25C) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

		location.	complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Forest Loss of a resource used by settlements. Increased expenditure on other fuel sources.	If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable**	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.

Social Impact Table 25 (Map 25C) (KPs 463.1 – 485.1): Otlukbeli Mountains and Guzyurdu Forest, Erzincan Province

		compensation. The level of compensation will be facilitated by the Projects complaints procedure.	

Environmental Impact Table 26 (Maps 26A and 26B) (KPs 485.1 – 505.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Lithic Sandy-skeletal Cryochrepts along ridge summits. • Fine-loamy Typic Cryorthents in valley bottoms.	Soil related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Main potential impacts: • soil erosion; • sediment yield; • soil productivity; • channel alteration.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.

Environmental Impact Table 26 (Maps 26A and 26B) (KPs 485.1 – 505.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	
Landscape and Visual			
The western mountains rise higher and the route passes into the true alpine zone peaking at 2,810m asl, where the snow still lies late into June. The landscapes here are desolate, sparsely vegetated, and angular with far-reaching vistas over neighbouring mountain ranges. The landscape is outstanding but remote and little visited and is previously scarred by the telecommunications station in this section and the un-reinstated natural gas pipeline. The diverse landform may offer opportunities to screen the route.	• Alpine vegetation in the western part of the Otlukbeli Mountains is extremely vulnerable to long-term damage because of the shallow, poor soils, and the extreme climatic conditions. • Visual liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline. • Elevation means that short growing season and cool temperatures will delay reinstatement. • Construction alongside mountain tracks will be visually conspicuous.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. Elsewhere **MODERATE IMPACTS** as high elevation grasslands may prove difficult to reinstate. Even with care, the visual impact can be expected to remain up to five years after construction has been completed.

Environmental Impact Table 26 (Maps 26A and 26B) (KPs 485.1 – 505.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Measures to reduce the impact of heavy machinery will include use of moveable equipment mats to spread vehicle weight and avoid deep rutting. The possibility of undertaking construction during early spring when the ground is still snow-covered and frozen will be investigated since this technique is used successfully in arctic tundra environments. At such times it may be possible to lift frozen turfs (impossible in the summer because of low root mass and friable soils) and replace them with little damage. If this is not possible, implement trials using reinstatement species and very low doses of quick-release fertilisers (NPK + micro-nutrients).	
Groundwater			
The pipeline route passes over springs on the Erzincan Plateau, which is a major groundwater resource used for drinking water by settlements in the vicinity of the route between KP 488 to the end of this section.	Potential for moderate and localised impacts to groundwater quality from	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and	**MODERATE IMPACT** This area is a major groundwater resource,

Environmental Impact Table 26 (Maps 26A and 26B) (KPs 485.1 – 505.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	construction activities.	conflicting with other users, including: • No groundwater abstraction within 50m of springs or wells. Groundwater will not be abstracted for use as hydrotest water. • No facilities (construction camps, pipe yards, fuel stores etc) will be located within 50m of springs or wells.	although its Class is not known at this stage. However, where mitigation measures described are applied, impacts are predicted to be moderate at most and localised. Strict adherence to the mitigation measures contained in the EMMP (Appendix C1) and PPP (Appendix C4) will be required.
Ecology			
Protected Areas Route passes south of the Kelkit Wildlife Protection Area (22,000 ha) , passing within 130m at its closest point KP 493.8, but does not cross the protected area. The area was established in 1983 to protect the Turkish Chamois and Wild Goat.	Although the pipeline route does not cross the protected area, there is a potential for disturbance if construction workers stray over the protected area boundaries.	Hunting of the Turkish Chamois and the Wild Goat by construction workers will be prohibited and enforced. Apply standard mitigation measures as described in Section 6.6, including ensuring workers keep within the RoW at all times, ensuring construction vehicles keep to approved roads and avoid off-road driving of vehicles.	**MINOR IMPACT** Only minor impacts on the basis of avoidance and strict adherence to project mitigation measures.
Important Ecological Factors ESA 23 is identified between KP 485.0 and KP 485.5 for a nationally-threatened plant species. The IUCN status for this species is given in Table 5.20, Section 5. ESA 24 occupies a total length of c. 24.1km of the route between KP 487.1 and KP 511.2 and continues on to Map 27B. Eight globally-threatened plant	Habitat destruction of the alpine zone may result in the loss of individuals from populations of globally-threatened plants and habitat destruction of montane steppe	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 23 & 24. The feasibility of translocating species will be assessed prior to	**MODERATE IMPACTS** Medium-term disturbance to internationally important flora and supporting habitats. Mitigation measures will minimise losses but because of the fragility of the habitat,

Environmental Impact Table 26 (Maps 26A and 26B) (KPs 485.1 – 505.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
species occur within this ESA (*Gypsophila aucheri, Arenaria pseudacantholimon, Festuca anatolica var. borealis, Paracaryum corymbiforme, Ranunculus sintenisii, Dianthus zederbaueri, Consolida olopetala* and *Minuartia anatolica var. scleranthoides*). The IUCN status for these species are given in Table 5.20, Section 5. Because of the fragility of this alpine zone ecosystem, ESA 24 has been extended to include the entire alpine habitat occurring along the pipeline route. At KP 497.5, 1 Black Kite (nationally-threatened) was recorded. The protection status for this species is given in Table 5.21, Section 5. BVS-027 and BVS-028 will be located at KP 487.7 and KP 499.1, respectively, within alpine zone habitat in ESA 24. Approximately 350m^2 of permanent landtake required for each BVS. New access roads will be constructed to each site, of c. 45m in length to BVS-027 and c. 134m to BVS-028.	may result in the loss of individuals from nationally-threatened plants populations. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss, if construction is undertaken during the breeding season (ie between March and July inclusive). July can remain sensitive for late and second broods. Permanent loss of 350m^2 of alpine zone habitat in ESA 24 during construction of the BVS sites.	construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly. • turfs containing the threatened plants to be nurture until replacement. Care will be taken in using fertiliser during re-instatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESAs 23 & 24. Additionally, the fragility of the alpine zone requires measures to be taken to reduce the impact throughout. The feasibility of using techniques to reduce the effects of heavy machinery will be investigated including limits on axle weights, the use of balloon tyres, the prohibition of tracked vehicles, and the use of geo-	disturbance effects may still be detectable after several years. **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to March, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACT** Based on the mitigation measures described, the small area of habitat affected and the temporary nature of construction activities, it is predicted that only minor impacts on the biological environment will occur as a result of construction activities at BVS-027 and BVS-028. This assessment will be confirmed by site-specific surveys prior to construction.

Environmental Impact Table 26 (Maps 26A and 26B) (KPs 485.1 – 505.1): Otlukbeli Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		textiles to line roadways. Preconstruction survey for evidence of past Black Kite nesting sites. If nesting sites are found within the RoW these will be removed prior to March and after July; where those within 250m of the RoW are observed in April and if nesting is occurring, construction will be avoided until July. Prior to construction of BVS-027 and BVS-028, a site-specific survey will be undertaken by an ecological specialist to identify and locate threatened species at the site and at any surrounding areas potentially affected by construction activities. Based on the findings of this survey, appropriate mitigation will be determined.	

Social Impact Table 26 (Map 26C) (KPs 485.1 – 505.1): Otlukbeli Mountains, Erzincan Province

MAP 26: PROJECT INFORMATION
There are no pump stations or construction camps in the area. There are two block valve stations.
MAP 26: MAP HIGHLIGHTS
• Predominant land uses are pasture, grazing, forestry and some irrigated agriculture. • Forest areas occupy the western boundary of part of the corridor. • Summits of narrow prominent ridges dominate the landscape.
MAP 26: IMPACTED & SURVEYED SETTLEMENTS
• ***Impacted**:* no settlements will be directly impacted by the pipeline project. None of these have land intersected by the proposed pipeline, none are within 5km of a pump station, none are within 2km of the block valve stations, and no settlements are within 500m of the pipeline route. Settlements impacted by traffic have not yet been identified. No settlements are downstream of a river/ creek crossing. • ***Not surveyed:*** three settlements on the map were not surveyed: Komur (2.65km from the pipeline); Kirmana (2.9km from the pipeline); and Kocyatagi (2.8km from the pipeline). These, however, are all more than 2km from the pipeline.

Environmental Impact Table 27 (Maps 27A and 27B) (KPs 505.1 – 526.5): Kara Mountain area, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Lithic Sandy-skeletal Cryochrepts along ridge summits. • Mesic Coarse-silty Typic Xerochrepts on lower slopes, especially below 2,000m. • Channel gravel and boulders along fluvial headwaters.	Soil related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Main potential impacts: • soil erosion; • sediment yield; • soil productivity; • frost heave (fine soils at elevation above 2,000m); • channel alteration.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.

Environmental Impact Table 27 (Maps 27A and 27B) (KPs 505.1 – 526.5): Kara Mountain area, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Bury pipe below 1m depth. • Channel stabilisation - see typical drawings.	
Landscape and Visual			
The route continues through the true alpine zone. The landscapes here are desolate, sparsely-vegetated, and angular with far-reaching vistas over neighbouring mountain ranges. Landscape quality is outstanding although remote and little visited. The landscape is also previously scarred by the telecommunications station in this section and the poorly reinstated NGP. From about KP 508, the Pipeline descends sharply along gravely hillsides and grassy valleys to the flat valley of Ilgar Creek where it crosses electricity transmission lines and a major highway. Landscapes characterised by cropland with river banks covered by dense bushes and trees. BVS-029 will be located at KP 520.0 within coniferous forest. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to this site of c. 35m in length.	Visual related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline. Alpine vegetation in the western part of the Otlukbeli Mountains is extremely vulnerable to long-term damage because of the shallow, poor soils, and the extreme climatic conditions. Elevation means that short growing season and cool temperatures will delay reinstatement. Potential impacts and their management during BVS	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular,	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. Elsewhere **MODERATE IMPACTS** as high elevation grasslands may prove difficult to reinstate. Even with care, the visual impact can be expected to remain up to five years after construction has been completed. **MODERATE TO MINOR IMPACTS** on lower lying cropland where re-vegetation will be easier to achieve.

Environmental Impact Table 27 (Maps 27A and 27B) (KPs 505.1 – 526.5): Kara Mountain area, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	construction will be the same as those during pipeline construction.	specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Measures to reduce the impact of heavy machinery will include use of moveable equipment mats to spread vehicle weight and avoid deep rutting. The possibility of undertaking construction during early spring when the ground is still snow-covered and frozen will be investigated since this technique is used successfully in arctic tundra environments. At such times it may be possible to lift frozen turfs (impossible in the summer because of low root mass and friable soils) and replace them with little damage. If this is not possible, implement trials using reinstatement species and very low doses of quick-release fertilisers (NPK + micro-nutrients).	
Surface Geology and Geohazards			
Faults Route crosses the North Anatolian Fault zone twice (KP 507.5 and 508.5).	See *Section 8*.	See *Section 8*.	See *Section 8*.

Environmental Impact Table 27 (Maps 27A and 27B) (KPs 505.1 – 526.5): Kara Mountain area, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Fault is class A and the fault zone is c. 500m wide at the crossing point. Route crosses the fault zone in an area that has a series of well-developed pressure ridges c. 490m wide. There are four main splays within this zone, which are considered as sympathetic faults that will slip only during an earthquake on the main fault trace; they are not likely to produce earthquakes independently.			
Surface Waters			
The route crosses Bulgurcayiri Creek (KPs 521.1 – 522.3). Bank vegetation and floodplain of creek are disturbed by construction of the NGP. The route also crosses the Ilgar River at the end of this map, which is discussed on the following Environmental Impact Table 28 (see Map 28A).	Disturbance to Bulgurcayiri Creek, directly through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Potential for long-term sedimentation and turbidity. The NGP lies adjacent and parallel to the river.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor at this watercourse crossing impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply standard mitigation	**INDIRECT POSITIVE IMPACT** where the Bulgurcayiri Creek crossing previously disturbed during construction of the NGP is reinstated. **MINOR IMPACTS** Although the water quality classification for Bulgurcayiri Creek is unknown, only minor impacts expected, as disturbance will be limited to the immediate working area. Sedimentation of Bulgurcayiri Creek will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.

Environmental Impact Table 27 (Maps 27A and 27B) (KPs 505.1 – 526.5): Kara Mountain area, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		measures in Section 6.4 and the RP, Appendix C2, to avoid sedimentation and turbidity at the Bulgurcayiri Creek crossing point, including sediment filters/trapping devices, settling ponds and trench de-watering.	
Groundwater			
The pipeline route continues to pass over springs on the Erzincan Plateau from the beginning of the section to KP 518.6.	Potential for moderate and localised impacts to groundwater quality from construction activities.	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including • No groundwater abstraction within 50m of springs or wells. Groundwater will not be abstracted for use as hydrotest water. • No facilities (construction camps, pipe yards, fuel stores etc) will be located within 50m of springs or wells.	**MODERATE IMPACT** This area is a major groundwater resource, although its Class is not known at this stage. However, where mitigation measures described are applied, impacts are predicted to be moderate at most and localised. Strict adherence to the mitigation measures contained in the EMMP (Appendix C1) and PPP (Appendix C4) will be required.
Ecology			
Important Ecological Factors ESA 24 continues for c. 6.25km on this map (see Environmental Impact Table 26 and Map 26B for previous description of species). ESA 25 and 26 occur between KP 522.3 and KP 522.8 and between KP 525.0 and KP 525.6, respectively. These ESA are identified for the globally-threatened plant species *Barbarea auriculata var. paludosa* occurring within ESA 25 and the globally-threatened *Gypsophila aucheri* within ESA 26. The IUCN status for these species are given in Table 5.20, Section 5.	Habitat destruction of the alpine meadow, wet meadow or the areas peripheral to cultivated lands may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 25 & 26. Diligence will be exercised in searching for *Acer divergens var. trilobium* in the forest between KPs 519.7 – 520.1. The feasibility of translocating species will be assessed prior to	**MODERATE IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2).

Environmental Impact Table 27 (Maps 27A and 27B) (KPs 505.1 – 526.5): Kara Mountain area, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
One Imperial Eagle (globally-threatened) was recorded at c. 1km north-west of KP 517. Near KP 523.5, 1 Whinchat and 1 Bluethroat (both nationally-threatened) were recorded, and another 2 Bluethroat were recorded at KP 523.8. At the Ilgar River crossing, 1 Dipper and 1 Barred Warbler (both nationally-threatened) were recorded. The protection status for these species are given in Table 5.21, Section 5. Field investigations undertaken in mid-2002 have determined that the re-routed section (necessitated by geohazard considerations) is a continuation of ESA 24.	to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during reinstatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 24. Preconstruction survey will establish the presence of mature trees and rock ledges within 500m of the pipeline route for the Imperial Eagle. If nesting sites are identified, avoidance of construction activity from April to July. Shrubs and dense vegetation	**MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Environmental Impact Table 27 (Maps 27A and 27B) (KPs 505.1 – 526.5): Kara Mountain area, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		along the RoW will be cleared outside the breeding season for the Whinchat. Clearance of riverside trees, shrubs and thickets in advance of the construction of the Bulgurcayiri Creek and Ilgar River crossings to be undertaken outside the April – July period for the Bluethroat and Barred Warbler. Preconstruction surveys will establish whether suitable Dipper nesting sites are available within 250m of the Ilgar River crossing. If this is the case, construction activity is to be avoided between April and July.	

Social Impact Table 27 (Map 27C) (KPs 505.14 – 526.5): Kara Mountain area, Erzincan Province

MAP 27: PROJECT INFORMATION
There are no pump stations or construction camps in the area. There is one block valve station.
MAP 27: MAP HIGHLIGHTS
• Pasture and rain fed agriculture are the predominant land uses. • Topography is steep, numerous springs emerge along the slopes • The route follows the summit of an east west ridge
MAP 27: IMPACTED & SURVEYED SETTLEMENTS
• ***Impacted****:* no settlements will be directly impacted by the pipeline project. None of these have land intersected by the proposed pipeline; none are within 5km of a pump station; none are within 2km of the block valve station, and no settlements are within 500m of the pipeline route. Settlements impacted by traffic have not yet been identified. No settlements are downstream from a river/ creek crossing. • ***Surveyed:*** there are no settlements within 2km of the pipeline.

Environmental Impact Table 28 (Maps 28A and 28B) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Fine-loamy to Loamy-skeletal shallow Typic Xerochrepts on sloping lands and some valley bottoms. • Mesic Typic Calcixerolls on valley bottoms. • Channel cobbles and other sediments on fluvial lands. • Typic Mesic Xerorthents along valley bottoms.	Soil related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. Main potential impacts from BTC Pipeline construction on hills include: • soil erosion; • sediment yield; • soil productivity. Potential impacts on flat and undulating land include: • soil erosion; • sediment yield; • soil productivity; • channel alteration; • water-logged soils and compaction.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on hill slopes and in areas of rill and gully development. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). • Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils.	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Soil productivity losses are predicted to last less than 3 months after construction is completed.

Environmental Impact Table 28 (Maps 28A and 28B) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Apply equipment mats as appropriate.	
Landscape and Visual			
Undulating, valley bottom landscape bound by low hills. Irrigated agriculture is the predominant landuse. The poorly reinstated NGP significantly detracts from the landscape along this section. The NGP diverges from the Ilgar River at KP 530. This location is characterised by a fluvial landscape, where river cobbles, gravel, and sand occupy a shallow, parabolic channel. Infrequent, thin forests occur on sloping lands either side of the route. Grazing dominates the land use. Highway 100 runs parallel with the BTC Pipeline route for some 10km before diverging along with the NGP. Further west as the route turns south, the landscape quality increase. The poorly drained valley bottoms are a mixture of cropland and expansive wet meadows with broad-leaved trees and the hills on the southern side are thickly forested with Scot's Pine. Small settlements lie 3 to 4km apart on well-drained, shallow slopes that fringe the valley bottoms. BVS-031 will be located at KP 547.0 on cultivated land. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 25m in length.	Visual related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel The wet marshland between the Suvarin Creek and Ilgar River will show a long-term/ permanent scar unless care is taken with heavy machinery. Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MODERATE IMPACT** during the short-term in the more sensitive landscape west of KP 530.

Environmental Impact Table 28 (Maps 28A and 28B) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2).Apply 'Soils' reinstatement specifications above.	
Surface Waters			
Two watercourses are crossed by the route in this section: • Ilgar River crossed five times (near KP 525.4, between KPs 529.8 – 531.1, KPs 531.1 – 531.6, KP 533.0 and near KP 535.0). BVS-030 will be located at KP 532.0 and c. 120m from Ilgar River. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 50m in length. • Buyuk Creek (KPs 534.5 – 535.0). Buyuk Creek is a right-bank tributary of Ilgar River. The BTC Pipeline crossing point is c. 25m from the NGP crossing of this creek.	The NGP lies adjacent and parallel to the river. Disturbance to Ilgar River and Buyuk Creek, directly through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Potential for long-term sedimentation and turbidity.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor at these watercourse crossings impacted by the presence and proximity of the NGP. Responsibilities between the	**INDIRECT POSITIVE IMPACT** where these watercourse crossings previously disturbed during construction of the NGP are reinstated. **MINOR IMPACTS** Although the water quality classifications for these watercourses are unknown, only minor impacts expected during both pipeline and BVS construction, as disturbance will be limited to the immediate working area. Sedimentation of both watercourses crossed in this section will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.

Environmental Impact Table 28 (Maps 28A and 28B) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		NGP and BTC Contractors are described in the RP (Appendix C2). Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, to avoid sedimentation and turbidity during crossing of these watercourses, including sediment filters/trapping devices, settling ponds and trench de-watering.	
Ecology			
Important Ecological Factors Four nationally-threatened birds were recorded from this section: • Whinchat: 3 at KP 530.6, 2 at Aktas Creek crossing, 1 at Ilgar River crossing, 12 at KP 543.2, and 3 at KP 536.9; • Barred Warbler: 1 at Aktas Creek crossing, 3 at Ilgar River crossing, and 4 near KP 536.9; • Dipper: 1 adult and 1 juvenile at Ilgar River crossing; • Booted Eagle: 1 near KP 536.9. The protection status for these species are given in Table 5.21, Section 5. ESA 51 (KP 528.20-529.20) is identified for a range of endemic flora species (including the national threatened endemics, *Helychrysum arenarium spp. erzincanicum* and *Ebenus macrophylla*).	Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive, although the Booted Eagle begins breeding as early as March). July can remain sensitive for late and second broods. Habitat destruction of arid sand-gravel meadows may result in the loss of individuals from populations of nationally-threatened endemics.	Shrubs and dense vegetation along the RoW will be cleared outside the breeding season for the Whinchat. Clearance of riverside trees, shrubs and thickets in advance of the construction of the Aktas Creek and Ilgar River crossings to be undertaken outside the April – July period for the Bluethroat and Barred Warbler. Preconstruction surveys will establish whether suitable Dipper nesting sites are available within 250m of the Ilgar River crossing. If this is the case, construction activity is to be avoided between April and July.	**MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April (March for the Booted Eagle), and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MODERATE IMPACTS** due to short-term disturbance to important flora within the ESA 51. The Construction Contractor will ensure that

Environmental Impact Table 28 (Maps 28A and 28B) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Preconstruction surveys will establish the presence of potential nesting sites for the Booted Eagle within 500m of the pipeline route. If nesting sites are identified, avoidance of construction activity from March to July. Threatened plant species will be identified and located during pre-construction surveys within ESA 51. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW.	construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2).

Environmental Impact Table 28 (Maps 28A and 28B) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Archaeology and Cultural Heritage			
Bakacak (3rd Degree Site*) – flat settlement located within the 100m Corridor. Although, no architectural remains were found within this settlement, Prehistoric ceramic shards have previously been found here. Akcakoy (3rd Degree Site*) – flat settlement, located to the south-east of the pipeline route. No architectural remains are visible as a result of agricultural activities. Based on the ceramics pieces observed on the surface, this is probably a Roman settlement. * These sites have not yet been registered by the MoC and are provisionally assigned these classifications. Bakacak and Akcakoy have been proposed for registration by the regional preservation council	Potential for sites to experience direct impacts, such as ground disturbance, during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of these sites.	The pipeline has been re-routed to avoid Bakacak flat settlement. Akcakoy will be delineated to avoid accidental damage during construction and fenced throughout the construction period. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Assuming Akcakoy is fenced, impacts will be limited to the temporary disturbance of the site setting and peripheral features. **MINOR IMPACTS** at most at Bakacak, which will be limited to the temporary disturbance of the site setting and peripheral features.

Social Impact Table 28 (Map 28C) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

MAP 28: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There are two block valve stations.

MAP 28: MAP HIGHLIGHTS

- Undulating valley bottom landscape with low hills and a high water table in places.
- The route crosses four land uses types, the predominant uses being agriculture and rainfed agriculture.
- Other land uses include non-agricultural land, pasture and forests.
- The pipeline crosses four creeks (Sancipinar, Suvarin, Buyuk and Aktas) and the IIgar River.

MAP 28: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted**:* five settlements will be directly impacted by the pipeline project. Four of these have land intersected by the proposed pipeline (Alacaatli/ Alacati, Sahverdi, Kalkanci and Hacikoy) (L), and two settlements (Bakacal Mah and Alacaatli/Alacati) are within 500m of the pipeline route (D). Three settlements (Melikserif, Alacaatli and Belensor) are within 2km of the block valve stations (B). No settlements are within 5km of a pump station. Settlements impacted by traffic have not yet been identified. One settlement is downstream of a river (Sipdigin is 2.5km downstream of River Llgar).

- ***Surveyed**:* four settlements (Alacaatli/ Alacati, Sahverdi, Kalkanci and Hacikoy) were surveyed by telephone (T).
- ***Not surveyed:*** seven settlements have not been surveyed: Melikserif (2km from the pipeline); Bakacal Mah (300m from the pipeline); Hanzar (1.6km from the pipeline); Ekrek (2km from the pipeline); Sipdigin (1.65km from the pipeline); Huseyinsih (1.7km from the pipeline); and Belensor (650m from the pipeline).
- ***Disclosure Meeting Location:*** Alacaatli

SITE SPECIFIC IMPACTS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Alacaatli/ Alacati (D) (L) (B) (T)			
• ***Demographics**:* 220 inhabitants. There has been an increase in population over the past five years. 50% of the population migrates seasonally. • ***Safety:*** the settlement centre is 500m from the pipeline, and the nearest house is 150m from the pipeline. • ***Project attitude:*** a construction camp would be welcome. There is general awareness of the pipeline, although the main concern is that the inhabitants do not have enough information about the pipeline. • ***Land ownership & use:*** 60% of the land is communally owned and used. There is temporary irrigation. • ***Settlement livelihood:*** agriculture and forestry are main sources of	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 28 (Map 28C) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

livelihood. 100% of inhabitants are farmers. • ***Availability & skills:*** inhabitants have no previous experience. • ***Accessibility:*** the settlement is accessible all year and is 23km from the nearest district centre. • ***Information provision:*** All local residents are literate. Sources of local and national information are TVs and family members. • ***Environmental & cultural sites:*** sites of significance include a park and a forest. • ***Infrastructure*****:** there is a regular supply of piped water although stored water is used as an alternative source. • ***Settlement problems***: inadequate access to water, low income and poor roads.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Forestry*** Loss of a resource used by settlements. Increased expenditure on other fuel sources. ***Land*** Potential complications in expropriation process. ***Irrigation*** Loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	settlement is within 500 m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9** Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**Any additional damage to be compensated for.** **Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement. **See Overview of the Land Acquisition Process in Appendix C9** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 28 (Map 28C) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

	Accessibility of recruitment Decreased access to recruitment process. ***Special sites*** Refer to Environmental Impact Tables. ***Block Valve Station*** See EIA tables and Overview of the Land Acquisition Process in Appendix C9.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Sahverdi (L) **(T)**			
• ***Demographics****:* 209 inhabitants. There has been an increase in population over the past five years and 40% of the population migrate. • ***Safety:*** the settlement centre is 2km from the pipeline and the closest house is 1.8km. • ***Project attitude:*** according to the Muhtar, the inhabitants would welcome a construction camp. There is general awareness about the project and the main concern is that land will be damaged. • ***Land ownership & use:*** 65% of land is communal. There is no seasonal grazing. Seasonal irrigation is used. • ***Settlement livelihood:*** agriculture, forestry and bee keeping (three households for their own consumption) are important activities. 100% of inhabitants are farmers. • ***Availability & skills:*** inhabitants have no previous pipeline experience. • ***Accessibility:*** the settlement is accessible throughout the year and is 9km from the nearest district centre.	***Land*** Potential complications in expropriation process. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Forest*** Loss of a resource used by settlements. Increased expenditure on	**See Overview of the Land Acquisition Process in Appendix C9** **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. If a significant number of trees on forestry land are cut, discuss with settlement	**See Overview of the Land Acquisition Process in Appendix C9** **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Significant impact** where more than 10% of trees are cut on forestry land used by

Social Impact Table 28 (Map 28C) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

9km from the nearest district centre. • ***Information provision:*** 99% of inhabitants are literate. Sources of local information are the TV, newspapers, and the Muhtar and sources of national information are TV, newspapers and family members. • ***Environmental & cultural sites:*** according to the Muhtar, there is a park and a forest. • ***Infrastructure*****:** there is a piped, regular supply of water. • ***Settlement problems***: poor roads, poor irrigation and infrastructure problems.	other fuel sources. ***Accessibility to recruitment*** Decreased access to recruitment process ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	& appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	any one settlement. **No residual impact expected** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 28 (Map 28C) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

SITE SPECIFIC IMPACTS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Kalkanci (L) **(T)**			
• ***Demographics****:* 210 inhabitants. There has been an increase in population over the past five years. 28% of the population migrate seasonally. • ***Safety:*** the settlement centre is 1.6km from the pipeline and the nearest house is 1.4km. • ***Project attitude:*** according to the Muhtar, a construction camp would be welcomed by inhabitants and there is general awareness of the project. • ***Land ownership & use:*** 70% of land is owned by local residents. There is no seasonal grazing. Some land is seasonally irrigated. • ***Settlement livelihood:*** agriculture and hunting are the main sources of livelihood. 100% of inhabitants are farmers. • ***Availability & skills:*** inhabitants have no previous pipeline experience. • ***Accessibility:*** the settlement is accessible throughout the year and is 7km from the district centre. • ***Information provision:*** Literacy rate is 99%. The main sources of local information are TVs, family members and radio and sources of national information are TV, newspapers, family members. • ***Environmental & cultural sites:*** none • ***Infrastructure*****:** there is a piped, regular supply of water. • ***Settlement problems***: unemployment, delays in payment from selling agricultural products and heating problems.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance during construction. ***Accessibility to recruitment*** Decreased access to recruitment process	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Significance cannot be established at this time** **No residual impact expected**

Social Impact Table 28 (Map 28C) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

SITE SPECIFIC IMPACTS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Hacikoy (L) **(T)**			
• ***Demographics**:* 75 inhabitants, there has been an increase in population. 50% of the population migrates. • ***Safety:*** the settlement centre is 1.8km from the pipeline, the closest house in the settlement from the pipeline 1.6km. • ***Project attitude:*** a construction camp would be welcome, there is general awareness of the project. • ***Land ownership & use:*** 60% of land is communal. There is seasonal grazing. There is temporary irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (two households, as one of many sources of income), education, forestry and trade. 90% of inhabitants are farmers. • ***Availability & skills:*** no previous experience. • ***Accessibility:*** the settlement is accessible all year, the distance from the settlement to the district centre is 3km. • ***Information provision:*** Literacy rate is 99%. The main sources of local information are TV, family, radio and the sources of national information are TV, newspaper, family. • ***Infrastructure*****:** there is a regular supply of piped water, a settlement fountain is the alternative source. • ***Settlement problems***: insufficient food, heating problems, agricultural quotas should be abrogated.	***Construction hazard: animals*** Trench poses safety hazard for livestock. ***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to recruitment*** Decreased access to **recruitment process.**	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **See Overview of the Land Acquisition Process in Appendix C9** Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No residual impact expected** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

Social Impact Table 28 (Map 28C) (KPs 526.5 – 547.4): Kose Mountains, Erzincan Province

	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Environmental Impact Table 29 (Maps 29A and 29B) (KPs 547.4 – 571.0): Kose Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Loamy-skeletal Typic Xerochrepts and Micro Xerochrepts on most sloping lands. • Stony land along ridge summits. • Cryic or mesic Typic Calcixerolls on soils formed on gently sloping to sloping lands from limestone or marl. • Aquic Xerorthents in highland swales with high water tables.	Main potential impacts on hills include: • soil erosion; • sediment yield; • soil productivity. Potential impacts on flat land and undulating land include: • soil erosion; • sediment yield; • soil productivity; • channel alteration; • water-logged soils and compaction; • frost heave (in upland valley bottoms).	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Use equipment mats as appropriate.	**MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed. Furthermore, soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
Landscape and Visual			
Route passes south of Refahiye across flat plateau lands and rolling farmed hills before ascending sharply from the valley floor at about 1,650m asl into the Tecer Mountains at 2,100m asl and then less steeply to above 2,300m asl. The wild landscapes here are of high quality, with craggy mountains, and broad grassy valleys, occasionally scattered with pines and, beyond the route, more extensive forests. Grazing is widespread and scattered summer migrant herder's settlements are evident. Further west the mountain scenery becomes more dramatic with sharp ridges and montane steppe interspersed with exposures of the whitish underlying marl, whose poorer soils support a diverse if sparse flora. BVS-032 will be located at KP 550.6 within plain steppe habitat. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 20m in length. Bekolar settlement lies	Medium to long-term visual impact where the route cuts through thin Calcixerolls to expose the underlying marl, which will persist as a whitish cast across the landscape. Short-term visual impact on non-marl portions of the route. Landform presents screening opportunities. Potential for short-term visual	Apply 'Soils' reinstatement specifications above, especially where topsoil is sufficiently thick to reinstate. Attempt high rate of fertilisation using NPK + micro-nutrients with mulching such as coir fibre. Particular attention will be paid to the control of dust, noise and traffic during construction at BVS-032.	**MAJOR TO MODERATE IMPACT** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies marl, it will retain its whitish colour and show as a white line across a distinct upland landscape. This impact is reduced in the more exposed rocky terrain of the summit where vegetation loss may not be so pronounced. However, a number of

Environmental Impact Table 29 (Maps 29A and 29B) (KPs 547.4 – 571.0): Kose Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
c. 310m from the site.	impact during construction of BVS-032 for villagers in Bekolar.		additional site-specific mitigation measures will further be employed in tuff areas to manage the above impact, including: • soil survey prior to construction to determine topsoil thickness at regular intervals and topsoil depth; • site-specific topsoil layer removal and monitoring during storage; • soils specialist in attendance throughout topsoil removal, storage and reinstatement; • post-reinstatement monitoring. **MINOR IMPACT** Given the relatively small size of the block valve station and the temporary nature of construction activities, impacts are anticipated to be minor subject to implementation of the specified mitigation measures.
Noise			
Bekolar settlement is located c. 220m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Bekolar settlement during soil stripping activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery;	**MINOR IMPACT** During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise

Environmental Impact Table 29 (Maps 29A and 29B) (KPs 547.4 – 571.0): Kose Mountains, Erzincan Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days.

Social Impact Table 29 (Map 29C) (KPs 547.4 – 571.068): Kose Mountains, Erzincan Province

MAP 29: PROJECT INFORMATION
There are no pumps or construction camps in the area. There is one block valve station.
MAP 29: MAP HIGHLIGHTS
• Predominant land use is pasture. There are some areas of irrigated agricultural land, rain fed agriculture and non-agricultural land. • Conservation forests occupy the ridges each side of the pipeline route.
MAP 29: IMPACTED & SURVEYED SETTLEMENTS
• ***Impacted**:* one settlement will be directly impacted by the pipeline project (Bekolar). It is within 500m of the pipeline route (D) and within 2km of the block valve station (B), however it does not have land intersected by the proposed pipeline. There are no settlements within 5km of a pump station. Settlements impacted by traffic have not yet been identified. No settlements are downstream of a pipeline river/ creek crossing. • ***Not surveyed:*** six settlements were not surveyed: Divir (1.5km from the pipeline), Bekolar (Arpayazi) (300m from the pipeline), Gavurdu, Yukarimaden Mah (1.4km from the pipeline), Asagimaden (1.75km from the pipeline) and Kocu (1.8km from the pipeline).

Environmental Impact Table 30 (Maps 30A and 30B) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Cryic or mesic Typic Calcixerolls on soils formed on gently sloping to sloping lands from limestone or marl. • Loamy-skeletal Shallow (or Micro) Xerochrepts on moderately steep and steep lands. • Aquic Xerorthents in highland swales with high water tables.	Main potential impacts: • soil erosion; • soil productivity; • waterlogging and compaction (in upland swales with high water tables). Other potential impacts include: • sediment yield; • soil contamination.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Crushed rock. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Employ equipment mats.	**MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed. Furthermore, soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. In areas with a high water table, water is predicted to remain in surface depressions for less than 3 months after construction.
Landscape and Visual			
The sharp ridged mountainous landscape continues with the montane steppe interspersed with exposures of the whitish flower-rich marl. The route dips but rises again to peak at 2,370m asl passing briefly back into the alpine zone on the tops of the barren rounded mountains where extensive views of the mountainscapes are obtained – contrasting umber and grey soils set off by the greens of the mountain meadows and fragmented pine forests below. Despite its wilderness character, this landscape, with a sparse if diverse flora, is more tolerant of change. Telecommunication masts and the un-reinstated NGP, (which converges with the route at KP 574), cause significant visual intrusion. From here the route descends sharply into the Kizilirmak valley at about 1,700m asl.	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. May be long-term or permanent where difficult to re-instate, or where ecological considerations prevent application of fertiliser. Visual liabilities of the NGP, which was not reinstated, are potentially exacerbated by the	Difficult to mitigate except where topsoil is sufficiently thick to reinstate. Attempt high rate of fertilisation using NPK + micro-nutrients with mulching using coir fibre or equivalent. It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-	**INDIRECT POSITIVE IMPACT** in areas where the BTC and the NGP corridors are reinstated. **MODERATE IMPACT** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies marl, it will retain its whitish colour and show as a white line across the

Environmental Impact Table 30 (Maps 30A and 30B) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	BTC Pipeline, where their RoWs lie adjacent or closely parallel.	phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2).	landscape. This impact is reduced in the more exposed rocky terrain of the summit where vegetation loss may not be so pronounced.
Noise			
Kasaplar settlement is located c. 215m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Kasaplar settlement during soil stripping activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels;	**MINOR IMPACT** During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days.

Environmental Impact Table 30 (Maps 30A and 30B) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

MAP 30: PROJECT INFORMATION			
There are no pump stations, construction camps or block valve stations in the area.			
MAP 30: MAP HIGHLIGHTS			
• The predominant land use types are pasture and rain-fed agriculture. • Uplands and mountainous landscape with high water tables. • Forests and dense grasslands occupy the sloping land. • The pipeline crosses three creeks (Kandil, Hishis and Kanezier)			
MAP 30: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted**:* eleven settlements (Kandil, Tuzlucayir, Tescil Harici, Yurtbasi, Tecknecik, Avsarozu, Gunyuzu, Arpayazi, Mandandere, Kasaplar and Aydin) will be directly impacted by the pipeline project. All of these have land intersected by the proposed pipeline (L). No settlements are within 5km of a pump station, or within 2km of a block valve station. Two settlements (Kasaplar, Yurtbasi) are within 500m of the pipeline route (D). Settlements impacted by traffic have not yet been identified. Three settlements are downstream of a river/creek crossing (Kasaplar is downstream of the Kanezler Creek, Tuzlucayir is downstream of the Hishis Creek and Kandil is downstream of the Kandil Creek). • ***Surveyed**:* one settlement (Yurtbasi) was surveyed in the field (S) and ten settlements (Kandil, Tuzlucayir, Tescil Harici, Tecknecik, Avsarozu, Gunyuzu, Arpayazi, Mandandere, Kasaplar and Aydin) were surveyed by telephone (T). • ***Not on the map:*** seven settlements are not on the map (Tescil Harici, Yurtbasi, Tecknecik, Avsarozu, Gunyuzu, Arpayazi, Mandandere).			
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yurtbasi (L) (D) (S)			
• ***Demographics**:* 2,200 inhabitants with 180 households. There has been an increase in population recently, due to the return of the unemployed and pensioners that relocated after the 1992 earthquake. • ***Safety:*** the settlement centre is 700m from the pipeline and the nearest house is 150m. • ***Project attitude:*** a construction camp would **not** be welcomed (by four out of 11 inhabitants interviewed) and the overall opinion of the project is **negative**, because the pipeline passes through the new area of the settlement, which is still in its development phase. In	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Protective barrier fencing**	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

addition, a previous project resulted in damage to land and compensation payments were insufficient. 27% of inhabitants are concerned about noise and dust. • ***Land ownership & use:*** 20% of land is owned by local residents and 80% is communal. Land owners have title deeds. There is a diverse range of livestock and there is seasonal grazing in Spring, Summer and November. The key crops cultivated are grain and sugar beet. Some land is irrigated using permanent channels. • ***Settlement livelihood:*** agriculture is the main source of livelihood and cereals and sugar cane are cultivated mainly for subsistence. Cattle, sheep breeding and bee keeping also take place. 50% of inhabitants are family labourers. • ***Availability & skills:*** local residents have had previous pipeline experience. Four out of 24 possible construction skills including typesetting, drivers, heavy machinery drivers, food service personnel and construction workers are available. 37% are willing to accept temporary jobs. • ***Accessibility:*** dirt roads, accessible in the winter. The settlement is 15km from the district centre. • ***Information provision:*** All inhabitants are literate. • ***Services*****:** support services for farmers (agricultural co-operatives) are present along with sports facilities, a Library, market and transport facilities. There is a primary school with one teacher and a nurse. • ***Infrastructure*****:** there is a piped, regular supply and no alternative sources are used. There are no water mains in the new settlement area of the settlement. Electricity and sewerage systems are present and there are no waste systems. The main form of waste disposal is through recycling or mixing with fertilisers. • ***Settlement problems***: inhabitants are unhappy because the pipeline will pass through the new area of their settlement. The settlement is relatively wealth although there has been a recent decline in the standard of living conditions resulting from the national economic downturn.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Bees*** Disturbance of any stationary hives located within 300m of the route ***Sensitive vegetation used by bees***	will be erected where a settlement is within 500 m of construction work. **Community liaison meetings held** during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

	Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	and monitoring measures are fully implemented.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9**	**See Overview of the Land Acquisition Process in Appendix C9**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Skills Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials	**Information is highlighted for the Contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**Potential positive benefits** to local settlements.
	Settlement opposed to construction camp. Nearby construction camp would not be welcomed by	Additional consultation to be carried out by the project prior to constructing a camp within 5km.	**Likelihood of significant impacts dependent on distance of settlement from camp.** Impacts arising

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

	some/all settlements.	Camp will **not** be located within 5km if against the wishes of the settlement. **Any** interaction between construction workers and communities (eg use of local shop) to be carefully monitored	from breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures.
	Defining right of way The pipeline route passes through an area that will become residential.	The Project will discuss the routing with settlement authorities to ensure that the RoW will not impede future development of the settlement (eg run beside a road). Additional meeting to be held with the community prior to construction to resolve concerns.	Residual impacts will depend upon routing. If RoW is not well situated, future housing development could put pipeline at risk.
	Negative experience Possible **opposition** to project and **increased sensitivity** to any negative impacts.	BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are	Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

		rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings**	
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Technecik (L) **(T)**			
• ***Demographics****:* 360 inhabitants. There has been a decrease in population over the past five years. There has been no migration. • ***Safety:*** the settlement centre is 1.5km from the pipeline, the nearest house in the settlement to the pipeline is 1.4km • ***Project attitude:*** according to the Muhtar*,* a construction camp would be welcomed, and there is a general awareness about the project. • ***Land ownership & use:*** 60% of land is owned by the state. There is no seasonal grazing, but seasonal irrigation is used. • ***Settlement livelihood:*** agriculture, bee keeping (15 households for their own consumption), hunting, forestry, trade and education are all activities in the settlement. 95% of inhabitants are farmers. • ***Availability & skills:*** inhabitants have had no previous pipeline experience. • ***Accessibility:*** the settlement is accessible throughout the year and is 8.9km to the district centre. • ***Information provision:*** The literacy rate is 85%. Local sources of information are TVs, family members, the internet newspapers and the Muhtar and national sources are TV, family members, the internet and newspapers • ***Environmental & cultural sites:*** the forest was raised as a site of significance. • ***Infrastructure*****:** there is a piped supply of water although it is irregular, stored water supply is the alternative water source. • ***Settlement problems***: unemployment, inadequate access to water and poor roads.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance during construction. ***Forest*** Loss of a resource used by	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. If a significant number of trees on forestry land are	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Significance cannot be established at this time.** **Significant impact** where

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

	settlements. Increased expenditure on other fuel sources.	cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	more than 10% of trees are cut on forestry land used by any one settlement.
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Avsarozu (L) (T)			
• ***Demographics****:* 97 inhabitants 20% of which migrate seasonally. There has been an increase in population over the past five years. • ***Safety:*** the settlement centre is 1.7km from the pipeline and the nearest house is 1.5km • ***Project attitude:*** according to the Muhtar, a construction camp would be welcomed and there is a general awareness of the project. • ***Land ownership & use:*** 60% of land is communally owned. Seasonal grazing takes place. All land is rain-fed. • ***Settlement livelihood:*** agriculture, bee keeping (six households, as one of two income sources) and forestry are main sources of livelihood. 100% of inhabitants are farmers. • ***Availability & skills:*** the inhabitants have had no previous pipeline experience. • ***Accessibility:*** the settlement is accessible all year round, the distance from settlement to district centre is 5.5km. • ***Information provision:*** Literacy rate is 40%. The sources of information are TV, family. • ***Environmental & cultural sites:*** a park and a forest • ***Infrastructure*****:** there is a piped supply of water, although it is irregular and stored water is also used • ***Settlement problems***: unemployment, inadequate access to water and low income.	***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Land*** Potential complications in expropriation process. ***Forest*** Loss of a resource used by settlements. Increased expenditure on other fuel sources.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **See Overview of the Land Acquisition Process in Appendix C9** If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9** **Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Gunyuzu (L) **(T)**			
• ***Demographics****:* 140 inhabitants none of whom migrate seasonally. There has been a recent decrease in population. • ***Safety:*** the settlement centre is 1.6km from the pipeline, and the nearest house is 1.5km • ***Project attitude:*** according to the Muhtar, a construction camp would be welcome and there is general awareness about the project.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow,

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

be welcome and there is general awareness about the project. • ***Land ownership & use:*** 80% of land is owned by local residents. There is no seasonal grazing. There is temporary irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (two households, as one of many sources of income) education, and trade are sources of livelihood. 80% of inhabitants are farmers. • ***Availability & skills:*** no previous pipeline experience. • ***Accessibility:*** the settlement is accessible all year round. • ***Information provision:*** All residents are literate. The main local sources of information are TVs, newspapers, the Muhtar and national sources of information are TVs and newspapers. • ***Environmental & cultural sites:*** a mausoleum • ***Infrastructure*****:** there is a piped, regular supply of water. No alternative water source is used. • ***Settlement problems***: unemployment, low income and delays in payment from selling agricultural products.	***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	affected land-users will be compensated. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Arpayazi (L) (T)			
• ***Demographics****:* 70 inhabitants, 47% of which migrate. There has been a recent increase in population. • ***Safety:*** the settlement centre is 5.4km from the pipeline. • ***Project attitude:*** according to the Muhtar*,* a construction camp would be welcome and there is general awareness of the pipeline. • ***Land ownership & use:*** 70% of land is privately owned by local residents. There is seasonal grazing. There is no temporary irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (one household as one of many sources of income), hunting, forestry and trade are sources of livelihood. 99% of inhabitants are farmers. • ***Availability & skills:*** inhabitants have no previous pipeline experience. • ***Accessibility:*** the settlement is accessible all year, the distance from	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Hunting*** Temporary reduction in game due to disturbance during construction.	**Livestock crossings** will be established at locations as agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. Project to **establish level of hunting** in settlements prior to construction.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Significance cannot be established at this time**

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

the settlement to the district centre is 22km. • ***Information provision:*** Literacy rate is 99%. The main sources of information are TVs and newspapers. • ***Environmental & cultural sites:*** mausoleum and forest. • ***Infrastructure*****:** there is a piped, regular supply of water. • ***Settlement problems***: inadequate access to water, poor roads and poor drinking water quality.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility to recruitment*** Decreased access to recruitment process	Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected**
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Madendere (L) (T)			
• ***Demographics****:* 84 inhabitants, none of whom migrate on a seasonal basis. There has been a recent decrease in population levels. • ***Safety:*** the settlement centre is 1.2km from the pipeline • ***Project attitude:*** according to the Muhtar*,* a construction camp would be welcome and there is general awareness about the project. • ***Land ownership & use:*** 60% of land is privately owned by the local residents. There is no seasonal grazing. There is temporary irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (four households, as one of many sources of income), forestry, trade are the main sources	***Drinking water*** Potential for disruption or contamination of drinking water during construction ***Irrigation*** Potential loss of flow from	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project. Contractor will **consult** with authorities to determine	No residual impacts. **If irrigation water is disrupted** longer than time

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

one of many sources of income), forestry, trade are the main sources of livelihood. 97% of inhabitants are farmers. • ***Availability & skills:*** inhabitants have no previous pipeline experience. • ***Accessibility:*** the settlement is accessible all year and is 18km from the district centre. • ***Information provision:*** Literacy rate is 90%. The main information sources are TV, family, phone. • ***Infrastructure*****:** there is no piped water, the only source is a settlement fountain. • ***Settlement problems***: inadequate access to water, infrastructure problems and poor irrigation.	planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Aydin (L) (T)			
• ***Demographics****:* 130 inhabitants migrate. There has been a recent increase in population. 66% of inhabitants migrate. • ***Safety:*** the settlement centre is 1.5km from the pipeline and the nearest house is 1.4km • ***Project attitude:*** according to the Muhtar, a construction camp would be welcomed and there is general awareness about the project.	***Construction hazards: animals*** Trench poses safety hazard for livestock	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

• ***Land ownership & use:*** 90% of land is communally owned. There is seasonal grazing and seasonal irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (10 households, as the main source of income), hunting, education, and trade are the main sources of livelihood. 80% of inhabitants are farmers. • ***Availability & skills:*** inhabitants have no previous pipeline experience. • ***Accessibility:*** the settlement is accessible all year, the distance from settlement to district centre is 27km. • ***Information provision:*** Literacy rate is 90%. Key sources of information are TVs and telephones. • ***Environmental & cultural sites:*** a mausoleum and the forest. • ***Infrastructure*****:** there is piped water although the supply is irregular. A local spring is the alternative source of water. • ***Settlement problems***: inadequate access to water and the need to rearrange irrigation channels.			complaints procedure.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9**	**See Overview of the Land Acquisition Process in Appendix C9**
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and	**Significance cannot be established at this time.**

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

		compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Mustafa Bey (T)			
• ***Demographics****:* 100 inhabitants, there has been an increase in population. 30% of the population migrates. • ***Safety:*** the settlement centre is 1.7km from the pipeline. • ***Project attitude:*** a construction camp would be welcome, there is general awareness about the project. • ***Land ownership & use:*** 70% of land is owned by local residents. There is seasonal grazing. There is temporary irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (six households, as one of many sources of income). 90% of inhabitants are farmers.	***Drinking water*** Potential for disruption or contamination of drinking water during construction ***Irrigation*** Potential loss of flow from planned/ accidental	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project. Contractor will **consult** with authorities to determine	No residual impacts. **If irrigation water is disrupted** longer than time

Social Impact Table 30 (Map 30C) (KPs 571.0 – 590.2): Kose Mountains, Sivas/Erzincan Province Border

• ***Availability & skills:*** no previous experience. • ***Accessibility:*** the settlement is accessible all year. The distance from settlement to district centre is 18km. • ***Information provision:*** Literacy rate is 90%. The main local sources of information are TV, radio and nationally TV, radio and Muhtar. • ***Infrastructure*****:** there is no piped water, the source of water is a settlement spring. • ***Settlement problems***: inadequate access to water, unemployment, low income.	disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to recruitment*** Decreased access to recruitment process	maximum acceptable time for disruption Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated**.** **No residual impact expected**
SITE SPECIFIC IMPACTS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Haci Bayram (T)			
• ***Demographics****:* 810 inhabitants. There has been an increase in population over the past five years. 50% of the population migrates. • ***Safety:*** the settlement centre is 1.75km from the pipeline. • ***Project attitude:*** according to the Muhtar, a construction camp would be welcome and there is general awareness about the project. • ***Land ownership & use:*** 60% of land is privately owned by local residents. There is seasonal grazing. There is temporary irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (seven households, for their own consumption) and education are the main sources of livelihood. 90% of inhabitants are farmers. • ***Availability & skills:*** inhabitants have no previous pipeline experience. • ***Accessibility:*** the settlement is accessible all year, the distance from settlement to district centre is 12km. • ***Information provision:*** Literacy rate is 90%. Key sources of information are TVs and radios. • ***Infrastructure*****:** there is a piped, regular supply of water. • ***Settlement problems****:* poor roads, low income and unemployment.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to recruitment*** Decreased access to recruitment process.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No residual impact expected.**

Environmental Impact Table 31 (Maps 31A and 31B) (KPs 590.2 – 611.6): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Cryic or mesic Typic Calcixerolls on soils formed on gently sloping to sloping lands from limestone or marl. • Loamy-skeletal Shallow (or Micro) Xerochrepts on moderately steep and steep lands. • Mesic Calcixerolls on soils occupying gently sloping and sloping lands. • Typic Xerorthents on valley bottoms.	Main potential impacts: • soil erosion; • sediment yield; • soil productivity; • soil contamination; • frost heave; • channel alteration; • waterlogging and compaction.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration.	**MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed. Furthermore, soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
Landscape and Visual			
Mesic rolling terrain that, with Sivas Provincial Highway 2 and the gas pipeline, follows the valley of the Kizilirmak River. Elevations lie between 1,600 and 1,800m. Numerous springs emerge near the base of surrounding slopes, and contribute to wet stands in undulating ground adjacent to the Kizilirmak. The sinuous river channel is anastomose, with portions of its flow disappearing in channel sediments rather than flowing over the surface. This slightly degraded landscape of low sensitivity includes a number of small river crossings, each with dense scrub and scattered trees in contrast to the grassy, grazed, gently-rolling valley land beyond. The route will be especially visible here during construction. Arable land is common, irrigated in places along the Kizilirmak valley. Numerous small settlements lie alongside the route. BVS-033 and BVS-0.4 will be located at KP 593.5 and KP 605.6, respectively, both within cultivated land. Approximately 350m^2 of permanent landtake required for each station. A new access road will be	• Visual and soil-related liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel. • Medium to long-term visual impact where the pipeline RoW cuts through thin Calcixerolls to expose the underlying marl, which will persist as a whitish cast across the landscape. • Removal of bushes and trees at small river crossing	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any	**INDIRECT POSITIVE IMPACT** in areas where the BTC and NGP corridors are reinstated. **MINOR TO MODERATE IMPACT** Assuming effective re-instatement, generally short-term minor to moderate impacts, but likely to be highly visible to many people. **MODERATE IMPACTS** where thin marl soils exposed by the Pipeline, persisting as a white

Environmental Impact Table 31 (Maps 31A and 31B) (KPs 590.2 – 611.6): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
constructed to BVS-033of c. 275m in length and to BVS-034 of c. 70m. Cukuryurt settlement lies c. 310m from BVS-034.	trees at small river crossing points will leave some permanent gaps. • Potential for short-term visual impact during construction for villagers in Cukuryurt during construction of BVS-034.	additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply 'Soils' reinstatement specifications above. Particular attention will be paid to the control of dust, noise and traffic during construction at BVS-034.	line across the landscape, visible, however, only during the short-term. **MINOR IMPACT** Given the relatively small size of the block valve station and the temporary nature of construction activities, impacts are anticipated to be minor, subject to implementation of the specified mitigation measures.
Surface Waters			
The pipeline route crosses Aciirmak River and Acisu River. Acisu River is a tributary of the Kizilirmak River and their confluence is c. 1.5km downstream of the BTC Pipeline crossing point.	Disturbance, directly through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Potential for long-term sedimentation and turbidity downstream of the NGP crossing. The NGP lies adjacent and parallel to the river.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to	**INDIRECT POSITIVE IMPACT** where these watercourse crossings previously disturbed during construction of the gas pipeline are reinstated. **MINOR IMPACTS** Although the water quality classifications for both Aciirmak and Acisu Rivers are unknown, only minor impacts

Environmental Impact Table 31 (Maps 31A and 31B) (KPs 590.2 – 611.6): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor at these watercourse crossings impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, to avoid sedimentation and turbidity at the Aciirmak River and Acisu River crossing points, including sediment filters/trapping devices, settling ponds and trench de-watering.	are expected, as disturbance will be limited to the immediate working area. Sedimentation of both watercourses crossed in this section will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
The Imranli Reservoir is currently under construction, lying to the north of the route, and c. 210m away at its closest point. The reservoir will have a volume of 62,500,000m³ at normal surface water elevation and serve an irrigation area of 11,220ha.	The reservoir will receive flows from both Kizilirmak River and Aciirmak River. Potential for indirect disturbance at Imranli Reservoir, resulting in a reduction in water quality.	Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, to avoid sedimentation and turbidity at both Kizilirmak River and Aciirmak River crossing points.	**MINOR IMPACT** Sedimentation of Kizilirmak River and Aciirmak River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Noise			
Noise sensitive receptors include: • Koyunkaya settlement (Imranli District, Sivas Province)is located c.	Noise impacts are expected to occur at the following	The following mitigation measures will be applied:	**MAJOR IMPACT** Due to the proximity of the

Environmental Impact Table 31 (Maps 31A and 31B) (KPs 590.2 – 611.6): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
160m from the centreline of the Pipeline; • Pirdede settlement (Imranli District, Sivas Province)is located c. 86m from the centreline of the Pipeline and is located adjacent to a crossing of the NGP; • Cukuryurt settlement is located c. 154m from the centreline of the Pipeline; • Kemerli settlement is located c. 197m from the centreline of the Pipeline.	locations: • Koyunkaya and Cukuryurt settlements during soil stripping, excavations and welding and lowering activities; • Pirdede settlement during soil stripping, welding and lowering, backfilling, excavation works, trenching and bending activities, in addition to sheet piling associated with the crossing of the NGP; • Kemerli settlement during soil stripping activities.	• use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	edge of Pirdede settlement to the Pipeline, short-term noise impacts are expected to occur during soil stripping, welding/lowering and backfilling. Longer-term impacts (ie three to four weeks) are likely to occur during piling activities at the NGP crossing. Stockpiling of spoil, where possible, and mobile noise barriers, will be used to screen nearby dwellings from construction works to the maximum extent possible. However, those nearest may still be exposed to temporary construction noise levels that exceed 70dB(A). It is important to emphasise this is a cautious assessment. The construction programme will make provision for a further assessment based on the true numbers of receptors affected and separation distances of receptors from noise sources and take whatever actions are necessary to reduce impacts to an acceptable level Since Pirdede settlement is located within 100m of piling

Environmental Impact Table 31 (Maps 31A and 31B) (KPs 590.2 – 611.6): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			activities, vibration impacts are also expected to occur at the nearest properties. **MINOR IMPACTS** Noise impacts are also expected to occur at Koyunkaya and Cukuryurt during soil stripping and welding/lowering activities, and at Kemerli during soil stripping. These impacts will be short-term in nature.
Archaeology and Cultural Heritage			
There are three archaeologically important areas located within the 100m corridor in this section: • Ethnographic Alaouite Cemetery near Koyunkaya settlement is crossed between KPs 591.9 – 591.3 (1st Degree Site*); • Cetelik Tumuli (1st Degree site*) comprises two adjacent tumuli near KP 607.6 and lies within the 100m Corridor; • Kemreli (3rd Degree Site*) – flattened settlement mound within the 100m Corridor, destroyed as a result of construction of the Iran natural gas pipeline and removal of earth for the surrounding marshes. There are ceramic shards dating to Late Calcolithic and Early Bronze Ages on the surface. • Cetelik Settlement (1st Degree site*) * These sites have not yet been registered by the MoC and are provisionally assigned these classifications. Kemreli has been proposed for registration by the regional preservation council	Potential for direct impacts, such as ground disturbance, at all three sites during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of these sites.	The extent of both the ethnographic Alaouite cemetery and Cetelik Tumuli will be investigated during further field surveys prior to construction. This will determine the need for detailed surface research and/or rescue excavations at these sites. Further investigation will delineate both sites and identify a safe route through both sites. The pipeline will be routed to the north of the NGP at the Ethnographic Alaouite Cemetery. Specific mitigation to be developed following site investigations. The pipeline has been re-routed to avoid Kemreli mound.	**MODERATE TO MINOR IMPACTS** Residual impacts cannot be determined precisely for the ethnographic Alaouite cemetery and Cetelik Tumuli at this stage since the extent of these sites are unknown. Archaeological investigations prior to construction will establish the full extent of both sites. However as investigations are expected to find a safe route through these sites, the ultimate scale of impact is likely to be minor. The Alaouite cemetery is expected to be avoided by the route, as further investigations will identify a route to the

Environmental Impact Table 31 (Maps 31A and 31B) (KPs 590.2 – 611.6): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	north of the current BTC alignment and the NGP, away from the site. **MINOR IMPACT** Assuming Kemreli mound is fenced, impacts will be limited to the temporary disturbance of the site setting and peripheral features.

Sivas Socio-Economic Overview

Demographics:
Sivas is the fifth smallest province in terms of population levels (698,000 inhabitants). This is in part due to high out-migration in the 1980s, when a large number of inhabitants migrated from rural areas to district centres, towns or other provinces. The province has the second lowest population density (after Gumushane) with 27 inhabitants per km^2. 50% of inhabitants live in urban areas. Migration has negatively affected agricultural activities, which have been left to the older generations. Approximately 8% of the surveyed population are Alevi Muslims, all others are Sunni Muslims. A very small proportion of respondents speak other languages such as Arabic (0.1%).

Land:
The province is located in the middle of the Anatolian Plateau and has a unique landscape. Circular basins are enclosed by hard gypsum that limits agricultural productivity. Private ownership followed by communal land ownership is most common. Land is relatively evenly distributed amongst surveyed local residents and it is one of the top four pipeline provinces for commercial livestock production (along with Erzincan, Adana and Kayseri). According to the SIS, only 7% of land is irrigated, explained by the shortage of feasible waterways or water sources for irrigation in high plateaus.

Livelihoods:
The economy is based on arable agriculture and animal husbandry. The former is the main economic activity, although large herds of animals graze pastureland. Animal husbandry is carried out by herdsmen who receive annual payments from local residents. This is in part due to the high out-migration of educated young adults for employment elsewhere. The province is ranked seventh (of the ten surveyed provinces) in terms of overall wealth (income and assets).

Infrastructure & Services:
Although water, telephone and electricity infrastructure exist, the supply of water, and to a lesser extent electricity, is irregular. Formal sewerage and waste disposal systems are rare. The average literacy rate is 75% within the surveyed settlements (marginally lower than other pipeline provinces). 38% of respondents had not completed primary school (the highest level found in all surveyed provinces). Almost half of the respondents have completed primary school and a further 12% secondary school, however only 2% had attended university. Most settlements have their own primary schools, or alternatively, the local government transports children from several settlements for education. There is a general lack of health facilities.

Key Problems:
Low-income levels were cited as the top problem for local residents in Sivas. Local residents have also been affected by rising agricultural input prices and limited irrigation infrastructure and are keen to receive agricultural and animal husbandry credit / support from the State.

Project Attitude:
Located on the NGP route, local residents have experienced material losses during construction and are concerned about the unresponsive behaviour of local authorities in dealing with land disputes.

Source: Household and Settlement Survey (2001)

Social Impact Table 31 (Maps 31C) (KPs 590.2 – 611.6): Imranli Karstic Area, Sivas Province

MAP 31: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There are two block valve stations.

MAP 31: MAP HIGHLIGHTS

- Three rivers bisect the pipeline, leading to Imranli Dam.
- National highway runs along path of pipeline.
- Predominant land use is rain-fed agriculture. The pipeline also passes through pasture areas.
- Four archaeologically important areas: Ethnographic Alaouite cemetery, Karatepe Mound, two adjacent tumuli and Celetiktepe settlement.

MAP 31: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** at least 11 settlements on this map will be directly impacted by the pipeline project. Six will have land (L) intersected by the proposed pipeline (Koyunkaya, Kevenli, Kemerli, Piredede, Cukuryurt and Durucin), four (Koyunkaya, Toklucak, Uyanik and Cukuryurt) are within 2km of the block valve stations (B), and six (Cukuryurt, Durucin, Imranli, Kemerli, Koyunkaya, Kevenli and Piredede) are within 500m of the pipeline route (D). None are within 5km of a construction camp or pump station. Settlements impacted by traffic have not yet been identified. No settlements are downstream of a river/ creek crossing.

- ***Surveyed:*** two settlements (Gokdere and Piredede) were surveyed (S) and six were interviewed via telephone (T).
- ***Non-surveyed:*** Toklucak (1.1km from the pipeline), Karli (2.25km from the pipeline), Celetiktepe (50m from the pipeline)
- ***Disclosure Meeting Location:*** Koyunkaya

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Uyanik (B)			
• ***Demographics****:* the settlement consists of 100 households with 300 inhabitants. • ***Safety****:* the settlement is situated 1.95km from the pipeline. • ***Project attitude:*** inhabitants are highly positive towards the project. • ***Land ownership & use:*** 88% of land is privately owned by the inhabitants, 10% of land is subject to sharecropping. A diverse variety of crops are cultivated, honey is produced and irrigation also occurs. Grazing takes place in Spring, Summer, October and November. • ***Settlement livelihood:*** livelihood activities include agriculture, bee keeping, construction and transportation. • ***Availability & skills:*** skills available in the settlement include heavy machine operators, heavy vehicle drivers, food service, mechanics	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Skills & resources*** Increased opportunity to provide skilled or semi-	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Information is highlighted to Contractor** so that they can ensure that directly	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Potential positive benefits** to local settlements.

Social Impact Table 31 (Maps 31C) (KPs 590.2 – 611.6): Imranli Karstic Area, Sivas Province

machine operators, heavy vehicle drivers, food service, mechanics, tree fellers, drivers, security personnel and welders. 46% of inhabitants would accept temporary employment. • ***Accessibility:*** the settlement is 17km from the district centre of Imranli. The gravel road is of poor quality, however the settlement is accessible all year round. • ***Information provision:*** 90% of the population is literate. The most effective information provision techniques are television and newspapers. • ***Environmental & cultural sites:*** religious buildings are located in this area. • ***Infrastructure:*** piped water is supplied to households year round, there is no alternative water source. There is an electricity supply, but no sewerage or waste disposal system. • ***Services:*** there is a primary school, and whilst there is no health centre, inhabitants have access to a travelling midwife. Sports facilities are also available. • ***Settlement problems:*** problems in this settlement include transport difficulties and low incomes.	skilled labour or to source goods or materials. ***Block Valve Station*** See Environmental Impact Tables and the Overview of Land Acquisition Process in Appendix C9.	impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kevenli (L) (T) (S)			
• ***Demographics****:* there are 58 inhabitants within this settlement. 25% of the population seasonally migrates. • ***Safety****:* the settlement is situated 1km from the pipeline. • ***Project attitude:*** according to the Muhtar*,* the attitude of the inhabitants towards the project is generally positive. • ***Land ownership & use:*** the inhabitants privately own 50% of the land. The other 50% is communally owned land. Irrigation also occurs. • ***Settlement livelihood:*** agriculture, bee keeping (three households produce honey as their only source of income), construction, and local government are the sources of livelihood for the inhabitants of	***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be

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this settlement. • ***Accessibility:*** it is 16km to the district centre of Imranli. Accessibility is poor from December to February. • ***Information provision:*** 99% of the population is literate. The best information provision tools are television and newspapers. • ***Environmental & cultural sites:*** there is a nearby plateau of environmental significance. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** problems within this settlement include unemployment, low incomes and inadequate childcare.		close to their original location.	facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Accessibility of recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy	**No residual impact expected.**
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Land Potential complications in expropriation process.	**See Overview of Land Acquisition Process in Appendix C9.**	**See Overview of Land Acquisition Process in Appendix C9.**
	Irrigation Loss of flow from planned/	Contractor will **consult** with authorities to determine	**If irrigation water is disrupted** longer than time

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	accidental disruption. Contamination of flow from spills or increase in sedimentation	maximum acceptable time for disruption.	considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kemerli (L) (D) (T)			
• ***Demographics:*** there are 300 inhabitants, however 99% seasonally migrate. • ***Safety****:* the settlement is situated 197m from the pipeline. • ***Project attitude:*** attitudes towards the project are mixed, as the natural gas pipeline had negative impacts on the settlement. • ***Land ownership & use:*** 60% of the land is privately owned by inhabitants. Grazing and agriculture cultivation occurs and irrigation is undertaken, however, irrigation channels are poor. Livestock graze in proximity to the pipeline. • ***Settlement livelihood:*** livelihood activities consist of agriculture, construction and local government. • ***Availability & Skills:*** inhabitants have previous experience from the Iran-Ankara natural gas project. • ***Accessibility:*** 13km to Imranli district centre. Accessibility is poor from September to February. • ***Information provision:*** 70% of the population is literate. The best information provision tools include television, newspapers, telephone and family. • ***Environmental & cultural sites:*** the settlement is located near a plateau of environmental significance. • ***Infrastructure:*** piped water is available in households. There is no alternative water source. • ***Settlement problems:*** problems include poor roads, poor irrigation and poor infrastructure.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be

Social Impact Table 31 (Maps 31C) (KPs 590.2 – 611.6): Imranli Karstic Area, Sivas Province

		for livestock.	facilitated by the Projects complaints procedure.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include: • Using appropriate channels of communication and media. • Emphasising oral communication where literacy is low. • Asking residents or workers to translate as necessary.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility of recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**

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SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Piredede (L) (D) (S)			
• ***Demographics:*** there are 80 inhabitants in the settlement. • ***Safety****:* the settlement is situated 86m from the pipeline. • ***Project attitude:*** inhabitants are concerned about the construction of the pipeline as they were negatively affected by the natural gas pipeline. • ***Land ownership & use:*** 50% of the land is privately owned by the inhabitants the other 50% is communally owned. Cultivation occurs and two households keep bees to produce honey as one of a number of income sources. Irrigation is also undertaken. • ***Settlement livelihood:*** activities include agriculture, bee keeping and local government. • ***Accessibility:*** it is 11km to the nearest district centre. Accessibility is poor from September to February. • ***Information provision:*** 80% of the population is literate. Television and radio provide the best sources of information. • ***Environmental & cultural sites:*** local caves and a mausoleum are present. • ***Infrastructure:*** piped water is available for households. There is no alternative water source. • ***Settlement problems:*** problems include poor roads, low income and infrastructure problems.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Bees***	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **Beekeeping: stationary**	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **No significant impacts**

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	Disturbance of any stationary hives located within 300m of the route.	**hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Land Potential complications in expropriation process.	**See Overview of Land Acquisition Process in Appendix C9.**	**See Overview of Land Acquisition Process in Appendix C9.**
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility to information Sectors of the population	**Communication with settlement** must take into account settlement	**Any change can highlight and exacerbate existing divisions** in communities.

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	may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	characteristics to ensure equal access to information for all residents. This should include: • Using appropriate channels of communication and media. • Emphasising oral communication where literacy is low.	Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Cukuryurt (L) (D) (B) (T)			
• ***Demographics****:* the settlement comprises 200 inhabitants, 65% of whom migrate seasonally. • ***Safety****:* the settlement is situated 154m from the pipeline. • ***Project attitude:*** attitudes are mixed as the inhabitants believe their land will be damaged, yet feel that the pipeline will benefit the region. • ***Land ownership & use:*** 70% of land is privately owned by inhabitants. No grazing or irrigation occurs. • ***Settlement livelihood:*** agriculture, bee keeping (20 households produce honey, as one of a number of income sources), hunting, manufacturing, trade and local government are the sources of livelihood for inhabitants of this settlement. • ***Accessibility:*** it is 7km to Imranli district centre. The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. The best information provision tools are television and family. • ***Environmental & cultural sites:*** Yes – around barrage • ***Infrastructure:*** piped water is available to households, however supply is irregular with frequent cuts in water supply. A fountain within the settlement provides an alternative source of water. • ***Settlement problems:*** infrastructure and inadequate access to water	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.**

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cause problems for this settlement.	***Bees*** Disturbance of any stationary hives located within 300m of the route	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of	**Significance cannot be established at this time.**

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		compensation will be facilitated by the Projects complaints procedure.	
	Skills & resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**Potential positive benefits** to local settlements.
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Accessibility of recruitment Decreased access to recruitment process ***Block Valve Station*** See Environmental Impact Tables and the Overview of Land Acquisition Process in	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy	**No residual impact expected.**

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	Appendix C9.		
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Durucin (L) (D) (T)			
• ***Demographics**:* there are 500 inhabitants within the settlement, with seasonal migration of 55%. • ***Safety**:* the settlement is situated 200m from the pipeline. • ***Project attitude:*** there is concern that land will be damaged. Inhabitants were affected by the natural gas pipeline. • ***Land ownership & use:*** all land is privately owned by inhabitants. Grazing and cultivation takes place. • ***Settlement livelihood:*** agriculture, bee keeping (50 households produce honey as one of a number of income sources), fishing, hunting, transport, manufacturing, construction, trade, tourism, local government are the sources of livelihood for the settlement. • ***Accessibility:*** the settlement is 4km from the district centre and is accessible all year. • ***Information provision:*** 90% of the population is literate. The best information provision tools are television and the newspaper. • ***Environmental & cultural sites:*** mausoleum. • ***Infrastructure:*** piped water is supplied to households but the supply is irregular with frequent water cuts. A local spring provides an alternative water source. • ***Settlement problems:*** the main problems are poor roads, poor irrigation and poor infrastructure.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children. Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations as agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 31 (Maps 31C) (KPs 590.2 – 611.6): Imranli Karstic Area, Sivas Province

	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of	Significance cannot be established at this time***.***

Social Impact Table 31 (Maps 31C) (KPs 590.2 – 611.6): Imranli Karstic Area, Sivas Province

		compensation will be facilitated by the Projects complaints procedure.	
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport need to be **taken into account** in the recruitment strategy.	**No residual impact expected.**
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Fishing Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.

Environmental Impact Table 32 (Maps 32A and 32B) (KPs 611.6 – 632.0): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Calcixerolls on soils occupying gently sloping and sloping lands. • Loamy-skeletal shallow (or Micro) Xerochrepts on moderately steep and steep lands. • Typic Xerorthents on valley bottoms. • Mesic Clayey-skeletal Micro Xerochrepts on upper slopes and steep lands. • Mesic Gypsic Calcixerolls or loamy Xerochrepts on lower slopes. • Mesic Xerorthents on valley bottoms.	Main potential impacts include: • soil erosion; • soil productivity; • sediment yield; • channel alteration. Other potential impacts include waterlogging and compaction.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Employ equipment mats.	**MODERATE IMPACT** Soil erosion predicted to be visibly active but no rill and gully formation evident. Furthermore, soil productivity losses are predicted to last generally less than one year after construction, but more than three months for arable land and more than 6 months in grazing pasture), but up to 2 years in upland areas with no formal land use.
Landscape and Visual			
West of Imranli, the route climbs into a markedly different landscape – that of polygonal gypseous karst. This complex, hilly terrain gets its name from narrow ridges of crystalline gypsum that totally enclose small basins of gypsic soils which, when seen from the air, resemble a honeycomb. On the ground, the landscape is one of many stony hummocks in a rolling grassy plain. Surface drainage is absent here since the drainage is internal, especially through sinkholes and subterranean passages. Small-scale cereal production and beekeeping occurs in some of the larger internal basins, where their access comes from agricultural tracks. The route descends steeply to cross the meandering Acioz River, its valley forming a green ribbon of meadows and trees in an otherwise more barren landscape, but here as elsewhere, the poorly reinstated NGP forms a massive scar through the landscape, visible from satellite. Associated quarries and tracks disfigure nearby hills and plains. The route continues across a broad generally flat karst plain, lacking trees and surface	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. This may be long-term or permanent where difficult to re-instate, or where ecological considerations prevent application of fertiliser. Visual liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any	**INDIRECT POSITIVE IMPACT** in the Acoiz valley where the BTC and NGP corridors are reinstated. **MODERATE IMPACT** Where reinstatement is unlikely to be fully effective in areas where the corridor overlies thin marl soils, it will retain its whitish colour and show as a white line across the landscape, although only in the short-term.

Environmental Impact Table 32 (Maps 32A and 32B) (KPs 611.6 – 632.0): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
drainage, largely cultivated for non-intensive cereal production, and with wide vistas of distant mountains. While the landscape is seriously degraded, its setting is still preserved by surrounding high quality scenery, especially from viewpoints over the Acioz River.		additional mitigation measures to ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply 'Soils' reinstatement specifications above.	
Surface Waters			
The pipeline route crosses Acioz River at KP 625.1. River channel is sinuous with a trapezoidal cross-section. Width of crossing is 27m and the bank-full width is approximately 4m, with an estimated floodplain width of also 27m. Bed consists of sand and gravel and the flow is intermittent and of a uniform and tranquil type. Bank-side vegetation comprises grass and trees, although the riparian vegetation has been disturbed. Water quality samples taken at the crossing point indicate that this is a Class IV river. Adamfaka settlement lies c. 1km downstream of BTC Pipeline crossing point. BVS-035 will be located at KP 625.0 and c. 45m from Acioz River. Approximately 350m2 of permanent landtake required. A new access road will be constructed to the site of c. 40m in length.	Direct disturbance to bank and bed morphology through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in already poor water quality. Potential for long-term sedimentation and turbidity downstream of the NGP crossing. Potential impacts on downstream ecology and water abstraction for human use.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to	**INDIRECT POSITIVE IMPACT** where the Acioz River crossing previously disturbed during construction of the NGP is reinstated. **MINOR IMPACTS** only expected during both pipeline and BVS construction, as disturbance will be limited to the immediate working area. Sedimentation of Acioz River crossed in this section will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.

Environmental Impact Table 32 (Maps 32A and 32B) (KPs 611.6 – 632.0): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		ensure the integrity of the BTC corridor at this watercourse crossing impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, for the protection of surface waters, including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench. Assess need for alternative water supply for downstream communities, such as Adamfaki settlement, and provide where necessary if sedimentation and turbidity persist for more than 3 days at the community.	
Ecology			
Important Ecological Factors European Pond Turtle (globally-threatened) was recorded at the Acioz River. The protection status for this species is given in Table 5.21, Section 5. Acioz River supports fish species of medium commercial value – nose carp (*Chondrostoma regium*), breeding from March to May, transcaucasian barb	Temporary localised disturbance to globally-threatened reptile species between May and September inclusive. The European Pond Turtle typically mates in May,	In advance of construction works associated with the Acoiz River crossing, riverside vegetation will be cleared between beginning of October and end of April, ie outside of the breeding season for	**MINOR IMPACTS** only to globally-threatened amphibians, if the construction period avoids the seasonal sensitivity.

Environmental Impact Table 32 (Maps 32A and 32B) (KPs 611.6 – 632.0): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
(*Capoeta capoeta angorae*), breeding between May and June, and chub (*Leuciscus cephalus*), breeding from April to June.	with eggs (up to 10 per clutch) laid amongst the roots of waterside vegetation in June. Incubation period is dependent upon variable by temperature, but is generally in the order of 70 days. Hatchlings emerge August – September. Temporary disturbance to commercially important fish and aquatic plants providing breeding sites for these species during construction across the Acoiz River.	the European Pond Turtle. For construction activity to be permitted during the breeding season of fish species with medium commercial value, the Contractor will be required to submit specific mitigation measures to avoid impacting breeding fish to BOTAŞ for approval. Such measures will include, but not be limited to, the following: preconstruction survey results indicating that spawning grounds are avoided, the provision of fish passages, etc, in addition to the generic mitigation measures that are required at all river crossings.	**MINOR IMPACTS** at most for all fish species if construction takes place outside of the breeding seasons (ie March to June inclusive). At other times of year (varying by species), impacts will generally be **MINOR** on the basis of the rigid application of water crossing mitigation measures.
Noise			
Noise sensitive receptors include: • Kilickoy settlement in Imranli District located c. 130m from the centreline of the Pipeline; • Yukari Adamfaki settlement located c. 205m from the Pipeline.	Short-term noise impacts are expected to occur at: • Kilickoy settlement during soil stripping, welding and lowering and backfilling activities; • Yukari Adamfaki settlement during soil stripping activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings;	**MINOR IMPACT** Short-term noise impacts are expected to occur at Kilickoy during soil stripping and welding/lowering activities and at Yukari Adamfacki during soil stripping. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. This will be short-term in

Environmental Impact Table 32 (Maps 32A and 32B) (KPs 611.6 – 632.0): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	nature, lasting only for a few days.
Archaeology and Cultural Heritage			
An archaeologically important site, South-West of Kilickoy Settlement, is crossed by the route east of KP 620. This area yields many late Byzantine and Medieval pottery shards, although no architectural remains are visible. The MoC has not yet registered this site. Area to the SW of Kilickoy village has been proposed for registration by the regional preservation council Kalatepe mound (Adamfaki village) – (1st Degree site)	Potential for the site to experience direct impacts, such as ground disturbance, during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of this site.	The extent of the site south-west of Kilickoy Settlement will be investigated during further field surveys prior to construction. This will determine the need for detailed surface research and/or rescue excavations at this site. Further investigation will delineate this site and identify a safe route through. Specific mitigation to be developed following site investigations. The MoC classification for the site will be determined from investigations. Construction will be carried out under the supervision of an	**MODERATE TO MINOR IMPACTS** Residual impacts cannot be determined precisely for this site at this stage since the extent is unknown. Archaeological investigations prior to construction will establish the full extent of the site. However as investigations are expected to find a safe route through these sites, the ultimate scale of impact is likely to be minor and short-term in duration.

Environmental Impact Table 32 (Maps 32A and 32B) (KPs 611.6 – 632.0): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		archaeologist authorised by BOTAŞ.	

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

MAP 32: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There is one block valve station.

MAP 32: MAP HIGHLIGHTS

- Unclassified roads link local settlements.
- One river bisects pipeline.
- An archaeologically important site is located south-west of Kilickoy Settlement which yields Byzantine & Medieval pottery. Kalatepe Mound north-west of the pipeline route.
- Main land uses are pasture and rain fed agriculture.

MAP 32: SURVEYED AND IMPACTED SETTLEMENTS

- ***Impacted:*** nine settlements will be directly impacted by the project. Eight settlements will have land intersected by the proposed pipeline (L) (Yaylacik, Derekoy, Begendik, Kilinckoy, Valituncel Mah, Karisyaka Mah, Adamfaki and Nasir). Five settlements (Becek, Kilinckoy, Yaylacik, Derekoy and Adamfaki) are within 500m of the pipeline route (D). None are within 5km of a construction camp or pump station. Two (Adamfaki and Yukari Adamfaki) are within 2km of the block valve station (B). Settlements impacted by traffic have not yet been identified. One settlement, Adamfaki is 800m downstream of a river crossing (Acioz River).
- ***Surveyed:*** one settlement (Nasir) was surveyed in the field (S) and seven settlements surveyed by telephone (T).
- ***Not surveyed:*** Dogancal (1.8km from the pipeline), Becek (400m from the pipeline), Kabaktepeler (1.5km from the pipeline), Acioz have not been surveyed.
- ***Not on map:*** Valituncel Mah, Karsiyaka Mah and Acioz
- ***Disclosure Meeting Location:*** Nasir

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Yaylacik (L) (D) (T)			
• ***Demographics:*** there are 35 inhabitants in the settlement. • ***Safety:*** the settlement is situated 450m from the pipeline. • ***Pipeline attitude:*** According to the Muhtar, the inhabitants are generally positive about the project. • ***Land ownership & use:*** 99% of the land is privately owned by the inhabitants. No grazing or irrigation is undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (one household produces honey as one of a number of income sources) and local government are the main sources of livelihood. • ***Availability & skills:*** the inhabitants have previous experience of the Iran-Ankara natural gas project.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

the Iran-Ankara natural gas project. • ***Accessibility:*** it is 3km to Imranli, the district centre. Accessibility is poor from December to February. • ***Information provision:*** 98% of the population is literate. The best information provision tools include television and the family. • ***Environmental & cultural sites:*** a nearby plateau is of environmental significance. • ***Infrastructure:*** piped water is available in households, however supply is irregular with and water cuts are frequent. Water can be sourced from local springs and carried to the settlement as an alternative water source. • ***Settlement problems:*** problems include inadequate access to water and poor infrastructure.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Special site*** Refer to Environmental Impact Tables. ***Accessibility to recruitment*** Decreased access to recruitment process ***Sensitive vegetation used by***	settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy **Effectiveness of dust**	**Any additional damage will be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No residual impact expected.** **No significant impacts**

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

	bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided	predicted if dust suppression and monitoring measures are fully implemented. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Derekoy (L) (D) (T)			
• ***Demographics:*** there are 230 inhabitants in the settlement, 39% seasonally migrate. • ***Safety****:* the settlement is situated 366 metres from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive about the pipeline. • ***Land ownership & use:*** 60% of land is owned privately by inhabitants. No grazing takes place as there is no livestock or irrigation. • ***Settlement livelihood:*** agriculture, hunting and local government are the local sources of livelihood.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

• ***Accessibility:*** it is 6km to Imranli, the district centre. Accessibility is poor from September to February. • ***Information provision:*** 85% of the population is literate. The best information provision tools include television and the family. • ***Environmental & cultural sites:*** important sites include a nearby plateau, caves and waterfalls. • ***Infrastructure:*** inhabitants have to source their water from the settlement fountain. • ***Settlement problems:*** problems include low incomes, inadequate access to water and poor roads.		settlement is within 500 m of construction work.	
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	Significance cannot be established at this time**.**
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities,	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

	potential disruption to utilities, etc. ***Drinking water*** Potential for disruption or contamination of drinking water during construction.	for all residents. This should include: - Using appropriate channels of communication and media. - Emphasising oral communication where literacy is low. The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	keep this to a minimum. **No residual impact.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Begendik (L) (T)			
• ***Demographics:*** 45 inhabitants with seasonal migration of 65%. • ***Safety:*** the settlement is situated 2.35km from the pipeline. • ***Project attitude:*** people are concerned that land will be damaged. • ***Local opinion of construction camps:*** according to the Muhtar, construction camps would not be welcome. • ***Land ownership & use:*** 70% of the land is privately owned by inhabitants. Both grazing and irrigation is undertaken. • ***Settlement livelihood:*** agriculture, hunting, transport, local government are the main sources of livelihood. • ***Accessibility:*** it is 6.6km to the district centre. Accessibility is good. • ***Information provision:*** 90% of the population is literate. Television and the newspaper are the best sources of information. • ***Environmental & cultural sites:*** important site include a nearby plateau and a river. • ***Infrastructure:*** inhabitants source their water from a settlement fountain.	***Hunting*** Temporary reduction in game due to disturbance during construction. ***Special site*** Refer to Environmental Impact Tables.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	Significance cannot be established at this time***.***

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

fountain. • ***Settlement problems:*** problems include low incomes, low population and unemployment.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Drinking water Potential for disruption or contamination of drinking water during construction	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the project.	**No residual impact.**
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy	**No residual impact expected.**
	Construction camp Nearby construction camp would not be welcomed by some/all of the settlements.	Additional consultation to be carried out by the Project prior to constructing a camp within 5km.	Camp will not be located within 5km if against the wishes of the settlement
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kilinckoy (L) (D) (T)			
• ***Population****:* there are 640 inhabitants, with seasonal migration of 56%. • ***Safety****:* the settlement is situated 130m from the pipeline.	***Construction hazards: human*** Working areas pose safety hazard to residents,	**Road safety training** will be held in schools prior to construction commencing.	**Continued attention** to mitigation measures will be critical to prevent injury.

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

• ***Project attitude:*** inhabitants are concerned about the impact of construction on lands as the natural gas pipeline caused considerable damage. • ***Land ownership & use:*** 80% of land is privately owned by inhabitants. There is no seasonal grazing of settlement livestock and no irrigation. • ***Settlement livelihood:*** sources of livelihood include animal husbandry, bee keeping (one household produces honey as one of a number of income sources) and local government. • ***Accessibility:*** it is 10km to Imranli district centre, accessibility is poor from December to February. • ***Information provision:*** 80% of the population is literate. The most effective information provision tools include television, the telephone and family. • ***Environmental & cultural sites:*** an ancient city, tower and registered stones are of cultural significance. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular and regular water cuts occur. A stored water supply forms an alternative water source. • ***Settlement problems:*** inadequate access to water, unemployment and poor roads are the main problems in this settlement.	particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original	**Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

		position for 15-20 days prior to moving back close to their original location.	facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Fishing Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing. ***Special site*** Refer to Environmental Impact Tables.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Negative experience Possible **opposition** to project and **increased sensitivity** to any negative impacts.	BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings.**	Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Valituncel Mah (L) **(T)**			
• ***Demographics:*** 500 inhabitants live in this settlement. • ***Safety****:* the settlement is situated 2km from the pipeline. • ***Project attitude:*** attitudes towards the project are generally positive. • ***Land ownership & use:*** 98% of the land is privately owned by inhabitants. There is no seasonal grazing of livestock and no irrigation undertaken. • ***Settlement livelihood:*** animal husbandry, bee keeping (3 households produce honey as one of a number of income sources), fishing (two households for their own consumption), hunting, construction, transport, trade, education and local government are all sources of livelihood for this settlement. • ***Accessibility:*** the settlement is 2km from the district centre and is accessible all year. • ***Information provision:*** 85% of the population is literate. The key information provision tools include television, family and the Muhtar. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular with frequent water cuts. A stored water supply provides an alternative water source. • ***Settlement problems:*** infrastructure problems and inadequate access to water are the main problems affecting the settlement.	***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

		Community liaison meetings: issue to be discussed at meetings before and during construction.	
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	Significance cannot be established at this time.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Karsiyaka Mah (L) (T)			
• ***Demographics:*** thee are 450 inhabitants, 19% seasonally migrate. • ***Project attitude:*** there are concerns that land will be damaged and compensation will be inadequate. • ***Land ownership & use:*** 95% of land is privately owned by inhabitants. Grazing occurs but no irrigation is undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (two households produce honey as one of a number of income sources), transport, construction, trade, education and local government are all sources of livelihood. • ***Availability & skills:*** inhabitants have previous experience of the Iran-Ankara natural gas project. • ***Accessibility:*** 13.5km to the district centre. The roads are poor but there is year round access. • ***Information provision:*** 95% of the population is literate. The best information provision tools include television, the newspaper, the internet and family. • ***Environmental & cultural sites:*** a nearby plateau is of environmental significance. • ***Infrastructure:*** there is no piped water supply, instead inhabitants access their water from a 'common depot'. • ***Settlement problems:*** problems include low incomes, inadequate access to water and poor roads.	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Accessibility of recruitment*** Decreased access to recruitment process.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Asking residents or workers to translate as necessary. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. Winter road closures, seasonal migration and poor transport will be **taken into**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **No residual impact expected.**

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

		account in the recruitment strategy.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Adamfaki / Yukari Adamfaki (L) (D) (B) (T)			
• ***Demographics:*** there are 147 inhabitants. Seasonal migration of 65%. • ***Safety:*** the settlement is situated 205m from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive. • ***Land ownership & use:*** 50% of land is privately owned by the inhabitants. Grazing and irrigation are both undertaken. • ***Settlement livelihood:*** agriculture, trade, transport, local government are the main sources of livelihood. • ***Accessibility:*** it is 19km to Zara, the district centre. The settlement has poor roads, accessibility is poor from December to February. • ***Information provision:*** 80% of the population is literate. The best information provision tools include television and family. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular with frequent water cuts. A settlement fountain provides an alternative water supply. • ***Settlement problems:*** low incomes, inadequate access to water and poor roads are the main problems affecting the settlement. • ***Other:*** the settlement is located immediately downstream of the pipeline on Acioz River.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In the event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Block Valve Station See Environmental Impact Tables and the Overview of Land Acquisition Process in Appendix C9.		

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Nasir (L) **(S)**			
• ***Demographics:*** there are 400 inhabitants within 60 households. The population is growing due to returning migrants. • ***Safety:*** the settlement is situated 1.17km from the pipeline. • ***Health:*** the sewerage system is poor, leading to health implications. • ***Project attitude:*** inhabitants are generally positive towards the project, as local residents believe that the pipeline will contribute to the development of Turkey. However, they are concerned that the pipeline may harm agricultural fields and pastures. Inhabitants were not satisfied with expropriation payments made during the construction of the natural gas pipeline. Damage to land was not reinstated those landowners that share land have not received payment. Specifically, 45% of the inhabitants believe the pipeline will bring no benefits. 18% believe it will bring employment opportunities to the settlement and 22% believe it will damage social harmony. • ***Land ownership & use:*** 40% of land is owned privately by the inhabitants and 50% is communal forest land holdings. Land owners do not possess title deeds (only right of possession) for their lands. Irrigation activities and seasonal grazing are undertaken. • ***Settlement livelihood:*** animal husbandry (cattle & poultry) is a major income resource. In addition, agriculture (sugar beet, grain and fruit trees) and transport also provide income sources. Crops and animals are also sold at the local bazaar. • ***Availability & skills:*** food service, heavy vehicle drivers, tree fellers, drivers, security and welders are available. 36% of respondents would accept temporary employment on the project. • ***Accessibility:*** it is 18km to Zara, the district centre. The settlement is accessible year round. • ***Information provision:*** 80% of the population is literate. • ***Infrastructure:*** piped water is supplied to households, however, supply is irregular with frequent water cuts and there is no alternative water source. There is an electricity supply but no sewerage or waste disposal system.	***Land*** Potential complications in expropriation process. ***Forest*** Loss of a resource used by settlements. Increased expenditure on other fuel sources. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that	**See Overview of Land Acquisition Process in Appendix C9.** If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and	**See Overview of Land Acquisition Process in Appendix C9.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage**

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

sewerage or waste disposal system. • ***Services:*** there is a primary school with one teacher and a health care centre with a midwife. • ***Settlement problems:*** problems include unemployment, a poor sewerage system and inefficient water supply. • ***Other:*** Nasir River passes through the settlement.	compensated for may be affected if mitigation measures not fully implemented ***Skills and resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Negative experience*** Possible **opposition** to project and **increased sensitivity** to any negative impacts.	immediately following construction will identify any additional land that has been affected. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings.**	**will be compensated for.** **Potential positive benefits** to local settlements. Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

Environmental Impact Table 33 (Maps 33A and 33B) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Calcixerolls on soils occupying gently sloping and sloping lands. • Loamy-skeletal Shallow (or Micro) Xerochrepts on moderately steep and steep lands. • Typic Xerorthents on some valley bottoms.	Main potential impacts: • soil erosion; • sediment yield; • soil productivity; • contaminated soils;	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MODERATE IMPACT** Soil erosion predicted to be visibly active but no rill and gully formation evident. Furthermore, soil productivity losses are predicted to last generally less than one year after construction, but more than three months for arable land and more than 6 months in grazing pasture), but up to 2 years in upland areas with no formal land use.
Landscape and Visual			
The route continues across a broad generally flat or lightly undulating, karst plain lacking trees and surface drainage, largely cultivated for non-intensive cereal production, and with wide vistas of distant mountains determining the landscape's huge scale. Shallow soils overlying gypseous marl support limited grazing with small fields of rainfed cereals occupying some valley bottoms. Riparian vegetation marks the path of small tributaries to the Acisu north of the pipeline and the Kirikli south of it. Low-density grasses grow on slopes. High groundwater may occur in some swales. The relatively featureless terrain, its mostly agricultural use and, in particular, the landscape degradation from the parallel NGP, detracts from the landscape quality and renders its low sensitivity. However its exposure and sensitive soils make it highly susceptible to change.	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. This may be long-term or permanent where difficult to reinstate, or where ecological considerations prevent application of fertiliser. Visual liabilities of the NGP, which was not reinstated, potentially accrue to the BTC Pipeline where their RoWs lie adjacent or closely parallel.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC	**INDIRECT POSITIVE IMPACT** in areas where the BTC and NGP and corridors are reinstated. **MODERATE IMPACT** in the short-term where the corridor overlies thin marl soils, as these are unlikely to reinstate to a high standard. Exposed marl may retain its whitish colour and show as a white line across the landscape. However, existing landscape degradation limits extent of

Social Impact Table 32 (Map 32C) (KPs 661.6 – 632.0): Imranli Karstic Area, Sivas Province

Construction Camp B will be tentatively located at KP 640.7, although the precise location for this camp is still being finalised. The camp will occupy an area of c. 14.12ha.	Short-term visual impact on non-marl portions of the route as a result of both pipeline construction and the presence temporary of Construction Camp B during the construction period.	Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor at this watercourse crossing impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply 'Soils' reinstatement specifications above. Attempt a high rate of fertilisation using NPK + micro-nutrients in combination with mulch such as coir fibre.	impact and presents opportunities for improvement.
Surface Waters			
The route crosses three rivers in this section – Nasir River (near KP 631.4); Kamislibogaz River (near KP 635.4); and Acisu River (KPs 635.6 – 636.2). Nasir and Kamislibogaz Rivers are tributaries of the Acisu River, joining c. 1.5km and 1km downstream of crossing point respectively.	Disturbance, directly through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Potential for long-term sedimentation and turbidity downstream of the NGP crossing.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any	**INDIRECT POSITIVE IMPACT** where these watercourse crossings previously disturbed during construction of the NGP is reinstated. **MINOR IMPACTS** Although the water quality classifications for the three watercourses are unknown, only minor impacts are expected, as disturbance will be limited to the immediate working area. Sedimentation of all watercourses crossed in

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		additional mitigation measures to ensure the integrity of the BTC corridor at these watercourse crossings impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, to avoid sedimentation and turbidity at these crossing points, including sediment filters/trapping devices, settling ponds and trench de-watering.	this section will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Ecology			
Important Ecological Factors ESA 27 is identified between KP 645.1 and KP 654.2 for four globally-threatened plant species (*Isatis sivasica, Minuartia anatolica var. scleranthoides, Onobrychis stenostachya sp. krausei* and *Lepidium caespitosum*) and one nationally-threatened species (*Tchihatchewia isatidea*). The IUCN status for these species are given in Table 5.20, Section 5. At the Nasir River crossing (KP 632.2), 1 Wryneck (nationally-threatened) was recorded. The protection status for this species is given in Table 5.21, Section 5.	Habitat destruction of plain steppe and habitats peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 27. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as	**MODERATE IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction

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	sensitive for late and second broods.	described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly. • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during reinstatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 27. Preconstruction survey will establish the presence of mature trees, (in particular dead trees, which are the favoured nesting sites of the Wryneck), along the RoW of the pipeline route. If present, these will be removed outside the breeding season.	schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.
Noise			
Sucak settlement in Zara District is located c. 160m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Sucak during soil stripping activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed	**MINOR IMPACT** Short-term noise impacts are expected to occur during soil stripping. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. However, this will be short-term in nature,

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		with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings and where possible, utilising existing screening, including that arising from the stockpiling of materials. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	lasting only for a few days.
Archaeology and Cultural Heritage			
The flat settlement of Sucak (3rd Degree Site*) lies within the 100m Corridor. Although no architectural remains were found on this site, ceramic shards dating to the Roman period were discovered. * This site has not yet been registered by the MoC and is provisionally assigned this classification. Sucak settlement has been proposed for registration by the regional preservation council	Potential for site to experience direct impacts, such as ground disturbance, during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	The Pipeline has been re-routed to avoid this site. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to the temporary disturbance of the site setting and peripheral features.

Social Impact Table 33 (Map 33C) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

MAP 33: PROJECT INFORMATION

A primary construction camp (Lot B) will be located in the area. It will require 14.12ha. It is located mostly on state land, and also on two smaller private land parcels. (Originally this construction camp was located 2.4km to the west. It was relocated away from an important bird site, and away from an area that was largely privately owned. Changing the location of the site has minimised resultant impacts). There is no pump station and no block valve station in the area.

MAP 33: MAP HIGHLIGHTS

- Three rivers and one access road bisect the pipeline.
- Main land use is rain-fed agriculture and pasture, with a small amount of irrigated agriculture near water courses.
- The pipeline route passes north of the archaeological site 'Nasir Settlement Surroundings', a hillside settlement.
- Seasonal migration occurs in all settlements.
- Hunting occurs at two settlements.
- There is insufficient water in many settlements.
- Agriculture and animal husbandry are undertaken.

MAP 33: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** 15 settlements on this map will be directly impacted by the pipeline project. Five (Demiryurt, Derbent, Ekinli, Tekkekoy and Sucak) will have land intersected by the proposed pipeline (L). One (Sucak) is within 500m of the pipeline route (D); three are within 2km of a construction camp (C) (Tekkekoy, Kadriye, Ciftlik); and eight are within 5km of a construction camp (Osmaniye, Kumbet, Baglama, Ucoluk, Akdegirmen, Ungar, Yarimkaya, Kevenli). Settlements impacted by traffic have not yet been identified.

- ***Surveyed****:* five settlements were surveyed by telephone (T).
- ***Not surveyed:*** Muhmutaga Farm (1.8km from the pipeline).
- ***Not on map:*** Ucoluk, Akdegirmen, Ungar, Yarimkaya
- ***Disclosure Meeting Location:*** Tekkekoy

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Sucak (L) (D) (T)			
• ***Demographics:*** there are 400 inhabitants with seasonal migration of 45%. • ***Safety:*** the settlement is situated 500m from the pipeline, the nearest house is 100m from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison**	**Continued attention** to mitigation measures will be critical to prevent injury.

Social Impact Table 33 (Map 33C) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

positive towards the project. • ***Land ownership & use:*** 70% of land is privately owned by inhabitants. Seasonal grazing and irrigation occur. • ***Settlement livelihood:*** agriculture, bee keeping (six households produce honey as one of a number of income sources), hunting, manufacturing, construction and local government are all sources of livelihood for the settlement. • ***Availability & skills:*** inhabitants have previous experience of the Iran-Ankara natural gas project. • ***Accessibility:*** the settlement is 12km from the district centre of Zara and the settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. The best information provision tools include television, radio and the newspaper. • ***Infrastructure:*** a regular supply of piped water is supplied to households. • ***Settlement problems:*** unemployment, low income and poor roads are amongst the problems faced by the settlement.		**meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Benefits** from health and safety awareness raising.
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 33 (Map 33C) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed.	**Significance cannot be established at this time.**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Availability of information Sectors of the population may not have access to	**Communication with settlement** must take into	**Any change can highlight and exacerbate existing**

Social Impact Table 33 (Map 33C) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

	project related information on employment opportunities, potential disruption to utilities, etc. ***Skills and resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Accessibility to recruitment*** Decreased access to recruitment process.	account settlement characteristics to ensure equal access to information for all residents. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**divisions** in communities. Mitigation measures will keep this to a minimum. **Potential positive benefits** to local settlements. **No residual impact expected.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Tekkekoy (L) (C) (T)			
• ***Demographics:*** there are 395 inhabitants with seasonal migration of 77% (agriculture 60%, students 12%, seasonal workers 5%). • ***Safety:*** the settlement is situated 3.2km from the pipeline and the nearest house is 3km from the pipeline. The distance from the construction camp to the nearest house is 3-4km. • ***Project attitude:*** attitudes towards the project are generally positive. The construction camp is generally welcome (one inhabitant is against it). Perceived benefits of the construction camp include the potential for the local road quality to be upgraded, and the potential to sell dairy and meat products to the camp. The settlement also has	***Construction Camp*** Primary receptor of impacts resulting from construction workers.	**Monthly community liaison** meetings will be held. **Preferential employment** opportunities. **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in	**Low likelihood of significant impacts.** Potential for impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures.

Social Impact Table 33 (Map 33C) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

sell dairy and meat products to the camp. The settlement also has two trucks and 25 tractors that could be used. There are expectations of possible employment opportunities at the construction camp and in the construction of the pipeline, increased settlement income and the potential to offer transportation services to the camp. • ***Availability & skills:*** inhabitants have experience from the natural gas pipeline, which passes to the south-east of the settlement. • ***Land ownership at construction site:*** the campsite is 14.12ha in size, most of which is state land. It also encompasses two smaller private land parcels that are owned by Tekke local residents with legal title. • ***Land ownership & use:*** 98% of the land is privately owned by inhabitants. Seasonal grazing occurs on pasture land or private land from May to October. For the last five years there has been no irrigation due to damage to the water supply system. The land ownership at the camp site is mostly state land consisting of two private lands. • ***Settlement livelihood:*** animal husbandry, in particular cattle, is the main economic activity undertaken in the settlement with significant dairy and meat production. Inhabitants claim that they could provide such products to the construction camp. A secondary economic activity is agriculture – grain: wheat & barley (produced and sold by households), sugar beet (sold), wood (sold), animal feed (used), vegetables (subsistence). In addition, bee keeping (three households produce honey as one of a number of income sources), trade, seasonal construction and local government activities are undertaken. 10% of inhabitants are unemployed. Women undertake agricultural work for the family. • ***Accessibility:*** although the road is of poor quality, the settlement is accessible most of the year due to its proximity to Zara, the district centre. However, the settlement is inaccessible for a short period during the winter months. • ***Information provision:*** 75% of the population is literate, although only 50% of women are literate. The best information provision tools include television, newspapers, radio, family and the imam	***Land*** Temporary expropriation of 14.12ha for the construction camp. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to	providing **health awareness training.** **See Overview of Land Acquisition Process in Appendix C9.** **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should	**Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities. **See Overview of Land Acquisition Process in Appendix C9.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 33 (Map 33C) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

include television, newspapers, radio, family and the imam. • ***Environmental & cultural sites:*** there is an old bridge to the north of the settlement; Seyhmerzuban mausoleum is next to the cemetery north of the settlement and a cave which can be traced back to the Stone Age is located west of the settlement. • ***Infrastructure:*** piped water supplies households, however supply is irregular with frequent water cuts. An alternative water source is to carry water to the settlement from nearby springs. Drinking water is supplied by the same system serving Zara district centre. There is a good electricity supply but no sewerage or adequate waste disposal systems. • ***Services:*** almost every household has a telephone and the settlement receives mobile phone coverage. There is a five year primary school and students travel to Zara district centre for a further three years of education. There is regular public transport to Zara district centre. There is no ATM, coffee house, market or library. • ***Settlement problems:*** low income, infrastructure problems, unemployment, poor road and insufficient water supply for irrigation are amongst the problems facing this settlement.	utilities, etc. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility of recruitment*** Decreased access to recruitment process ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	include emphasising oral communication where literacy is low. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No residual impact expected.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 33 (Map 33C) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

		Community liaison meetings: issue to be discussed at meetings before and during construction.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Demiryurt (L) **(T)**			
• ***Demographics****:* there are 215 inhabitants, 70% of whom seasonally migrate. • ***Safety:*** the settlement is situated 6km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the project. • ***Land ownership & use:*** 90% of land is privately owned by inhabitants. Seasonal grazing occurs but there are no irrigation activities. • ***Settlement livelihood:*** agriculture, bee keeping (three households produce honey as one of a number of income sources), fishing (five households for own consumption), hunting, transport, trade, local government are all local sources of livelihood. • ***Accessibility:*** it is 13.8km to the district centre. The settlement is accessible all year round. • ***Information provision:*** 90% of the population is literate. The best information provision tools include television, newspapers, telephone and family. • ***Environmental & cultural sites:*** caves are of cultural significance and a mud lake is an important environmental site. • ***Infrastructure:*** piped water is supplied to households, but supply is irregular with frequent water cuts. A fountain in the settlement provides an alternative water source. • ***Settlement problems:*** problems include inadequate access to water, infrastructure problems and poor roads.	***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

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		width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	
	Accessibility of recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	Significance cannot be established at this time.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 33 (Map 33C) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

		construction.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Derbent (L) **(T)**			
• ***Demographics****:* there are 140 inhabitants in the settlement. • ***Safety:*** the centre of the settlement is situated 3.45km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the project. • ***Land ownership & use:*** the inhabitants lease 60% of land. Actual land ownership is low. Seasonal grazing occurs and there is no irrigation. • ***Settlement livelihood:*** agriculture and local government activities are important livelihood sources for this settlement. • ***Accessibility:*** it is 20 km to the district centre. The settlement is accessible all year. • ***Information provision:*** 80% of the population is literate. • ***Infrastructure:*** piped water is supplied to households. • ***Settlement problems:*** problems include unemployment, low income and poor roads.	***Land*** Potential complications in expropriation process.	**See Overview of Land Acquisition Process in Appendix C9.**	**See Overview of Land Acquisition Process in Appendix C9.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kadriye (C) **(S)**			
• ***Demographics:*** there are no inhabitants during the winter. The Muhtar*'s* family live in the settlement during the summer. • ***Safety:*** it is 5km from the proposed camp to the nearest house and 1km to the nearest land plot. • ***Project attitude:*** inhabitants are generally positive towards the project. Attitudes towards the construction camp are welcoming. • ***Land ownership & use:*** Tekke inhabitants own the land that the proposed construction camp would be situated on. Seasonal irrigation and grazing are undertaken.	***Construction camp Impacts:*** Primary receptors of impacts resulting from construction workers.	**Monthly community liaison** meetings will be held. **Preferential employment** opportunities. **Project to liase** with local health authorities BTC Company to look at	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures.

Social Impact Table 33 (Map 33C) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

• ***Settlement livelihood:*** Sources of livelihood include grain – wheat & barley (consuming & selling), animal feed, vegetables (subsistence); bee keeping and animal husbandry – cattle. During summer, local residents are involved in agricultural pursuits, in the winter inhabitants leave the settlement. • ***Accessibility:*** it is 5.3km to the district centre. A new road has been built within the past five years but it is of poor quality. The settlement is not accessible in January or February. • ***Information provision:*** 100% of the population, including women are literate. The best information tools include TV, radio, family, neighbours and the Muhtar. • ***Environmental & cultural sites:*** there is a thermal spring, used for jaundice treatment, 200m north of the settlement. • ***Infrastructure:*** the main source of water is piped water. There is a regular electricity supply but no sewerage system. Waste is recycled. • ***Services:*** there is a telephone in the settlement and there is mobile phone coverage. There is no school. • ***Other settlement services (of potential use to construction workers):*** none		opportunities to cooperate in providing **health awareness training.** Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities. **No residual impact expected.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility of recruitment Decreased access to recruitment process. ***Special site*** See Environmental Impact Tables. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.		
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kalkan Ciftlik Mah (C) (S)			
• ***Demographics:*** there are 84 inhabitants, 52 women & 32 men. • ***Safety:*** 2.5km from the proposed camp to nearest house.	***Construction Camp Impacts:***	**Monthly community liaison** meetings will be held.	**Low likelihood of significant impacts.**

Social Impact Table 33 (Map 33C) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

• ***Project attitude:*** attitudes towards the project are generally positive and construction camps would be welcome. Perceived benefits of a construction camp include possible employment opportunities at the camp and in pipeline construction. They anticipate increased income, the potential to sell items such as milk and cheese to the camp, the potential for settlement owned tractors to be utilised during construction and for the local road quality to be improved. There are no perceived problems from the construction camp but local roads are of poor quality and would not be suitable for heavy traffic. The inhabitants do not expect any tensions with construction workers. • ***Land ownership at Construction Camp:*** largely state owned. Also includes two private land parcels owned by Tekke local residents with legal title. • ***Land ownership & use:*** the land is privately owned and legal titles are held. Grazing occurs on pasture land and private land from May to November. There is almost no irrigation due to insufficient water supply. • ***Settlement livelihood:*** sources of livelihood include agriculture – grain (for selling & household consumption), wheat, vegetables (for household consumption), legumes (for selling & household consumption), wood; animal husbandry - bovine, poultry, ovine, cattle, bee-keeping and seasonal construction. Milk and cheese is produced predominantly for subsistence. 12% of the population is unemployed. • ***Accessibility:*** Roads are old and the quality is poor. • ***Information provision:*** Almost all the population is literate, including women. The best local information tools include television, radio, family, neighbours, imam and the school. • ***Environmental & cultural sites:*** there is a small artificial lake very close to the proposed camp area which birds use during their migration season (spring and autumn). Also, foxes and rabbits are present in the region. • ***Availability & skills:*** none of the inhabitants worked on the natural gas pipeline.	Primary receptor of impacts resulting from construction workers. ***Special site*** Refer to Environmental Impact Tables. ***Skills and services*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	**Preferential employment** opportunities. **Project to liase** with local health authorities BTC Company to look at opportunities to cooperate in providing **health awareness training.** **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities. **Potential positive benefits** to local settlements. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 33 (Map 33C) (KPs 632.0 – 651.4): Imranli Karstic Area, Sivas Province

• ***Infrastructure:*** piped water is supplied to households. The electricity supply is irregular in winter and spring due to birds damaging the electricity lines, there is no alternative source of energy. There is no sewerage system so waste is recycled as fertilizer, burned or hidden. • ***Services:*** each household has a telephone; and there is mobile telephone coverage. There is a five year primary school. Students travel to Zara district for a further three years of education. However, the primary school will be closed in 2002 due to a lack of students. There is regular public transport to Zara district centre. There is no ATM, coffee house, market or library. • ***Settlement problems:*** insufficient roads, unemployment, insufficient electricity supply and insufficient water for irrigation are all problems in this settlement.			

Environmental Impact Table 34 (Maps 34A and 34B) (KPs 651.4 – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Calcixerolls on soils occupying gently sloping and sloping lands. • Loamy-skeletal Shallow (or Micro) Xerochrepts on moderately steep and steep lands. • Typic Xerorthents on some valley bottoms. • Typic Rhodoxeralfs on valley bottom soils that have a reddish colour.	Main potential impacts: • soil erosion; • soil productivity. Other potential impacts include: • sediment yield; • channel alteration; • soil contamination; • waterlogging and compaction (rare).	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Employ equipment mats.	**MODERATE IMPACT** Soil erosion predicted to be visibly active but no rill and gully formation evident. Furthermore, soil productivity losses are predicted to last generally less than one year after construction, but more than three months for arable land and more than 6 months in grazing pasture), but up to 2 years in upland areas with no formal land use.
Landscape and Visual			
The route continues across the flat to lightly undulating, exposed karst plain and has been largely cultivated for non-intensive cereal production, presenting wide vistas of distant mountains. It descends to cross the Acisu River, a wide meandering river with stony riffles and deep pools and sandy river cliffs, where it temporarily diverges from the gas pipeline. It continues west through the hilly and more distinctive terrain north of Kuru Lake, before turning south-west at KP 662 across a rolling landscape of marly soils broken by occasional outcrops of anhydrite. Marl dominates the landscape by giving a whitish cast to surrounding hills. Shallow landslides and their debris scar some slopes. The route descends c. 100m to cross the Tatli River at KP 670 before turning westerly across gypseous hills at about 1400m elevation. Occasional streams every 2 – 3km cross the route, the larger of which are marked by riparian vegetation on their banks. Small settlements occupy flat lands near streams. Grasses occupy most slopes, but many are also bare with their underlying gypsum, marl, or limestone exposed as a whitish cast	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. May be long-term or permanent where difficult to reinstate, or where ecological considerations prevent application of fertiliser. Short-term visual impact on non-marl portions of the route. Visual liabilities of the NGP, which was not reinstated, potentially accrue to the BTC Pipeline where their RoWs lie adjacent or closely parallel.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to	**INDIRECT POSITIVE IMPACT** in areas where the BTC and NGP corridors are reinstated. **MODERATE IMPACT** in the short-term where the corridor overlies thin marl soils, as these are unlikely to reinstate to a high standard. Exposed marl may retain its whitish colour and show as a white line across the landscape. However, existing landscape degradation limits extent of impact and presents opportunities for improvement.

Environmental Impact Table 34 (Maps 34A and 34B) (KPs 651.4 – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
on the landscape. Low-density grazing and rainfed cereals support the local economy.		ensure the integrity of the BTC corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Attempt a high rate of fertilisation using NPK + micro-nutrients in combination with mulch such as coir fibre.	
Surface Waters			
The pipeline route crosses the Acisu River at KP 660.6. River channel is irregular and meandering, with point and mid-channel bars. Cross-section is parabolic at the meander inflection point; bank cutting at meander apex changes cross-section. Width of crossing is 45m and bank-full width is approximately 20m, although floodplain is between 225 and 450m. Bed consists of sand and gravel and the flow is perennial, of a uniform and tranquil type. Bank-side vegetation comprises shrubs and trees and there is no riparian vegetation. Water samples taken 430m downstream of the crossing point indicate that this is a Class IV river.	Direct disturbance to bank and bed morphology through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in already poor water quality. Potential for short and long-term sedimentation and turbidity. Potential impacts on downstream ecology and water abstraction for human use.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any	**INDIRECT POSITIVE IMPACT** where the Acisu River crossing previously disturbed during construction of the NGP is reinstated. **MINOR IMPACTS** only expected, as disturbance will be limited to the immediate working area. Sedimentation of Acisu River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.

Environmental Impact Table 34 (Maps 34A and 34B) (KPs 651.4 – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		additional mitigation measures to ensure the integrity of the BTC corridor at this watercourse crossing impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, for the protection of surface waters, including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench. Assess need for alternative water supply for downstream communities and provide where necessary if sedimentation and turbidity persist for more than 3 days at a community.	
The route crosses Tatli River between KPs 673.7 – 674.0. River channel form, which was re-constructed during construction of the natural gas pipeline, is irregular and meanders with a parabolic cross-section. Pool and riffle bars present, although mid-channel bars are located upstream of crossing point. Width of crossing is 30m and bank-full width is approximately 5m, although the floodplain is between 30 and 150m wide. Upstream width of the natural channel is approximately 10m wide. Bed consists of sand and gravel and the flow is perennial, of a uniform and	Direct disturbance to bank and bed morphology through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality, which is already highly	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix	**INDIRECT POSITIVE IMPACT** where these watercourse crossings previously disturbed during construction of the NGP is reinstated. **MINOR IMPACTS**

Environmental Impact Table 34 (Maps 34A and 34B) (KPs 651.4 – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
tranquil type. Riparian vegetation is fragmentary and disturbed and there is no bank-side vegetation. A bridge is located approximately 1km downstream of the crossing point. Water samples taken 480m downstream of the crossing point indicate that this is a Class IV river. Korkuyu Creek is crossed by the route near KP 670 and is a tributary of the Tatli River. Confluence is c. 3km downstream of crossing point.	polluted in Tatli River. Potential for long-term sedimentation and turbidity downstream of crossing point of both Tatli River and Korkuyu Creek.	C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor at these watercourse crossings impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, for the protection of surface waters, including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench.	Tatli River is a poor quality river (Class IV) and the classification for Korkuyu Creek is unknown. However, only minor impacts are expected, as disturbance will be limited to the immediate working areas for both watercourses. Sedimentation of Tatli River and Korkuyu Creek will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Ecology			
Protected Areas Kuru Lake is a large, shallow, eutrophic lake, (lying c. 1.25km south of the pipeline route), with extensive reedbeds and marsh. This lake is being considered by the Ministry of Environment (MoE) for designation as an Internationally Important Wetland under the Ramsar Convention. At least seven nationally-threatened bird species have been recorded.	See Potential Impacts below. There will be no impact to the integrity of the lake and therefore its proposed protection status.	See Mitigation Measures below.	See Residual Impacts below.

Environmental Impact Table 34 (Maps 34A and 34B) (KPs 651.4 – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Important Ecological Factors ESA 27 continues for c. 2.8km(see Environmental Impact Table 33 and Map 33B for previous description of species). ESA 28 is identified between KP 659.5 and KP 664.4 for two globally-threatened plant species (*Cousinia sivasica* and *Isatis sivasica*) and one nationally-threatened species (*Tchihatchewia isatidea*). In addition, two globally-threatened plants (*Minuartia anatolica var. lanuginosa* and *Aethionema lepidioides*) occur just outside the 500m Corridor parallel to this ESA. The IUCN status for these species are given in Table 5.20, Section 5. Tracks of Eurasian Otter (globally-threatened) were recorded from the banks of the Acisu River near the pipeline crossing point. The protection status for this species is given in Table 5.21, Section 5. Kuru Lake supports at least seven nationally-threatened birds. Totals on 26.05.2001 include - Red-necked Grebe 14, Greylag Goose 10 plus 3 chicks, Garganey 7, Shoveler 8, Pochard 11, Marsh Harrier 3, and Common Crane 2. The protection status for these species are given in Table 5.21, Section 5. The sandy river banks of Acisu River between KP 660.4 to KP 660.7 are an important area for bird species. 2 Black Stork, 1 Marsh Harrier, and 1 Whinchat (all nationally-threatened) were recorded here, with a large sand martin colony. Furthermore, another Whinchat was recorded at each of KP 667.5 and KP 673.0. The protection status for these species are given in Table 5.21, Section 5. BVS-036 will be located at KP 660.9 on cultivated land within ESA28. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to this site of c. 25m in length.	Destruction of plain steppe and habitats peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Minor temporary disturbances are expected to a globally-threatened mammal during seasonal sensitivities (see EMMP, Appendix C1): • breeding season for the Eurasian Otter is year round in Turkey, with a tendency towards the spring period in cooler regions. While the Kuru Lake is distant enough from the Pipeline for construction not to cause undue disturbance, disturbance could arise if pipe dumps, contractor's yards or camps are located in this area. Disturbance from construction personnel walking or driving around the lake would also be detrimental. Potential for direct disturbance to nationally-threatened birds	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 28. Diligence will be exercised in searching inside the corridor for those species known to occur just outside of the corridor. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly. • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during reinstatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 28	**MODERATE IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACT** at most to the Eurasian Otter during the construction period where the specified mitigation measures are applied for the seasonal sensitivities identified. **MINOR IMPACTS** at most at Kuru Lake based on avoidance and where the specified mitigation measures are applied. **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. This is particularly critical for the sand martin colony, which occupies the Acisu River banks between March and September, although preconstruction surveys will

Environmental Impact Table 34 (Maps 34A and 34B) (KPs 651.4 – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods. The sand martin colony likely to be occupied from March to September. Permanent loss of 350m2 of habitat during construction of BVS-036 within ESA 28.	sparingly or not at all in ESA 28 despite this being mostly cultivated land. Preconstruction surveys of the RoW in the vicinity of river crossings will aim to identify the location and extent of otter holts within the vicinity (250m) of intended river crossings. If discovered these may be cleared in the late summer months under the close supervision of an ecologist approved by BOTAŞ. Preconstruction survey to establish location of sand martin colony in relation to Acisu River crossing; if within 100m of the centre line of works, construction will be undertaken between October and March. The sand martin colony and areas of reeds and dense vegetation will be placed out of bounds for construction workers. In addition, the clearance of riverside reedbeds and other dense vegetation in advance of the construction of the Acisu River crossing to be undertaken outside the April – July period for the Marsh Harrier.	confirm the presence of this species at the pipeline crossing point of the Acisu River. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April for all bird species except for the sand martin, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACT** Based on the mitigation measures described, the small area of habitat affected and the temporary nature of construction activities, it is predicted that only minor impacts on the biological environment will occur as a result of construction activities at BVS-036. This assessment will be confirmed by the site-specific survey prior to construction.

Environmental Impact Table 34 (Maps 34A and 34B) (KPs 651.4 – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		The presence of the Black Stork between April and July probably indicates that breeding is occurring. If this is confirmed by preconstruction surveys during this period, the location of nest sites within 100m of the RoW will be determined and construction within 500m of the nest site will be avoided between April and July. Shrubs and dense vegetation along the RoW will be cleared outside the breeding season for the Whinchat (April to July). Prior to construction of BVS-036, a site specific survey will be undertaken by an ecological specialist to identify and locate threatened species at the site and at any surrounding areas potentially affected by construction activities. Based on the findings of this survey, appropriate mitigation will be determined. The area of sensitive habitat in ESA 28 affected by construction activities will be minimised to the minimum necessary for safe working.	
Noise			
Topcu Yenikoy settlement is located c. 161m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Topcu Yenikoy settlement during soil	The following mitigation measures will be applied:	**MINOR IMPACT** Short-term noise impacts are expected to occur during soil

Environmental Impact Table 34 (Maps 34A and 34B) (KPs 651.4 – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	stripping and welding and lowering activities.	• use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	stripping and welding/lowering activities. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days.
Archaeology and Cultural Heritage			
(i) Topcuyenikoy Mound - 1st Degree; (ii) Karapinar Mounds - 1st Degree; (iii) Kaletepe - 1st Degree			

|Social Impact Table 34 (Map 34C) (KPs 651. – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

MAP 34: PROJECT INFORMATION			
There are no pump stations or construction camps in the area. There is one block valve station.			
MAP 34: MAP HIGHLIGHTS			
• Two rivers and one creek bisect the pipeline. • Access roads link some settlements. • A potential RAMSAR site (Kuru Lake) is located 1.7km south of pipeline. • Kalatepe Hill is a first degree archaeological site. • Main land uses are pasture and rain fed agriculture.			
MAP 34: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted:*** five settlements will be directly impacted by the pipeline project. Two settlements will have land intersected by the proposed pipeline (Topcuyenikoy, Bakimli); three (Hoplamaz, Kalatepe and Topcu Yenikoy) are within 500m of the pipeline route (D). None are within 5km of a construction camp or pump station. One (Topcyenikoy) is within 2km of the block valve station (B). Settlements impacted by traffic have not yet been identified. Topcu Yenikoy is downstream of the Acisu River crossing (R). • ***Surveyed:*** two settlements (Bakili and Topcu Yenikoy) were surveyed by telephone (T). • ***Not surveyed:*** Ahmetcavus Mah (1.95km from the pipeline), Desturoglu (1.6km from the pipeline), Hoplamaz (700m from the pipeline), Kalatepe (very close to pipeline, on the Tafli River).			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Topcu Yenikoy (L) (D) (B) (R) (T)			
• ***Demographics:*** 130 inhabitants reside in the settlement, with seasonal migration of 50%. • ***Safety****:* the settlement is situated 400m from the pipeline, the nearest house is 75m from the pipeline. • ***Project attitude:*** attitudes towards the project are mixed and inhabitants are concerned their land will be damaged. • ***Land ownership & use:*** share cropping is the predominant land use (90% of inhabitants). Few inhabitants have legal ownership of land. No animal grazing occurs but irrigation does take place. • ***Settlement livelihood:*** agriculture, bee keeping (3 households produce honey as one of a number of income sources), hunting,	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

|Social Impact Table 34 (Map 34C) (KPs 651. – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

construction and local government provide sources of livelihood. • ***Availability & skills:*** inhabitants have previous experience of the Iran-Ankara natural gas project. • ***Accessibility:*** the settlement is 22km from Hafik district centre. The settlement is accessible all year. • ***Information provision:*** 80% of the population is literate. • ***Infrastructure:*** piped water is supplied to households and a fountain in the settlement provides an alternative water source. • ***Settlement problems:*** problems include inadequate access to water, low incomes and unemployment.		settlement is within 500 m of construction work.	
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Land Potential complications in	**See Overview of Land Acquisition Process in**	**See Overview of Land Acquisition Process in**

|Social Impact Table 34 (Map 34C) (KPs 651. – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

	expropriation process.	**Appendix C9.**	**Appendix C9.**
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**Significance cannot be established at this time**
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be

|Social Impact Table 34 (Map 34C) (KPs 651. – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility of recruitment*** Decreased access to recruitment process ***Block Valve Station*** See Environmental Impact Tables and Overview of Land Acquisition Process in Appendix C9.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. . Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum **No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Bakimli (L) **(T)**			
• ***Demographics:*** there are 80 inhabitants with seasonal migration of 35%. • ***Safety****:* the settlement is situated 2.2 km south of the pipeline. • ***Project attitude:*** the attitude towards the pipeline is generally positive and there are no major concerns. • ***Land ownership & use:*** 60% of land is privately owned by the inhabitants. Due to this significant communal land usage there are few title deeds in place. Seasonal grazing occurs and irrigation is undertaken, however this irrigation is quite poor.	***Land*** Potential complications in expropriation process.	**See Overview of Land Acquisition Process in Appendix C9.** ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working	**See Overview of Land Acquisition Process in Appendix C9.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

|Social Impact Table 34 (Map 34C) (KPs 651. – 675.0): Imranli Karst Area (North of Kuru Lake), Sivas Province

• ***Settlement livelihood:*** agriculture and local government are the main sources of livelihood for the inhabitants of this settlement. • ***Availability & skills:*** inhabitants have previous experience of the Iran-Ankara natural gas project. • ***Accessibility:*** he settlement is 17.5km from the district centre. Accessibility is poor from December to February. • ***Information provision:*** 99% of the population is literate. • ***Environmental & cultural sites:*** a nearby castle is of cultural significance. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular with frequent water cuts. A settlement fountain provides an alternative water supply. • ***Settlement problems:*** infrastructure problems, poor roads and poor irrigation are amongst the problems facing the settlement.		width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	
	Construction hazards: animals Trench poses safety hazard for livestock	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport need to be **taken into account** in the recruitment strategy.	**No residual impact expected**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Environmental Impact Table 35 (Maps 35A and 35B) (KPs 675.0 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Loamy-skeletal Shallow (or Micro) Xerochrepts on moderately steep and steep lands. • Mesic Calcixerolls on lands occupying some valley bottoms and nearby slopes. • Typic Xerorthents on other valley bottoms. • Typic Rhodoxeralfs on valley bottom soils that have a reddish colour.	Main potential impacts: • soil erosion; • soil productivity; • sediment yield; • channel alteration.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MODERATE IMPACT** Soil erosion predicted to be visibly active but no rill and gully formation evident. Furthermore, soil productivity losses are predicted to last generally less than one year after construction, but more than three months for arable land and more than 6 months in grazing pasture), but up to 2 years in upland areas with no formal land use.
Landscape and Visual			
The route crosses the Tuzla Creek, another river scarred severely by the NGP. From here to Sivritepe settlement the route crosses the familiar rugged karst land with its rocky outcrops, intermittent degraded steppe grasslands and low grade cereal cultivation. Landscape sensitivity is generally low. Occasional streams every 2 – 3km cross the route, the larger of which are marked by lush riparian vegetation. Small settlements occupy flat lands near the streams. Grasses occupy most slopes, but many are also bare with their underlying gypsum, marl, or limestone exposed as a whitish cast on the landscape. Low-density grazing and rainfed cereals support the local economy. Irrigated farmland occurs near the settlement of Akpinar and by the Karasu River crossing.	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. May be long-term or permanent where difficult to re-instate, or where ecological considerations prevent application of fertiliser. Short-term visual impact on non-marl portions of the route. Visual liabilities of the NGP potentially accrue to the BTC Pipeline where their two RoWs lie adjacent or closely parallel.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC	**INDIRECT POSITIVE IMPACT** in areas where the BTC and NGP corridors are reinstated. **MINOR IMPACTS** in the short-term where the corridor overlies thin marl soils, as these are unlikely to reinstate to a high standard. Exposed marl may retain its whitish colour and show as a white line across the landscape. However, the flat landscape with potential upland viewpoints several kilometres away, presents limited viewing opportunity and, with the

Environmental Impact Table 35 (Maps 35A and 35B) (KPs 675.0 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Attempt a high rate of fertilisation using NPK + micro-nutrients in combination with mulch such as coir fibre. Extensive reinstatement of riparian scrub will be necessary at the Tuzla Creek crossing.	existing landscape degradation limits the extent of impact to minor.
Surface Waters			
The route crosses Tuzla River between KPs 676 – 678.0). The river channel has been severely damaged by construction of the NGP. BVS-037 will be located at KP 678.0 and c. 90m from Tuzla River. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site, c. 75m in length. Islim River is crossed by the route at KP 690.1.	Disturbance, directly through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Potential for short-term sedimentation and turbidity (if flowing) downstream of the NGP crossing.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to	**INDIRECT POSITIVE IMPACT** where these watercourse crossings previously disturbed during construction of the NGP is reinstated. **MINOR IMPACTS** Although the water quality classifications for the two watercourses are unknown, only minor impacts are expected during both pipeline

Environmental Impact Table 35 (Maps 35A and 35B) (KPs 675.0 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor at these watercourse crossings impacted by the presence and proximity of the NGP. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, to avoid sedimentation and turbidity at these crossing points, including sediment filters/trapping devices, settling ponds and trench de-watering.	and BVS construction, as disturbance will be limited to the immediate working area. Sedimentation of Tuzla River and Islim River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Ecology			
Important Ecological Factors ESAs 29-32 are identified for the following globally-threatened plant species: • *Alyssum caespitosum* and *Galium cornigerum* within ESA 29 (between KP 679.2 and KP 680.5); • *Minuartia anatolica var. lanuginosa* within ESA 30 (between KP 685.6 and KP 686.2); • *Cousinia sivasica* within ESA 31 (between KP 688.7 and KP 689.2); • *Cousinia sivasica* within ESA 32 (between KP 693.0 and KP 693.4). In addition, one globally-threatened plant (*Minuartia rimarum var. multiflora*) occurs just outside the corridor north of ESA 29. The IUCN status for these	Habitat destruction of plain steppe and habitats peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 29-32. Diligence will be exercised in searching inside the corridor for those species known to occur just outside of the corridor at ESA 29. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals	**MODERATE IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for

Environmental Impact Table 35 (Maps 35A and 35B) (KPs 675.0 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
occurs just outside the corridor north of ESA 29. The IUCN status for these species are given in Table 5.20, Section 5. At KP 690.9 near the Islim River, 1 Black Stork, 1 Common Crane and 1 Whinchat (all nationally-threatened) were recorded. 1 Whinchat was recorded at both KPs 678.7 and the Islim River crossing (KP 690.1) and 2 at KP 685.1. The protection status for these species are given in Table 5.21, Section 5.	if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during reinstatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESAs 29-32. The presence of the Black Stork between April and July, probably indicates that breeding is occurring. If this is confirmed by preconstruction surveys during this period, the location of nest sites within 100m of the RoW will be determined and construction within 500m of the nest site will be avoided between April and July.	breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Environmental Impact Table 35 (Maps 35A and 35B) (KPs 675.0 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Shrubs and dense vegetation along the RoW will be cleared outside the breeding season for the Whinchat (April to July). Clearance of riverside vegetation at Islim River will be avoided between April and July for the Common Crane.	
Noise			
Akpinar settlement in Hafik District is located c. 173m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Akpinar settlement during soil stripping and welding and lowering activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for	**MINOR IMPACT** Short-term noise impacts are expected to occur at Akpinar during soil stripping activities. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days.

Environmental Impact Table 35 (Maps 35A and 35B) (KPs 675.0 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	
Archaeology and Cultural Heritage			
Akpinartepe Mound (1st Degree Site*) is located within the 100m Corridor and lies c. 50m from the route at KP 682.0. * This site has not yet been registered by the MoC and is provisionally assigned this classification.	Indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	This site will be fenced throughout the construction period. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Assuming Akpinartepe Mound is fenced, impacts will be limited to the temporary disturbance of the site setting and peripheral features.

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

MAP 35: PROJECT INFORMATION			
There are no pump stations or construction camps in the area. There is a block valve station.			
MAP 35: MAP HIGHLIGHTS			
• Pipeline crosses two rivers and one creek. • Passes by archaeological sites, Yugtepe Mound and Akpinartepe Mound. • Access roads link many of the settlements in the area. • Main land uses are pasture, irrigated agriculture and rain-fed agriculture.			
MAP 35: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted:*** seven settlements on this map will be directly impacted by the pipeline project (Golcuk, Celalli, Alcioren, Akpinar, Karayun, Tahtakement, Yavu). They will all have land intersected by the proposed pipeline (L). One of these (Akpinar) is also within 500m of the pipeline route (D). None are within 5km of a construction camp or pump station. Two (Golcuk and Celalli) are within 2km of the block valve station (B). Settlements impacted by traffic have not yet been identified. No settlements are downstream of a pipeline river crossing (R). • ***Surveyed:*** two settlements (Celalli, Karayun) were surveyed (S) in the field and five settlements were surveyed by telephone (T). • ***Not surveyed:*** Acipinar (2.8km from the pipeline). • ***Not on map:*** Alcioren			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Golcuk (L) (B) (T)			
• ***Demographics:*** there are 30 inhabitants with seasonal migration of 60%. • ***Safety:*** the settlement is situated 2.6km north of the pipeline. The nearest house is 2.4km from the pipeline. • ***Project attitude:*** according to the Muhtar the inhabitants are generally positive towards the project and have no major concerns. • ***Land ownership & use:*** 90% of land is leased by inhabitants. It is assumed that few land title deeds are held. No seasonal grazing or irrigation takes place. • ***Settlement livelihood:*** agriculture, hunting, transport and local government are all sources of livelihood.	***Land*** Potential complications in expropriation process. ***Hunting*** Temporary reduction in game due to disturbance during construction.	**See Overview of Land Acquisition Process in Appendix C9.** Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than	**See Overview of Land Acquisition Process in Appendix C9.** **Significance cannot be established at this time**

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

• ***Availability & skills:*** inhabitants have previous experience of the Iran-Ankara natural gas project. • ***Accessibility:*** it is 16 km to Hafik, the district centre. The settlement is accessible all year round. • ***Information provision:*** Turkish is the main. 99% of the population is literate. • ***Infrastructure:*** piped water is supplied to households. • ***Settlement problems:*** low incomes, debt and inadequate childcare are all problems in the settlement.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility to recruitment*** Decreased access to recruitment process	recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. . Winter road closures, seasonal migration and poor transport will be taken into account in the recruitment strategy.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Celalli (L) (S)			
• ***Demographics:*** there are 180 inhabitants within 40 households. Seasonal migration occurs. • ***Safety****:* the settlement is situated 2.2km from the pipeline. • ***Health:*** the sewerage system is poor, leading to health problems. Dumping of garbage into the river has led to contamination. • ***Project attitude:*** the attitude is generally positive as inhabitants believe it will benefit Turkey. However, the inhabitants experienced problems during the construction of the natural gas pipeline, including	***Land*** Potential complications in expropriation process. ***Construction hazards: animals***	**See Overview of Land Acquisition Process in Appendix C9.** **Livestock crossings** will be established at locations	**See Overview of Land Acquisition Process in Appendix C9.** **Potential for accidents involving livestock.**

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

lack of payment or low payments for expropriated land that are still unresolved. • ***Land ownership & use:*** 50% of land is communally owned and 30% is privately owned by inhabitants. Land owners do not possess title deeds (only right of possession) for their land. Seasonal grazing occurs but there is no irrigation. • ***Settlement livelihood:*** animal husbandry activities (cattle, sheep, goats & poultry) satisfy the daily requirements of the households in the settlement. Scarcity of agricultural land means that the dry agriculture activities undertaken are not able to sustain the population. Bee keeping is also undertaken. • ***Availability & skills:*** available skills include heavy vehicle drivers, drivers and welders. 18% of the population would accept a temporary job working on the pipeline construction. • ***Accessibility:*** it is 20km to Hafik district centre. There is good year round accessibility as the road is asphalted. • ***Information provision:*** 95% of the population is literate. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular with regular water cuts. There is no alternative water source. There is an electricity supply, but no sewerage or waste disposal systems. • ***Services:*** there is no primary school as there are insufficient students, instead children travel to the district centre of Hafik. There is a health care centre, a small market, gendarmerie station and an agricultural credit cooperative in the settlement. • ***Settlement problems:*** there is a lack of water, low incomes, out-migration and poor sewerage. It is a relatively poor settlement.	Trench poses safety hazard for livestock ***Health*** Potential health impacts on construction workers. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials ***Accessibility to recruitment*** Decreased access to recruitment process ***Negative experience*** Possible **opposition** to project and **increased sensitivity** to any negative impacts.	agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Information is highlighted to Contractor** so that they can ensure that their workers are protected. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during	Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No residual impact.** **Potential positive benefits** to local settlements. **No residual impact expected** Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

		construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings.**	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Alcioren (L) (T)			
• ***Demographics:*** there are 158 inhabitants, with seasonal migration of 14%. • ***Safety****:* the settlement centre is situated 3.1km from the pipeline, the nearest house is 3km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the project and have no major concerns. • ***Land ownership & use:*** 70% of land is communally owned, seasonal grazing occurs but there is no irrigation. • ***Settlement livelihood:*** sources of livelihood include agriculture, bee keeping (one household produces honey as one of a number of sources), hunting, trade and local government. • ***Accessibility:*** the settlement is 10km from the district centre and is accessible all year. • ***Information provision:*** 90% of the population is literate. • ***Environmental & cultural sites:*** the nearby plateau and caves are of environmental significance. • ***Infrastructure:*** piped water is supplied to households. • ***Services:*** there is no primary school. • ***Settlement problems:*** problems include low incomes, poor irrigation and unemployment.	***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

		construction.	
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**Significance cannot be established at this time**
	Land Potential complications in expropriation process.	**See Overview of Land Acquisition Process in Appendix C9.**	**See Overview of Land Acquisition Process in Appendix C9.**
	Accessibility of information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

	Accessibility of recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	compensated. **No residual impact expected.**
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Akpinar (L) (D) (T)			
• ***Demographics:*** 198 inhabitants reside in the settlement. • ***Safety****:* the settlement is situated 450m from the pipeline, the nearest house is 75m from the pipeline. • ***Project attitude:*** attitudes are mixed, inhabitants are concerned that their lands will be damaged. • ***Land ownership & use:*** 77% of land is privately owned. Irrigation is undertaken but there is no grazing. • ***Settlement livelihood:*** activities include agriculture, bee keeping (four households produce honey as one of a number of income sources), trade and local government. • ***Accessibility:*** it is 36km to Sivas district centre. The settlement is accessible all year. • ***Information provision:*** 95% of the population is literate. • ***Environmental & cultural sites:*** there is a nearby mausoleum.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison**	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from awareness raising. **Any additional damage will**

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

• ***Infrastructure:*** piped water is supplied to households however supply is irregular with frequent water cuts. A local spring provides an alternative water source. • ***Settlement problems:*** problems include low incomes, inadequate access to water and unemployment.	compensated for may be affected if mitigation measures not fully implemented.	**meetings** held during and immediately following construction will identify any additional land that has been affected.	**be compensated for.**
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations	Contractor will **consult** with authorities to determine maximum acceptable time	**If irrigation water is disrupted** longer than time considered acceptable by

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

	of flow from spills or increase in sedimentation. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	for disruption. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Karayun (L) (S)			
• ***Demographics:*** there are 350 inhabitants within 80 households. • ***Safety****:* the settlement is situated 1.5km north of the pipeline, the nearest house is 1km from the pipeline. • ***Health:*** the sewerage system is poor. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the project. • ***Land ownership & use:*** 50% of land is privately owned by the inhabitants with another 20% leased by the inhabitants. Inhabitants are concerned over how ownership rights of communal land will be dealt with. Irrigation activities are undertaken and grazing occurs. • ***Settlement livelihood:*** agriculture (grain, sugar beet, timber, fruit trees), bee keeping, animal husbandry (cattle & poultry), construction and transport are all sources of livelihood. • ***Availability & skills:*** heavy vehicle drivers, food service, mechanics, tree fellers, drivers, welder and type setting are all available. 55% of the population would accept temporary work on the pipeline construction.	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fences** will be erected in areas of danger for livestock. **See Overview of Land Acquisition Process in Appendix C9.** Contractor will **consult** with authorities to determine maximum acceptable time	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of Land Acquisition Process in Appendix C9.** **If irrigation water is disrupted** longer than time considered acceptable by

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

construction. • ***Accessibility:*** it is 29km to Sivas district centre. • ***Information provision:*** 90% of the population is literate. • ***Infrastructure:*** piped water is supplied to households. There is an electricity supply but no sewerage or waste disposal systems. • ***Services:*** there is a primary school and a midwife in the settlement, a coffee house, market and police. • ***Settlement problems:*** unemployment, low incomes, immigration and poor sewerage system are all problems for this settlement.	disruption. Contaminations of flow from spills or increase in sedimentation. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	for disruption. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Potential positive benefits** to local settlements. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Tahtakement (L) (D) (T)			
• ***Demographics:*** there are 80 inhabitants with seasonal migration of 36%. • ***Safety****:* the settlement is situated 600m from the pipeline and the nearest house is 500m from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the pipeline, there are no major concerns.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

• ***Land ownership & use:*** 50% of land is privately owned by inhabitants, 50% is communally owned. Irrigation activities are undertaken and there is no grazing. • ***Settlement livelihood:*** agriculture, bee keeping (five households produce honey as one of a number of income sources), commercial fishing, fishing, hunting, trade and local government are all sources of livelihood. • ***Accessibility:*** it is 28km to Sivas district centre. The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. • ***Environmental & cultural sites:*** a nearby plateau and lake are of environmental significance. • ***Water infrastructure:*** piped water is supplied to households, however the supply is irregular with frequent water cuts. A local spring provides an alternative water source. • ***Settlement problems:*** problems include poor roads, low incomes and inadequate access to water.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Land*** Potential complications in expropriation process. ***Fishing*** Potential reduction in fisheries yield or damage to	include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **See Overview of Land Acquisition Process in Appendix C9.** **Fisheries mitigation measures** including: verification of fisheries, fish	**Any additional damage will be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of Land Acquisition Process in Appendix C9.** **No significant impacts** if there is compensation for any reduction in yields, and if

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

	fisheries habitats within 2 km downstream of a river crossing.	characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	habitat restoration measures are implemented in full. The level of compensation will be facilitated by the Projects complaints procedure.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. Winter road closures, seasonal migration and poor	**Significance cannot be established at this time** **No residual impact**

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

	Accessibility to recruitment Decreased access to recruitment process.	transport will be **taken into account** in the recruitment strategy. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**expected** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yavu (L) **(T)**			
• ***Demographics:*** there are 85 inhabitants with seasonal migration of 35%. • ***Safety****:* the settlement is situated 800m from the pipeline. The nearest house is 700m.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison**	**Continued attention** to mitigation measures will be critical to prevent injury.

Social Impact Table 35 (Map 35C) (KPs 675 – 696.4): Imranli Karst Area to North-West of Yavu Settlement, Sivas Province

• ***Project attitude:*** the attitude towards the project is generally positive and there are no major concerns. • ***Land ownership & use:*** 50% of land is privately owned by inhabitants and 50% is communally owned. Irrigation is undertaken and there is no livestock grazing. • ***Settlement livelihood:*** agriculture and local government are the main sources of livelihood. • ***Accessibility:*** it is 29km to Sivas district centre. The settlement has poor accessibility from December to February. • ***Information provision:*** 80% of the population is literate. • ***Environmental & cultural sites:*** there is a nearby park. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular with frequent water cuts. The settlement fountain provides an alternative water source. • ***Settlement problems:*** poor irrigation, poor roads and inadequate access to water are the main problems in the settlement.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Land*** Potential complications in expropriation process. ***Accessibility to recruitment*** Decreased access to recruitment process	**meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **See Overview of Land Acquisition Process in Appendix C9.** ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **See Overview of Land Acquisition Process in Appendix C9.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **No residual impact expected**

Environmental Impact Table 36 (Maps 36A and 36B) (KPs 696.4 – 713.3): North-East of Sivritepe Settlement to West of Kanligolet (Uctepe) Irrigation Pond, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Typic Calcixerolls on most plains surfaces. • Mesic Clayey-skeletal Shallow Xerochrepts on plateau scarps. • Minor inclusions of Rhodoxeralfs on some plains locations.	Main potential impacts: • soil erosion; • sediment yield; • soil productivity; • channel alteration; • soil contamination.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings	**MODERATE IMPACT** Soil erosion predicted to be visibly active but no rill and gully formation evident. Furthermore, soil productivity losses are predicted to last generally less than one year after construction, but more than three months for arable land and more than 6 months in grazing pasture), but up to 2 years in upland areas with no formal land use.
Landscape and Visual			
The route diverges from the NGP at KP 690. At Sivritepe settlement, the route turns sharply south and crosses the Tatli River, a broad, stony-bedded river in a wide floodplain used predominantly for agriculture but with scattered groups of mature trees. Continuing south past KP 695 it crosses flat or slightly rolling terrain, still on gypseous soils, which are used for non-intensive cereal production, except as it crosses the valleys of the Aci River and Kanli Creek where irrigated cropland occurs. Landscape sensitivity is low. BVS-038 and BVS-039 will be located at KP 702.3 and KP 713.7 on cultivated land. Approximately 350m^2 of permanent landtake required for each station. A new access road will be constructed of c. 35m in length to each site.	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. May be long-term or permanent where difficult to re-instate, or where ecological considerations prevent application of fertiliser. Short-term visual impact on non-marl portions of the route. Visual liabilities of the NGP, which was not reinstated, are potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel.	It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. A two-phase approach to reinstatement in the vicinity of the NGP will be adopted (see the RP, Appendix C2). Phase 1 will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems; and Phase 2 will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC	**INDIRECT POSITIVE IMPACT** in areas where the BTC and NGP corridors are reinstated. **MINOR IMPACT** in the short-term where the corridor overlies thin marl soils, as these are unlikely to reinstate to a high standard. Exposed marl may retain its whitish colour and show as a white line across the landscape. However, as the landscape is not considered sensitive, the overall impact is minor.

Environmental Impact Table 36 (Maps 36A and 36B) (KPs 696.4 – 713.3): North-East of Sivritepe Settlement to West of Kanligolet (Uctepe) Irrigation Pond, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	corridor in this section of the route impacted by the presence and proximity of the NGP. In particular, specific reinstatement measures will be required on adjacent agricultural land, for example in areas of poor topsoil management. Responsibilities between the NGP and BTC Contractors are described in the RP (Appendix C2). Attempt a high rate of fertilisation using NPK + micro-nutrients in combination with mulch such as coir fibre.	
Surface Waters			
The route crosses Tatli River for the second time on this map. River channel is irregular and meanders with a parabolic cross-section. Crossing point is at the meander inflection point. Alternating bars are present. Bank-full width is approximately 40m, although the floodplain width is between 1 and 5 river widths. Bed consists of gravel and cobbles and the flow is intermittent, of a uniform and tranquil type. There is no riparian vegetation and bank-side vegetation comprises bunch grass and shrubs. Uctepe and Kukkuk settlements lie c. 2.5km and 4km downstream of crossing point, respectively.	Direct disturbance through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in already poor water quality. Potential for short-term sedimentation and turbidity (if flowing). Potential impacts on downstream ecology and water abstracted from Tatli River for human use.	Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, for the protection of surface waters, Including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench. Assess need for alternative water supply for downstream communities, such as Uctepe and Kulluk settlements, and provide where necessary if sedimentation and turbidity persist for more than 3 days at the community.	**MINOR IMPACT** Although the water quality classification for Tatli River is unknown, only minor impacts are expected during pipeline construction, as disturbance will be limited to the immediate working area. Sedimentation of Tatli River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.

Environmental Impact Table 36 (Maps 36A and 36B) (KPs 696.4 – 713.3): North-East of Sivritepe Settlement to West of Kanligolet (Uctepe) Irrigation Pond, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Noise			
Sivritepe settlement in Central District is located c. 138m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Sivritepe settlement during soil stripping and welding and lowering activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	**MINOR IMPACT** Short-term noise impacts are expected to occur during soil stripping activities. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days.
Archaeology and Cultural Heritage			
Sivritepe 2 (3rd Degree Site*) – flat settlement located within the 100m	Eastern parts of the mound	This site will be fenced throughout	**MINOR IMPACT**

Environmental Impact Table 36 (Maps 36A and 36B) (KPs 696.4 – 713.3): North-East of Sivritepe Settlement to West of Kanligolet (Uctepe) Irrigation Pond, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Corridor. No architectural remains are visible on the surface. * This site has not yet been registered by the MoC and is provisionally assigned this classification. Sivritepe 2 has been proposed for registration by the regional preservation council The following have been proposed for registration by the regional preservation council: (i) Sivritepe Graveyard; (ii) Bestepeler Village cemetery	are located within the 100m Corridor and may suffer indirect impacts from construction activities that will affect the visual/historical setting of the site.	the construction period. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	Assuming Sivritepe 2 is fenced, impacts will be limited to the temporary disturbance of the site setting and peripheral features.

Social Impact Table 36 (Map 36C) (KPs 696.4 – 713.3): North-East of Sivritepe Settlement to West of Kanligolet (Uctepe) Irrigation Pond, Sivas Province

MAP 36: PROJECT INFORMATION			
There are no pump stations or construction camps in area. There is one block valve station.			
MAP 36: MAP HIGHLIGHTS			
• Several rivers with downstream settlements bisect pipeline. • Two large irrigation ponds are located in the area, upstream of the pipeline. • Local access roads link settlements. • Main land uses include rain fed agriculture and irrigated agriculture, with a small amount of pasture.			
MAP 36: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted:*** four settlements on this map will be directly impacted by the pipeline project (Sivritepe, Uctepe, Harmancik, Bestepe). They will all have land intersected by the proposed pipeline (L). (Sivritepe and Bestepe) are within 500m of the pipeline route (D). Sivritepe is also within 2km of the block valve station (B). None are within 5km of a construction camp or pump station. Settlements impacted by traffic have not yet been identified. One settlement is downstream of a river crossing (Kulluk) (R). • ***Surveyed:*** one settlement (Sivritepe) was surveyed in the field and two were surveyed by telephone (T). • ***Disclosure Meeting Location***: Bestepe			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Sivritepe (L) (D) (B) (S)			
• ***Demographics:*** 230 inhabitants with 48 households. • ***Safety****:* the settlement is situated 400m from the pipeline, the nearest house is 100m from the pipeline. • ***Project attitude:*** attitudes are positive. 36% of the population have expectations of direct employment opportunities. • ***Land ownership:*** 50% of the land is privately owned by inhabitants. In addition, 25% is leased by inhabitants, and 25% is communal grazing. There is no irrigation. • ***Settlement livelihood:*** sources of livelihood include agriculture, transport and animal husbandry (cattle and horses). • ***Availability & skills:*** drivers, food service and welders are available. 64% of the population would accept temporary employment on the	***Construction hazards : human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 36 (Map 36C) (KPs 696.4 – 713.3):
North-East of Sivritepe Settlement to West of Kanligolet (Uctepe) Irrigation Pond, Sivas Province

64% of the population would accept temporary employment on the pipeline construction. • ***Accessibility:*** it is 24km to Sivas district centre. The road is low quality asphalt, partly gravel, and is often inaccessible in December and January. • ***Literacy:*** 80% of the population is literate. • ***Water sources:*** piped water is supplied to households, however, supply is irregular with frequent water cuts. There is no alternative water source. • ***Services:*** there is an electricity supply, but no sewerage or waste disposal system. There is also a primary school, and access to a travelling health team. • ***Settlement problems:*** problems include unemployment, low incomes and transport difficulties.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards; animals*** Trench poses safety hazard for livestock ***Accessibility to recruitment*** Decreased access to recruitment process	construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Harmancik (L) (T)			
• ***Demographics:*** there are 169 inhabitants, with seasonal migration of 45%. • ***Safety****:* the settlement is situated 1km from the pipeline, the nearest house is 400m from the pipeline. • ***Project attitude:*** attitudes are mixed, the inhabitants are unsure about land costs, they feel that lands will be damaged and do not believe expropriation will be adequate.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 36 (Map 36C) (KPs 696.4 – 713.3):
North-East of Sivritepe Settlement to West of Kanligolet (Uctepe) Irrigation Pond, Sivas Province

• ***Land ownership & use:*** the primary landownership is communal (50%). Irrigation is undertaken. • ***Settlement livelihood:*** livelihoods include agriculture and local government. • ***Accessibility:*** it is 29km to Sivas district centre. The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. • ***Environmental & cultural sites:*** there is a nearby castle. • ***Infrastructure:*** piped water is supplied to households. • ***Settlement problems:*** infrastructure problems and low income are problems.		**Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Land Potential complications in expropriation process.	**See Overview of Land Acquisition Process in Appendix C9.**	**See Overview of Land Acquisition Process in Appendix C9.**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**

Social Impact Table 36 (Map 36C) (KPs 696.4 – 713.3):
North-East of Sivritepe Settlement to West of Kanligolet (Uctepe) Irrigation Pond, Sivas Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Bestepe (L) (D) (T)			
• ***Demographics:*** there are 300 inhabitants with seasonal migration of 60%. • ***Safety:*** the settlement centre is situated 800m from the pipeline, the nearest house is 600m from the pipeline. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive and have no major concerns. • ***Land ownership & use:*** the primary landownership is communal (60%). It is assumed that there is a low percentage of title deeds. There is no seasonal grazing or irrigation undertaken. • ***Settlement livelihood:*** livelihoods include agriculture and local government. • ***Accessibility:*** it is 29km to the district centre. The settlement is accessible all year round. • ***Information provision:*** 90% of the population is literate. • ***Environmental & cultural sites:*** there is a castle in the area. • ***Water infrastructure:*** piped water is supplied to households, however, the supply is irregular with frequent water cuts. There is also a common depot that provides an alternative water source. • ***Settlement problems:*** the roads are poor, there is inadequate access to water and there are infrastructure problems.	***Land*** Potential complications in expropriation process. ***Accessibility to recruitment*** Decreased access to recruitment process	**See Overview of Land Acquisition Process in Appendix C9.** Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**See Overview of Land Acquisition Process in Appendix C9.** **No residual impact expected**

Environmental Impact Table 37 (Maps 37A and 37B) (KPs 713.3 – 733.9): Tutmac Proposed Irrigation Pond to Alacorak and Ulas Lakes, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soils types from the previous section continue in this section of the route: • Mesic Typic Calcixerolls on most plains surfaces. • Mesic Clayey-skeletal Shallow Xerochrepts on plateau scarps. • Minor inclusions of Rhodoxeralfs on some plains locations.	Main potential impacts: • soil erosion; • sediment yield; • soil productivity. Other potential impacts include: • channel alteration; • soil contamination.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MODERATE IMPACT** Soil erosion predicted to be visibly active but no rill and gully formation evident. Furthermore, soil productivity losses are predicted to last generally less than one year after construction, but more than three months for arable land and more than 6 months in grazing pasture), but up to 2 years in upland areas with no formal land use.
Landscape and Visual			
The route crosses flat or slightly rolling upland stepped plateau, still on gypseous soils, which are used for non-intensive cereal production. North of Ulas, the flat landscapes are interrupted by a series of rocky ridges rising sharply from the plain like dragons' backs, and closer to the town the route passes between a number of shallow gypseous lakes, fringed with reedbeds and trees. Landscape is generally unremarkable. While the ridges themselves are spectacular, the agricultural surroundings and electricity lines detract considerably from the scene. Similarly, while some of the lakes are attractive, those closest to the route are not – being seasonal and suffering from degradation associated with the urban fringe of Ulas. South of Ulas, the route crosses a gently-rising area of intensive but non-irrigated arable land. At KP 722, a single, 100m high scarp separates two levels of plateaux.	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. May be long-term or permanent where difficult to re-instate, or where ecological considerations prevent application of fertiliser. Short-term visual impact on non-marl portions of the route.	Attempt a high rate of fertilisation using NPK + micro-nutrients in combination with mulch such as coir fibre.	**MINOR IMPACT** Exposed marl may retain its whitish colour and show as a white line across the landscape. However, as the landscape is not considered sensitive and is tolerant of change, the overall impact is minor.
Ecology			
Protected Areas (Potential) Ulas and Alacorak Lakes, a series of five lakes being considered by the Ministry of Environment (MoE) as an Internationally Important Wetland under the Ramsar Convention, are located c. 1.2km north-west and c.	See Potential Impacts below.	See Mitigation Measures below.	See Residual Impacts below.

Environmental Impact Table 37 (Maps 37A and 37B) (KPs 713.3 – 733.9): Tutmac Proposed Irrigation Pond to Alacorak and Ulas Lakes, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
930m south-east of the 100m Corridor. The three small lakes appear to be permanently wet, while the largest lake is at best seasonal having been dry for a long time at the point of survey on 22.05.2001. Importantly, the lakes appear to act as a whole with birds moving around freely between them particularly at times of disturbance.			
Important Ecological Factors ESA 33 occurs between KP 728.0 and KP 739.9 and is identified for eight globally-threatened plant species (*Dianthus zederbaueri, Achillea goniocephala*, *Astragalus listoniae, Astragalus cymbibracteatus, Astragalus ulashensis, Glaucium acutidentatum, Centaurea sivasica* and *Cerastium saccardoanum*) occur. A further two globally-threatened plants *(Campanula strigillosa* and *Onobrychis argyrea spp. argyrea*) were recorded just east of the corridor parallel to ESA 33. The IUCN status for these species are given in Table 5.20, Section 5. Ulas and Alacorak Lakes support at least two globally-threatened birds – White-headed Duck and Ferruginous Duck – the former (the most important species present along the route corridor) almost certainly breeds, while the other might have done so. In addition, 14 nationally threatened species were present during the bird survey: Red-necked Grebe 2 pairs; Great Egret 1; Common Shelduck 1; Teal 2; Garganey 6; Shoveler 1 pair; Pochard 3 pairs; Marsh Harrier 2; Common Crane 2; Black Tern 1; Citrine Wagtail 1; Whinchat 3; 7 White–winged Black Terns; Montagu's Harrier 2 pairs. Other species noted, which are neither globally or nationally-threatened, but have protection under the Bern Convention, included Purple Heron 1; Whiskered Tern 2; Ruddy Shelduck 154 plus juveniles; Savi's Warbler 1; Great Reed Warbler 12 singing males; Chough 2. Local people reported that about seven pairs of cranes bred around the lakes in 2001. At the beginning of this map (KP 713.5), 2 Common Crane nationally-threatened) were recorded, although none were observed around the lakes. This sighting is highly likely to be associated with the lakes rather than breeding at the location at which it was observed. The protection	Habitat destruction of plain steppe and habitats peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Ulas and Alacorak Lakes are among the most valuable ecological sites along the route. While the lakes are distant enough from the Pipeline for construction itself not to cause undue disturbance, (one lake in fact borders the town of Ulas), disturbance could arise if pipe dumps, contractor's yards or camps are located in this area. Disturbance from construction personnel walking or driving around the lakes would also be detrimental. Minor temporary disturbances are expected to a globally-threatened mammal during seasonal sensitivities (see	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 33. Diligence will be exercised in searching inside the corridor for those species known to occur just outside of the corridor. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW.	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds at Ulas and Alacorak Lakes as disturbance will be kept to a minimum through avoidance of the area. This impact is further minimised as birds have successfully bred despite the close proximity of settlements, the largest being Ulas, and infrastructure, ie a motorway and railroad. **MINOR IMPACT** at most to the Forest Dormouse during the construction period where the specified mitigation measures are applied for the

Environmental Impact Table 37 (Maps 37A and 37B) (KPs 713.3 – 733.9): Tutmac Proposed Irrigation Pond to Alacorak and Ulas Lakes, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
status for species observed at the lakes are given in Table 5.21, Section 5.The degree to which the lakes are used as a staging point by migratory waders and waterfowl is as yet unknown. Forest Dormouse (globally-threatened mammal) was recorded between KPs 719.9 – 725.0. The protection status for this species is given in Table 5.21, Section 5.	EMMP, Appendix C1): • breeding season for the Forest Dormouse is between May and August, but in warmer areas the season may extend beyond this period.	Care will be taken in using fertiliser during re-instatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 33. No construction facilities have been or will be located between KP720 and the Ulas Railway Line. The lakes will be placed out-of-bounds to construction personnel. Preconstruction surveys for the Forest Dormouse of dense woodland in the RoW; if present route clearance will be undertaken during the autumn or winter period.	seasonal sensitivities identified.
Archaeology and Cultural Heritage			
(i) Ziyaret Hill (Tutmac Village) - 1st Degree; **(ii) Yassı Hill (Tutmac Village) - 1st Degree**			

Social Impact Table 37 (Map 37C) (KPs 713.3 – 733.9): Tutmac Proposed Irrigation Pond to Alacorak and Ulas Lakes, Sivas Province

MAP 37: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There is one block valve station.

MAP 37: MAP HIGHLIGHTS

- National Highway, unclassified/local access roads, river and energy transmission lines bisect the pipeline.
- Two potential RAMSAR (wetland) sites are located in area along with an irrigation pond (very close to pipeline) and two archaeological sites.
- Main land use is rain fed agriculture. A small amount of irrigated agriculture is undertaken along Tecer River.

MAP 37: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** four settlements on this map will be directly impacted by the pipeline project (Tutmac, Hacimirza, Ikindi, Karasar). They all have land intersected by the proposed pipeline (L). None are within 500m of the pipeline route. No settlements are within 5km of a construction camp or pump station. One settlement (Tutmac) is within 2km of the block valve station (B). Settlements impacted by traffic have not yet been identified. No settlements are downstream of a river/ creek crossing.

- ***Surveyed:*** one settlement (Karasar) was surveyed in the field (S) and three settlements surveyed by telephone (T).
- ***Not surveyed:*** Ulas (1.5km from the pipeline).
- ***Not on map:*** Ikindi.

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Tutmac (L) (B) (T)			
• ***Demographics:*** there are 169 inhabitants with seasonal migration of 5%. • ***Safety****:* the settlement is situated 1.3km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive towards the project, there are no major concerns. • ***Land ownership & use:*** 40% of land is privately owned by the inhabitants. Irrigation is undertaken and there is no livestock grazing. • ***Settlement livelihood:*** agriculture, bee keeping (three households produce honey for own consumption), transport and education are all sources of livelihood for the settlement. • ***Accessibility:*** it is 30km to Sivas district centre. The settlement has poor accessibility in December and January. • ***Information provision:*** 99% of the population is literate. It should be noted that as there is poor energy supply to the settlement, television	***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Land*** Potential complications in expropriation process.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **See Overview of Land Acquisition Process in Appendix C9.**	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **See Overview of Land Acquisition Process in Appendix C9.**

Social Impact Table 37 (Map 37C) (KPs 713.3 – 733.9): Tutmac Proposed Irrigation Pond to Alacorak and Ulas Lakes, Sivas Province

noted that as there is poor energy supply to the settlement, television is not a reliable information provision tool. • ***Environmental & cultural sites:*** there is a castle nearby. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular with frequent water cuts. There is also a stored water supply and a poor energy supply. • ***Settlement problems:*** poor roads, inadequate access to water and inadequate energy supply are all problems for this settlement.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Block Valve Station*** See Environmental Impact Tables and the Overview of Land Acquisition Process in Appendix C9.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Hacimirza (L) **(T)**			
• ***Demographics:*** there are 92 inhabitants with seasonal migration of 80%. • ***Safety:*** the settlement is situated 2.6km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive but are concerned with regard to how land values will be determined. • ***Land ownership & use:*** 80% of land is privately owned by inhabitants. There are no seasonal grazing or irrigation activities. • ***Settlement livelihood:*** activities include agriculture, forestry, manufacturing and construction. • ***Availability & skills:*** inhabitants have previous mining experience. • ***Accessibility:*** the settlement is 12.4km from the district centre. The settlement has poor quality roads but it is accessible all year. • ***Information provision:*** 70% of the population is literate. • ***Infrastructure:*** piped water is supplied to households. • ***Services:*** there are no health care facilities.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility to recruitment*** Decreased access to recruitment process	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected**

Social Impact Table 37 (Map 37C) (KPs 713.3 – 733.9): Tutmac Proposed Irrigation Pond to Alacorak and Ulas Lakes, Sivas Province

• ***Settlement problems:*** problems include poor roads, unemployment, inadequate health care and inadequate childcare.			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Karasar (L) (S)			
• ***Demographics:*** there are 350 inhabitants (and increasing) with 55 households. • ***Safety****:* the settlement is situated 2.5km from the pipeline and the nearest house is 2.4km from the pipeline. • ***Health:*** the sewerage system is poor which impacts on health. • ***Project attitude:*** inhabitants are positive towards the project, however the inhabitants are concerned about damage that may be incurred on infrastructure. 42% are hopeful they will receive employment. • ***Land ownership & use:*** 80% of the land is owned privately by the inhabitants, another 20% of land is leased by inhabitants. Landowners do not possess title deeds (only right of possession) for their lands. Seasonal grazing and irrigation activities are undertaken. • ***Settlement livelihood:*** agricultural activities (sugar beet, barley, wheat, oat, rye, fruit trees) are carried out for subsistence purposes. Small-scale animal husbandry is the main economic activity. In addition bee keeping and provision of transport services is undertaken. • ***Availability & skills:*** stonemasonry, heavy vehicle drivers, drivers and welders are available. 75% would accept a temporary job working on the pipeline construction. • ***Accessibility:*** the settlement is 16km from Ulas district centre. Transportation is very difficult during the winter due to muddy roads. Roads are closed for 2-3 days during January and February. • ***Information provision:*** 60% of the population is literate. • ***Infrastructure:*** piped water is supplied to households. There is electricity supply but no sewerage or waste disposal systems. • ***Service:*** there is an elementary school with one teacher and a	***Land*** Potential complications in expropriation process. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials	**See Overview of Land Acquisition Process in Appendix C9.** **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and	**See Overview of Land Acquisition Process in Appendix C9.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Potential positive benefits** to local settlements.

Social Impact Table 37 (Map 37C) (KPs 713.3 – 733.9): Tutmac Proposed Irrigation Pond to Alacorak and Ulas Lakes, Sivas Province

travelling midwife. • ***Settlement problems:*** unemployment, low income, insufficient financial resources for local authority and a poor sewerage system are all problems in this settlement.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc. ***Accessibility to recruitment*** Decreased access to recruitment process.	sourcing of goods and supplies within Project constraints. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasise oral communication where literacy is low. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected.**

Environmental Impact Table 38 (Maps 38A and 38B) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soils types from the previous section continue in this section of the route: • Mesic Typic Calcixerolls on most plains surfaces. • Mesic Clayey-skeletal Shallow Xerochrepts on plateau scarps. • Minor inclusions of Rhodoxeralfs on some plains locations. PT 4 will be located at KP 743.9. The site has only recently been selected as the preferred location for this pump station. Baseline soil quality information is therefore absent at this stage	Main potential impacts include: • soil erosion; • sediment yield; • soil productivity. Other potential impacts will include: • channel alteration; • potential for existing soil contamination at the PT 4 site.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • An additional survey to record existing baseline soil conditions will be undertaken at the PT 4 site to identify any areas of existing soil contamination.	**MODERATE IMPACT** Soil erosion predicted to be visibly active but no rill and gully formation evident. Furthermore, soil productivity losses are predicted to last generally less than one year after construction, but more than three months for arable land and more than 6 months in grazing pasture), but up to 2 years in upland areas with no formal land use.
Landscape and Visual			
The route crosses a gently-rising area of intensive, but non-irrigated, arable land before it ascends very gradually through a series of plateaux that are stepped, so that abrupt scarps separate one elevation from the next. This area is the Uzun Plateau, founded mostly on marl, and the rock lends a pale quality to the landscape, largely made up of heavily grazed grassland and montane steppe although scattered areas are cultivated for cereals. The undulating plains are treeless except in and around some settlements and the settlements are small and well-scattered, so that the region has a desolate feeling. Landscape interest is limited by the relatively featureless terrain and barrenness of the gravely, sparsely-vegetated land. Landscape sensitivity is generally low. The undulating and rolling headlands of Cakmakli Creek (elevations	Disturbing Xerochrepts on hills and scarps will expose the underling marl, leaving a persistent whitish line across upland portions of the landscape. This is less important here than in previous locations due to the already eroded condition of the landscape. There will be a relatively large area of visual influence during	Attempt a high rate of fertilisation using NPK + micro-nutrients in combination with mulch such as coir fibre. PT 4 has been located within the rural environment to minimise its impact on residential properties. The landscape is undulating and opportunities to use the existing landform features to conceal parts of the facility will be further investigated. A careful replanting	**MINOR IMPACT** Exposed marl may retain its whitish colour and show as a white line across the landscape. However, as the landscape is not considered sensitive and is tolerant of change, the overall impact is minor. **MODERATE IMPACTS** Moderate visual impacts on high sensitivity residential

Environmental Impact Table 38 (Maps 38A and 38B) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
between 1,700 and 1,800m) provide areas of local interest. The stream comprises sinuous, shallow channels, which support wide bands of riparian vegetation and meadow and irrigate the surrounding farmland. PT 4 will require a landtake of 18.7 ha. In addition, there will be a temporary campsite during the construction period, which will occupy c. 12.3 ha. The PT 4 site occupies flat terrain c. 2km east of the settlement of Alaca, at an altitude of c. 1,550m. A main road is located c. 5km to the east of the site. The location provides broad vistas dominated by grasslands and rain-fed cereals. Landscape value is low. BVS-040 will be located at KP 752.2 within cultivated land. Approximately, 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 55m in length. Pasakoy settlement lies c. 190m from the site.	construction of PT4, due to the generally flat terrain in which the site is located. The settlement of Alaca will have the clearest views of construction activities. Residential properties on the eastern edge of the settlement will be most affected, as the settlement itself will screen construction activities from the west side of the settlement. Construction activities will also be visible from parts of the settlements of Bogazdere (Kantariz) (3.5km to the north), Kazanpinar (5km to the east) and Patirkoy (3.5km to the south-east). However, only those residents on the edges of the town closest to the PT 4 site are likely to experience views during construction. Potential for short-term visual impact during construction of BVS-040 for villagers in Pasakoy.	scheme will be employed during reinstatement (see the RP, Appendix C2). In addition mitigation measures in Section 6.3 will be applied. Particular attention will be paid to the control of dust, noise and traffic during construction at BVS-040.	properties with medium distance views of PT 4. However, this impact will occur for a limited period during construction (see Section 7.2.2 for an assessment of operational landscape and visual impacts). **MINOR IMPACT** Given the relatively small size of the block valve station and the temporary nature of construction activities, impacts are anticipated to be minor subject to implementation of the specified mitigation measures.
Surface Geology and Geohazards			
Faults Route crosses Deliler Fault, which is a class A fault, south of KP 740. Deliler Fault is c. 100km long with a general trend from NE-SW. The segment of the fault at the crossing point is c. 55km long.	See *Section 8*.	See *Section 8*.	See *Section 8*.

Environmental Impact Table 38 (Maps 38A and 38B) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Surface Waters			
The Ulas-Kurtlukaya Reservoir is a proposed reservoir lying c. 490m west of route, which will receive flows from Cakmakli and Kurtlukayasuyu Creeks.	Potential for indirect disturbance at Ulas-Kurtlukaya Reservoir, due to run-off containing suspended solids from working areas entering Kurtlukayasuyu Creek (< 1km upstream of the reservoir), consequently resulting in a reduction in water quality in the reservoir.	Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, to avoid sedimentation and turbidity at Kurtlukayasuyu Creek crossing point, including measures to protect surface waters flowing into the reservoir, such as sediment filters/trapping devices, settling ponds and trench de-watering.	**MINOR IMPACT** Only minor impacts expected, as disturbance will be limited to the immediate working area at Kurtlukayasuyu Creek. Sedimentation of Kurtlukayasuyu Creek will only be visible for less than 3 weeks after construction, with no obscuration of the river bed. This impact will not be transmitted as far as the reservoir.
Ecology			
Important Ecological Factors ESA 34 occurs between KP 735.9 and KP 739.4 and is identified for seven globally-threatened plant species (*Dianthus zederbaueri, Physoptychis haussknechtii, Alyssum lepidoto-stellatum, Campanula strigillosa, Salvia vermifolia, Hypericum thymbrifolium* and *Centaurea sivasica*) and one nationally-threatened species (*Astragalus karputanus*). In addition, four globally-threatened species (*Astragalus cymbibracteatus, Achillea goniocephala, Astragalus listoniae* and *Crocus kotschyanus sp. cappadocicus*) occur just outside the corridor to the SE of this section. One globally-threatened species (*Campanula strigillosa*) occurs just outside the 500m Corridor to the east of KP 747.8. The IUCN status for these species are given in Table 5.20, Section 5. At KP 741.6, 2 Whinchat and 1 Barred Warbler (both nationally-threatened) were recorded. The protection status for these species are given in Table 5.21, Section 5.	Habitat destruction of plain steppe and habitats peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 34. Diligence will be exercised in searching inside the corridor for those species known to occur just outside of the corridor. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used,	**MODERATE IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts

Environmental Impact Table 38 (Maps 38A and 38B) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during re-instatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 34. Shrubs, thickets and dense vegetation along the RoW will be cleared outside the breeding season for the Whinchat and Barred Warbler.	will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

MAP 38: PROJECT INFORMATION

There is a pump station (PT4) in the area. It is a 18.68 hectare site, located on relatively flat land surrounded by mountainous terrain. Adjacent to the pump station is its temporary construction camp (12.31ha). There is no block valve station in the area.

MAP 38: MAP HIGHLIGHTS

- There are three irrigation ponds in the area.
- Two creeks bisect the pipeline.
- The pump station is located on an active fault line.
- Main land use is rain-fed agriculture with pockets of irrigated agriculture and pasture near creeks.

MAP 38: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** ten settlements will be directly impacted by the pipeline project. Seven will have land intersected by the proposed pipeline (Kurtkaya, Hurriyet, Yesilyet, Devlet Uretme Ciftligi, Yazicik, Bogazdere, Basoren) (L); one settlement (Kantariz) is within 500m of the pipeline route (D). Five settlements (Yazicik, Bogazdere, Akkuzulu, Kazanpinar, Basoren) are within 5km of a pump station (P). Settlements impacted by traffic have not yet been identified. One settlement is downstream of a creek crossing (Kantariz is downstream of the Cakmakli Creek).

- ***Surveyed:*** two settlements (Yazicik, Kazanpinar) were surveyed in the field (S) and seven settlements surveyed by telephone (T).
- ***Not surveyed:*** Kantariz (nearest house is 400m from the pipeline), Akkuzulu.
- ***Not on map:*** Hurriyet, Devlet Uretme Ciftigi, Yazicik, Bogazere, Akkuzulu, Kazanpinar.
- ***Disclosure Meeting Location:*** Basoren

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Kurtkaya/ Kurtlukaya (L) (T)			
• ***Demographics:*** there are 91 inhabitants with seasonal migration of 50%. • ***Safety:*** the settlement is situated 1.2km from the pipeline. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive about the project and have no major concerns. • ***Land ownership & use:*** 90% of land is privately owned by the inhabitants. Seasonal grazing occurs and irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (four households produce honey for own consumption), trade and local government	***Construction hazards: animals*** Trench poses safety hazard for livestock	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

produce honey for own consumption), trade and local government area all sources of livelihood. • ***Accessibility:*** the settlement is 11km from Ulas district centre. The settlement has poor accessibility from December to February. • ***Environmental & cultural sites:*** there is a graveyard and forest in the area. • ***Infrastructure:*** piped water is supplied to households. • ***Settlement problems:*** problems include poor roads and low incomes. • ***Other:*** this settlement had low awareness of the pipeline.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility of recruitment*** Decreased access to recruitment process ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No residual impact expected** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Hurriyet Mah (T) **(L)**			
• ***Demographics:*** there are 375 inhabitants with seasonal migration of 17%. • ***Safety****:* the settlement is situated 1.4km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive about the project and have no major concerns. • ***Land ownership & use:*** 100% of land is privately owned by the inhabitants. No grazing occurs but irrigation activities are	***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

inhabitants. No grazing occurs but irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture (no animal husbandry), bee keeping (two households produce honey for their own consumption), commercial fishing (five households fish as their main source of income), forestry, mining, construction, transport, trade, education and local government are all sources of livelihood. • ***Accessibility:*** the settlement is 14.8km from the district centre. The settlement is accessible all year. • ***Information provision:*** 80% of the population is literate. • ***Environmental & cultural sites:*** Kervansaray is a cultural site. • ***Infrastructure:*** piped water is supplied to households. • ***Settlement problems:*** poor roads, unemployment and inadequate access to water are problems for this settlement.		compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	
	Accessibility of recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Yesilyurt (L) **(T)**			
• ***Demographics:*** there are 293 inhabitants with seasonal migration of 3%. • ***Safety****:* the settlement is situated 3.4km from the pipeline. • ***Disputes:*** there is political instability in the settlement. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive towards the project and have no major concerns. • ***Land ownership & use:*** There is no seasonal grazing of settlement livestock and irrigation is undertaken. • ***Settlement livelihood:*** animal husbandry, bee keeping (eight households produce honey as one of many sources of income), trade, education and local government are all sources of livelihood. • ***Accessibility:*** it is 22.5km to the district centre. The settlement has poor accessibility all year round. • ***Information provision:*** 70% of the population is literate. • ***Water infrastructure:*** piped water is supplied to households. • ***Settlement problems:*** there is political instability and unemployment.	***Land*** Potential complications in expropriation process. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc.	**See Overview of Land Acquisition Process in Appendix C9.** **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include using appropriate channels of communication and media and emphasising oral communication where	**See Overview of Land Acquisition Process in Appendix C9.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

		literacy is low.	
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yazicik (L) (P) (S) (T)			
• ***Demographics:*** there are 80 inhabitants within 16 households and seasonal migration of 35%. • ***Safety****:* the settlement is situated 5km from the pump station. • ***Disputes:*** there are disputes over natural resources. • ***Project attitude:*** attitudes towards the pipeline project are positive and the pump station is welcomed. Perceived benefits of the pipeline and pump station include employment opportunities in pipeline construction. Perceived problems include concerns over disruption to the harvest during construction. • ***Land ownership at pump station site:*** the site is 18.68ha in size, of which 8.6ha are owned by local residents in Yazicik, and 10ha are owned by local residents in Yesilyurt. • ***General land ownership & use:*** the land for construction is privately owned (by two brothers) and thus there were no concerns regarding expropriation (beyond establishing a fair price and paying on time)	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of Land Acquisition Process in Appendix C9. ***Land*** Permanent land expropriation of 6.8ha will occur.	Evaluate the possibility of assigning unused state owned pastureland. **See Overview of Land Acquisition Process in**	Potential loss of land. **See Overview of Land Acquisition Process in Appendix C9.**

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

expropriation (beyond establishing a fair price and paying on time). 50% of land is communal. No irrigation is undertaken. • ***Settlement livelihood:*** agriculture (grain), forestry and education are all sources of livelihood. There is little commercial activity. • ***Availability & skills:*** there is previous experience in motorway construction. • ***Accessibility:*** it is 58 km to the provincial centre of Ulas and 7km to the district centre. The settlement is located on the highway and is accessible all year. • ***Information provision:*** 100% of the population is literate. • ***Environmental & cultural sites:*** Hitittit's Traces is a cultural site. In addition, the settlement has very healthy water that is of environmental significance. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular with frequent water cuts. There is no alternative water source. There is also an electricity supply. • ***Services:*** There is no sewerage system, primary school or health care facilities. • ***Settlement problems:*** problems include financial problems, inadequate access to water, unemployment and inadequate childcare facilities.	***Livelihoods*** Decreased land resources may result in decreased livelihood opportunities. **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers	**Appendix C9.** **See Overview of Land Acquisition Process in Appendix C9.** **Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company will look at opportunities to cooperate in providing **health awareness training.**	**See Overview of Land Acquisition Process in Appendix C9.** **Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities.

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

	PIPELINE IMPACTS: ***Land*** Potential complications in expropriation process. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Accessibility to recruitment*** Decreased access to recruitment process	**See Overview of Land Acquisition Process in Appendix C9.** **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**See Overview of Land Acquisition Process in Appendix C9.** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Bogazdere (L) (P) (T)			
• ***Demographics****:* there are 61 inhabitants with seasonal migration of 50%. • ***Safety****:* the settlement is situated 750m from the pipeline and the nearest house is 600m from the pipeline. It is approximately 3.5km from the pump station. • ***Project attitude:*** inhabitants are generally positive towards the project, however they are concerned about potential health issues. They also feel they have not been provided with enough information	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of Land Acquisition		

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

They also feel they have not been provided with enough information about the project. Inhabitants would generally welcome the pump station and perceive direct employment opportunities with pipeline construction. Perceived problems include some concern over potential damage to roads and harvest. • ***Land ownership & use:*** 80% of land is privately owned by the inhabitants. Most inhabitants have land titles. Average land holdings surrounding pump station are 19ha with nine plots of land. Primary land use is grain cultivation. There is no grazing. Irrigation is undertaken. • ***Settlement livelihood:*** sources of livelihood include agriculture, bee keeping (fifteen households produce honey as one of many income sources), hunting and trade. • ***Accessibility:*** The settlement is accessible all year. • ***Information provision:*** 90% of the population is literate. • ***Environmental & cultural sites:*** there is a castle in the area. • ***Infrastructure:*** piped water is supplied to households. • ***Settlement problems:*** problems include poor roads and low income. • ***Other:*** inhabitants would like the opportunity to have surplus soil deposited in nominated preferred locations.	Process in Appendix C9.. **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers **PIPELINE IMPACTS:** ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	**Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company will look at opportunities to cooperate in providing **health awareness training.** Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**Significance cannot be established at this time**
	Accessibility of recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner o need to move hives to a position at least 300m from the route. If	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

		moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Construction hazards: humans Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kazanpinar (P) **(S)**			
• ***Demographics:*** there are 270 inhabitants within 37 households. • ***Safety****:* the settlement is situated 4km from the pipeline and 5 km from the pump station. • ***Health:*** the sewerage system is poor, leading to health implications. • ***General Land ownership & use:*** 65% of land is leased by inhabitants and 32% is owned privately by inhabitants. The	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of		

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

inhabitants and 32% is owned privately by inhabitants. The inhabitants do not, however, own land in or around the pump station itself. Low levels of grazing occur. There is no irrigation. • ***Project attitude:*** Attitudes towards the pipeline are mixed. The settlement had a negative experience with land acquisition during highway construction, however, they believe that the pipeline will have national and local benefits and has the potential to improve the settlements economic life. Inhabitants would generally would welcome a pump station but not within 3km of the settlement. Perceived benefits of the pipeline and pump station include high employment expectations. Perceived problems associated with the pipeline and pump station include construction work that could increase traffic flow through and near to the settlement. There is also concern that passing workers could consume settlement natural resources without permission. • ***Settlement livelihood:*** livelihood sources include agriculture (grain), trade and animal husbandry (cattle & poultry). • ***Accessibility:*** the settlement is x km from the district centre and is located very close to a national highway, therefore there is good accessibility. • ***Information provision:*** 70% of the population is literate. • ***Infrastructure:*** piped water is supplied to households however, the supply is irregular with frequent water cuts. A community well and a local spring provide alternative water sources of water. • ***Services:*** there is a primary school but no health care facilities. • ***Settlement problems:*** poor sewerage system, poor transportation and inadequate water supply are all problems for the settlement.	the pump station. See Sections 6 and 7 and the Overview of Land Acquisition Process in Appendix C9.. **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers **PIPELINE IMPACTS:** ***Accessibility to information*** Sectors of the population may not have access to project related information on	**Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company will look at opportunities to cooperate in providing **health awareness training.** **Communication with settlement** must take into account settlement characteristics to ensure equal access to information	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** **Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **No residual impact expected**

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

	employment opportunities, potential disruption to utilities etc	for all residents. This should include emphasising oral communication where literacy is low. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Negative experience Possible **opposition** to project and **increased sensitivity** to any negative impacts.	BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings**	Level of residual impact will depend on degree to which concerns are resolved prior to construction.
	Construction hazards:	**Livestock crossings** will be	**Potential for accidents**

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

	animals Trench poses safety hazard for livestock.	established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Basoren (L) (P) (D) (T)			
• ***Demographics:*** 322 inhabitants reside in the settlement, 10% seasonally migrate. (If the settlements' Akkuzulu Quarter is included, there are 576 inhabitants and 53 households). • ***Safety****:* the settlement is situated 650m from the pipeline and 5km from the pump station. The nearest house is 50m from the pipeline. • ***Health:*** the poor sewerage system impacts on health. • ***Land ownership & use:*** 50% of land is privately owned by the inhabitants and 50% is community owned. There is no seasonal grazing and no irrigation. The inhabitants do not own land in or around the pump station. • ***Project attitude:*** the attitude towards the pipeline is generally positive, however the settlements have requested that a liaison officer be nominated to receive concerns from inhabitants for any losses that might arise during construction. Damage to the local area caused by construction of the natural gas pipeline was considerable and damage was not reinstated. Inhabitants generally welcome the pump station. Perceived benefits of the pipeline and pump station include employment opportunities in pipeline construction and indirect employment opportunities in the provision of goods and services to the camp and materials for construction. The perceived problems include concerns over potential damage to land and crops. • ***Settlement livelihood:*** agriculture, bee keeping (two households produce honey as one of many economic sources), construction, trade and local government are the main sources of livelihoods. • ***Accessibility:*** it is 15km to Altinyayla district centre. Roads are occasionally closed in the winter months of December to February	**PUMP STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of Land Acquisition Process in Appendix C9.. **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers	**Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company will look at opportunities to cooperate in providing **health awareness**	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.**

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

occasionally closed in the winter months of December to February. • ***Information provision:*** 60% of the population is literate. • ***Infrastructure:*** piped water is supplied to households, however, supply is irregular with frequent water cuts. A settlement fountain provides an alternative water source. • ***Settlement problems:*** roads are poor, there is inadequate access to water, unemployment and a poor sewerage system.	**PIPELINE IMPACTS:**	**training.**	**Benefits** from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities.
	Construction hazards: human Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Land Potential complications in expropriation process.	**See Overview of Land Acquisition Process in Appendix C9.**	**See Overview of Land Acquisition Process in Appendix C9.**
	Drinking water Potential for contamination of drinking water by sediment or accidental spills	**Alternative sources of water** will be provided during construction to settlements that use water channels for drinking that are crossed by the construction activities.	**No residual impact.**
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
		Groundwater During land acquisition, any	**If there is any long term impact on water sources**,

Social Impact Table 38 (Map 38C) (KPs 733.9 – 751.3): North-East of Kurtlukaya Settlement to South of Basoren Settlement, Sivas Province

		ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	appropriate alternatives to be provided by the Project.
	Accessibility to Recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Negative experience Possible **opposition** to project and **increased sensitivity** to any negative impacts.	BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings.**	Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Environmental Impact Table 39 (Maps 39A and 39B) (KPs 751.3 – 767.5): North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Loamy-skeletal Xerochrepts on sloping uplands. These are highly eroded on the scarp (see Landscape and Visual below). • Fine-silty Xerofluvents near channels supporting pasture and riparian vegetation. • Mesic Typic Calcixerolls on sloping and gently sloping lands planted to rainfed cereals.	Main potential impacts: • soil erosion; • sediment yield; • soil productivity. Other potential impacts will include: • channel alteration; • soil contamination.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MODERATE IMPACT** Soil erosion predicted to be visibly active but no rill and gully formation evident. Furthermore, soil productivity losses are predicted to last generally less than one year after construction, but more than three months for arable land and more than 6 months in grazing pasture), but up to 2 years in upland areas with no formal land use.
Landscape and Visual			
The route continues to traverse a series of stepped plateaux founded mostly on marl, and the rock lends a pale quality to the landscape which is largely made up of heavily grazed grassland and montane steppe although scattered areas are cultivated for cereals. The undulating plains are treeless except in and around some settlements and the settlements are small and well-scattered, so that the region has a desolate feel. The Sekerpinar River has well-developed marshland in places. Further south, the route picks its way between a series of small rivers flowing through wide, flat-bottomed, verdant valleys, bounded either side by very steep, almost cliff-like, scarp slopes of exposed marl that show white in the landscape. These valleys are covered with buttercups during the spring, forming bright yellow swathes across the landscape, and clumps of poplars	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. May be long-term or permanent where difficult to re-instate, or where ecological considerations prevent application of fertiliser. This is less important here than in previous locations due to the already eroded condition of the landscape.	Attempt a high rate of fertilisation using NPK + micro-nutrients in combination with mulch such as coir fibre.	**MINOR IMPACT** Exposed marl may retain its whitish colour and show as a white line across the landscape, although this may be less conspicuous here than in previous locations due to the already eroded condition of the landscape.

Environmental Impact Table 39 (Maps 39A and 39B) (KPs 751.3 – 767.5): North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
and willows are present. Larger settlements occur along the valley edges. The route keeps to the higher ground where the plains are stony, open, sparsely-vegetated, and largely featureless. Landscape interest is limited, except where views include the green river valleys.			
Surface Waters			
Sekerpinar Reservoir has been proposed for construction by the DSI and will be situated c. 960m east of the route. The pond will receive flows from Sekerpinar River.	Potential for indirect disturbance at Serkerpinar Reservoir, due to run-off containing suspended solids from working areas entering Sekerpinar River, resulting in a reduction in water quality in the reservoir.	Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, to avoid sedimentation and turbidity at Sekerpinar River, such as sediment filters/trapping devices, settling ponds and trench de-watering.	**MINOR IMPACT** Only minor impacts expected, as disturbance will be limited to the immediate working area. Sedimentation of Sekerpinar River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed. This impact will not be transmitted as far as the reservoir.
Ecology			
Important Ecological Factors ESA 52 is identified for the presence of a range of endemic plant species including the nationally- and globally-threatened *Dianthus zederbaueri.* ESA 35 occurs between KP756.2 and KP 757.5 and is identified for two globally-threatened plant species (*Bornmuellera cappadocica* and *Crocus kotschyanus sp. cappadocicus*). In addition, two other globally-threatened plants (*Campanula strigillosa* and *Astragalus cymbibracteatus*) occur just east of the corridor parallel to this ESA. The IUCN status for these species are given in Table 5.20, Section 5. A riparian marsh just south of the settlement of Kurkcukyurt, along the Sekerpinar Creek, is of importance as a migratory staging point for the globally-threatened Great Snipe. The marsh also held several pairs of breeding waders (Redshank and Lapwing) and Mallard and good numbers	Although the route has been re-aligned to avoid the most important parts of the marsh, habitat destruction of plain steppe may still result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened Whinchat during nesting, feeding or indirectly, through habitat loss if construction is	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 52 and ESA 35. Diligence will be exercised in searching inside the corridor for those species known to occur just outside of the corridor. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for globally and nationally-threatened birds, where pipeline construction is

Environmental Impact Table 39 (Maps 39A and 39B) (KPs 751.3 – 767.5): North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
of riparian passerines including Whinchat (nationally-threatened). The protection status for this species is given in Table 5.21, Section 5.	undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods. Potential for direct disturbance to a globally-threatened migratory species. Autumn passage of the Great Snipe is between August and September, though it may continue into November. Therefore, potential for direct disturbance during this period for birds using Serkerpinar as a staging point.	is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during re-instatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 52 and ESA 35. The marsh habitat will be protected from heavy machinery by the use of moveable equipment mats pads. It will be ensured that the marsh is not drained accidentally as a result of construction. Preconstruction survey to establish the extent of resource utilisation of Serkerpinar River as a staging post by the Great Snipe. Specific mitigation plan to be	scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Environmental Impact Table 39 (Maps 39A and 39B) (KPs 751.3 – 767.5): North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		developed based on the outcome of the survey, once level of resource utilisation is established. Shrubs and dense vegetation along the RoW at Serkerpinar River will be cleared outside the breeding season for the Whinchat.	
Noise			
Pasakoy settlement in Altinyayla District is located c. 138m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Pasakoy settlement during soil stripping and welding and lowering activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for	**MINOR IMPACT** Short-term noise impacts are expected to occur during soil stripping activities. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days.

Environmental Impact Table 39 (Maps 39A and 39B) (KPs 751.3 – 767.5): North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	
Archaeology and Cultural Heritage			
Hoyuktepe (East) (3rd Degree Site*) is a flat settlement that lies north-west of the route near KP 765.0. Roman ceramic shards are found on the surface of this site. Yeldegirmeni Tumulus - 1st Degree The following have been proposed for registration by the regional preservation council: (i) Hoyoktepe; (ii) Pasakoy (iii) Ciftetepe; (iv) Tumulus; (v) Bescardak * This site has not yet been registered by the MoC and is provisionally assigned this classification.	Potential for site to experience direct impacts, such as ground disturbance, during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	The pipeline has been re-routed to avoid this site. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to the temporary disturbance of the site setting and peripheral features.

Social Impact Table 39 (Map 39C) (KPs 751.3 – 767.):
North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

MAP 39: PROJECT INFORMATION			
A pump station (PT4) that is located on Map38 is within 5km of one settlement in this area. There is also a block valve station in the area.			
MAP 39: MAP HIGHLIGHTS			
• River bisects pipeline and flows into Sekerpinar pond. • There are four archaeological sites in area. • Main land uses are pasture and rain fed agriculture.			
MAP 39: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted:*** seven settlements will be directly impacted by the pipeline project. All will have land intersected by the proposed pipeline (Pasakoy, Mutubey, Kurkcuyurt, Harmandali, Yesilyurt Mah, Deliilyas Mah, Safak) (L). Two (Pasakoy and Harmandali) are within 500m of the pipeline route (D); none are within 5km of a construction camp; and one Yesilyurt Mah is within 5km of a pump station (P). Pasakoy is within 2km of the block valve station (B). Settlements impacted by traffic have not yet been identified. One settlement is downstream of a river crossing (Kurkcuyurt) • ***Surveyed:*** five settlements (Pasakoy, Mutubey, Kurkcuyurt, Harmandali, Yesilyurt Mah) were surveyed in the field (S) and three settlements surveyed by telephone (T). • ***Not on map:*** Deliilyas, Safak			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Pasakoy (L) (D) (B) (S)			
• ***Demographics:*** there are 250 inhabitants with 30 households. • ***Safety:*** the settlement is situated 400m from the pipeline and the nearest house is 80m from the pipeline. • ***Health:*** the poor sewerage system causes health problems. • ***Disputes:*** tensions exist between parts of the community and the Muhtar. • ***Project attitude:*** the general attitude towards the project is positive. 55% of those interviewed are optimistic about employment opportunities and 18% about land compensation. However, there is considerable concern over the safety of children and animals during construction. • ***Land ownership & use:*** 50% of land is privately owned by inhabitants, the remaining 20% is communal pasture and 30%	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 39 (Map 39C) (KPs 751.3 – 767.):
North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

forests. Landowners do not possess title deeds (only right of possession) for their lands. Seasonal grazing of cattle and sheep occurs. There is no irrigation. • ***Settlement livelihood:*** animal husbandry (cattle) is the main economic activity. Dry–agriculture (barley & wheat) is undertaken, however although there are vast lands available for carrying out agricultural activities, insufficiency of labour force and barrenness result in non-cultivation of fields. • ***Availability & skills:*** heavy machine operators, heavy vehicle drivers, drivers and security are available. 82% of those interviewed would accept a temporary job on the pipeline construction. • ***Accessibility:*** the distance to Altinyayla district centre is 12km. Transportation is difficult during the winter due to mud. Roads are blocked with snow for intervals during January and February. • ***Information provision:*** 80% of the population is literate. • ***Infrastructure:*** piped water is supplied to households however supply is irregular with occasional water cuts. There is no alternative water source. There is an electricity supply, but no sewerage or waste disposal systems. • ***Services:*** there is a primary school with two teachers and a travelling midwife, however, there is no health care centre. • ***Settlement problems:*** transport difficulties, lack of water, unemployment and a poor sewerage system are all problems for the settlement. It is a relatively poor settlement.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Land*** Potential complications in expropriation process. ***Accessibility to recruitment*** Decreased access to	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **See Overview of Land Acquisition Process in Appendix C9.** Winter road closures, seasonal migration and poor transport will be **taken into**	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **See Overview of Land Acquisition Process in Appendix C9.** **No residual impact expected**

Social Impact Table 39 (Map 39C) (KPs 751.3 – 767.):
North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

	recruitment process ***Skills and resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials ***Block Valve Station*** See Environmental Impact Tables and the Overview of Land Acquisition Process in Appendix C9.	**account** in the recruitment strategy. **Information is highlighted to Contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements. .
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Mutubey (L) **(S)**			
• ***Demographics:*** 500 inhabitants, with 90 households. • ***Safety****:* settlement is situated 1.1km from pipeline and the nearest house is 1km from the pipeline. • ***Health:*** poor sewerage system causing poor health. • ***Project attitude:*** generally positive, providing necessary measures are put in place to ensure the safety of children during construction; and employment opportunities and expropriation payments are maximised. • ***Land ownership & use:*** 50% of land is privately owned by inhabitants and the remaining is communal pastures and forests (40%). Landowners do not possess title deeds (only right of possession) for their lands. Seasonal grazing occurs. There is no irrigation.	***Land*** Potential complications in expropriation process ***Construction hazards: animals*** Trench poses safety hazard for livestock.	**See Overview of Land Acquisition Process in Appendix C9.** **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**See Overview of Land Acquisition Process in Appendix C9.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 39 (Map 39C) (KPs 751.3 – 767.):
North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

irrigation. • ***Settlement livelihood:*** dry agriculture (grain) for own consumption, animal husbandry (cattle, sheep & poultry), and construction. • ***Availability & skills:*** heavy vehicle drivers, drivers and welders are available. • ***Accessibility:*** 14km to Altinyayla district centre. Transportation is very difficult during winter due to muddy roads. Roads are blocked by snow for intervals during January, February and March. • ***Information provision:*** 80% of the population is literate. • ***Infrastructure:*** piped water is supplied to households however supply is irregular with frequent water cuts. There is no alternative water source. • ***Services:*** there is electricity supply but no sewerage or waste disposal systems. There is also an elementary school with seven teachers and 130 students, and a travelling midwife. However, there is no health care centre. • ***Settlement problems:*** poor sewerage system, disease, unemployment and inadequate waste disposal.	***Accessibility of recruitment*** Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kurkcuyurt (L) **(S)**			
• ***Demographics:*** there are 700 inhabitants within 90 households. Many people migrate to provincial centres due to lack of arable land. • ***Safety:*** the settlement is situated 1.25km from the pipeline and the nearest house is 850m from the pipeline. • ***Health:*** the poor sewerage system causes ill health. • ***Project attitude:*** attitudes are generally positive, particularly if the project provides employment opportunities. • ***Land ownership & use:*** 90% of land is privately owned by the inhabitants and the remaining 10% is communal land. Landowners do not possess title deeds (only right of possession) for their lands. Arable land is limited and seasonal grazing occurs. There is no irrigation.	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Land*** Potential complications in expropriation process.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **See Overview of Land Acquisition Process in Appendix C9.**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of Land Acquisition Process in Appendix C9.**

Social Impact Table 39 (Map 39C) (KPs 751.3 – 767.):
North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

• ***Settlement livelihood:*** animal husbandry (cattle, sheep & poultry) is the main economic activity. Minimal agricultural activities (grain) are undertaken. There are also some trade and education activities. • ***Availability & skills:*** food services, heavy vehicle drivers, tree feller, drivers and typesetter are available. • ***Accessibility:*** it is 13km to Altinyayla district centre. Roads become muddy during winter and are sometimes blocked by snow January and February, therefore accessibility is poor during this period. • ***Information provision:*** 80% of the population is literate. • ***Infrastructure:*** piped water is supplied to households, there is an electricity system, however there are no sewerage or waste disposal systems. • ***Services***: there is a primary school that has the capacity to become a regional boarding school. It currently has seven teachers and 88 students. There is an un-staffed health care centre, a travelling midwife, and the settlement has a small market and a flourmill that are sufficient to meet the needs of local people. • ***Settlement problems:*** problems include transport difficulties, unemployment, poor sewerage system, (is a relatively wealthier and larger settlement, however in recent years unemployment has resulted in intensive emigration).	***Accessibility to recruitment*** Decreased access to recruitment process ***Health*** Potential health impacts on construction workers.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Information is highlighted to contractor** so that they can ensure that their workers are protected.	**No residual impact expected** **No residual impact**.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Harmandali (L) (D) (S)			
• ***Demographics:*** there are 300 inhabitants within 73 households. • ***Safety:*** the settlement is situated 650m from the pipeline, the nearest house is 500m from the pipeline. • ***Project attitude:*** the attitude is generally positive. Settlements have high expectations of expropriation payments and upgrading of settlement roads by the construction company. 54% of those interviewed welcome potential employment opportunities, 36% see no benefits. • ***Land ownership and use:*** 60% of land is privately owned by the	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 39 (Map 39C) (KPs 751.3 – 767.):
North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

inhabitants with another 20% leased by the inhabitants. Landowners, however, do not possess title deeds (right of possession) for their land. Harmandali has established a water cooperative to allow wet agriculture/farming. There is no irrigation. • ***Settlement livelihood:*** dry agricultural activities (grain) are undertaken, however settlements are attempting to convert this to wet agricultural activities. In addition the inhabitants undertake bee keeping and provide transport. Cattle, sheep & poultry are farmed. • ***Availability & skills:*** food services, heavy vehicle drivers, mechanics, drivers, tree fellers and welders are available. • ***Accessibility:*** it is 16km to Altinyayla district centre. Transportation is very difficult during winter with muddy roads. The road is closed due to snow during January and February. • ***Information provision:*** 90% of the population is literate. • ***Infrastructure:*** piped water is supplied to households however the supply is irregular. There is no alternative water source. There is an electricity system and sewerage system, but no waste disposal system. • ***Services:*** there is a primary school with six teachers and 120 students; and a travelling midwife, but no health care centre. There is a small market and a coffee house. • ***Settlement problems:*** problems include unemployment, transport difficulties and poverty. It is considered to be a relatively poor settlement, however the local community is exerting effort to improve the settlement eg establishment of a water supply cooperative.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Land*** Potential complications in expropriation process. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **See Overview of Land Acquisition Process in Appendix C9.** **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300 metres from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of Land Acquisition Process in Appendix C9.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be

Social Impact Table 39 (Map 39C) (KPs 751.3 – 767.):
North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

		position for 15-20 days prior to moving back close to their original location.	facilitated by the Projects complaints procedure.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Skills and resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yesilyurt Mah (Alaca) (L) (P) (S/T)			
• ***Demographics:*** there are 220 inhabitants within 27 households.	**PUMP STATION IMPACTS:**		

Social Impact Table 39 (Map 39C) (KPs 751.3 – 767.):
North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

• ***Safety**:* the centre of the settlement is 2km from the pump station. • ***Project attitude:*** attitudes towards the pipeline project are generally positive. Respondents would welcome a pump station and perceive employment opportunities during construction. With regard to perceived problems inhabitants are concerned that the proximity of the pump station might disrupt the social balance of the settlement. There are also concerns over potential damage to land and roads. • ***Pump station site land ownership:*** privately owned (by Yazicik residents) • ***General Land ownership:*** 50% of the land is privately owned, and 5% is communal land. Diverse seasonal grazing occurs. There is no irrigation. • ***Settlement livelihood:*** agriculture (grain, vegetables, sugar beet), bee keeping, hunting and local government are all sources of livelihood. • ***Availability & skills:*** 73% of those interviewed would accept a temporary job working on the pipeline construction. • ***Accessibility:*** Roads are of reasonable quality. • ***Information provision:*** 100% of the population is literate. • ***Environmental & cultural sites:*** there is an ancient Hittite site. • ***Infrastructure:*** piped water is supplied to households. • ***Services:*** there is no sewerage system. There is a primary school and tradition health care methods are applied. • ***Settlement problems:*** problems include a poor sewerage system and flooding	The settlement will be a primary receptor of impacts resulting from construction of the pump station. See Sections 6 and 7 and the Overview of Land Acquisition Process in Appendix C9.. **PUMP STATION CONSTRUCTION CAMP IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction workers **PIPELINE IMPACTS:** ***Land*** Potential complications in expropriation process.	**Monthly community liaison** meetings will be held**.** **Preferential employment opportunities.** **Project to liase** with local health authorities. BTC Company will look at opportunities to cooperate in providing health awareness training. **See Overview of Land**	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts.** Benefits from raising health awareness of the workforce (many of whom will be local). Further positive benefits dependent on the scale of community investment activities. **See Overview of Land Acquisition Process in**

Social Impact Table 39 (Map 39C) (KPs 751.3 – 767.):
North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

		Acquisition Process in Appendix C9.	**Appendix C9.**
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**Significance cannot be established at this time**
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 39 (Map 39C) (KPs 751.3 – 767.):
North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

		construction.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Safak (L) **(T)**			
• ***Demographics:*** there are 510 inhabitants with seasonal migration of 10%. • ***Project attitude:*** attitudes are positive, although the inhabitants would like to receive more information on the proposed pipeline. • ***Land ownership & use:*** 90% of the land is privately owned by the inhabitants. Seasonal grazing and irrigation activities occur. • ***Settlement livelihood:*** agriculture, fishing, transport, tourism, bee keeping (150 households produce honey for their own consumption), construction, trade, education and local government are all sources of livelihood. • ***Accessibility:*** The settlement is accessible all year. • ***Information provision:*** 40% of the population is literate. Television, radio and the newspaper are the best information provision tools. • ***Infrastructure:*** piped water is supplied to households. • ***Settlement problems:*** problems include poor roads and unemployment.	***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 39 (Map 39C) (KPs 751.3 – 767.):
North of Pasakoy Settlement to South of Harmandali Settlement, Sivas Province

	Construction hazards: animals Trench poses safety hazard for livestock	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Environmental Impact Table 40 (Maps 40A and 40B) (KPs 767.5 – 787.6): Uzun Plateau, Sivas/Keysari Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Loamy-skeletal Xerochrepts on sloping uplands. • Mesic Typic Calcixerolls on undulating lands, especially those planted to rainfed cereals. • Fine-silty Xerofluvents near channels supporting pasture and riparian vegetation.	**Main potential impacts include:** • soil erosion; • sediment yield; • soil productivity; • channel alteration; • soil contamination.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed. Furthermore, soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
Landscape and Visual			
The route continues to keep to the higher ground where the plains are stony, open, sparsely-vegetated, and largely featureless, picking its way between a series of small rivers flowing through wide, flat-bottomed, extremely green valleys, bounded either side by very steep, almost cliff-like, scarp slopes of exposed marl that show white in the landscape. These valleys are covered with buttercups during the spring, forming bright yellow swathes across the landscape, and clumps of poplars and willows are present. Larger settlements are present along the valley edges. Landscape interest is limited and sensitivities low, except where views include the green river valleys where they become moderate to high.	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. This may be long-term or permanent where difficult to re-instate, or where ecological considerations prevent application of fertiliser. This is less important here than in previous locations due to the already eroded condition of the landscape.	Attempt a high rate of fertilisation using NPK + micro-nutrients in combination with mulch such as choir fibre.	**MINOR IMPACT** Exposed marl may retain its whitish colour and show as a white line across the landscape, although this may be less conspicuous here than in previous locations due to the already eroded condition of the landscape.
Ecology			
Important Ecological Factors ESA 53 (KP 778.22 – 779.17) is identified due to the presence of the nationally threatened, endemic *Paronychia cataonica.*	Habitat destruction may result in the loss of individuals from the population of the	Threatened plant species will be identified and located during pre-construction surveys within ESA	**MODERATE IMPACTS** due to short-term disturbance to important flora within the ESA

Environmental Impact Table 40 (Maps 40A and 40B) (KPs 767.5 – 787.6): Uzun Plateau, Sivas/Keysari Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	nationally threatened species.	53. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW.	53. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2).

Social Impact Table 40 (Map 40C) (KPs 767.5 – 787.6): Uzun Plateau, Sivas/Keysari Province Border

MAP 40: PROJECT INFORMATION			
There is no pump station, construction camp or block valve station in the area.			
MAP 40: MAP HIGHLIGHTS			
• Methiye Pond in area. • Major land uses are rain-fed agriculture, pastures and meadows.			
MAP 40: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted**:* two settlements on this map will be directly impacted by the pipeline project (Taslihoyuk & Methiye). They will both have land intersected (L) by the proposed pipeline. Taslihoyuk is within 500m of the pipeline route (D). None are within 5km of a construction camp, pump station, or within 2km of a block valve station. Settlements impacted by traffic have not yet been identified. There are no settlements downstream of a river/ creek crossing. • ***Surveyed:*** three settlements (Taslihoyuk, Kizilhoyuk, Altinyayla) were surveyed in the field (S) and two settlements (Methiye and Denizyas) were surveyed by telephone (T). • ***Not on map:*** Altinyayla, Denziyas, Tuzlacayir • ***Disclosure Meeting Location:*** Taslihoyuk			
SITE SPECIFIC CHARACTERISTICS			
Taslihoyuk (L) (D) (S)	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
• ***Population**:* 700 inhabitants reside in the settlement, there are 100 households. • ***Safety:*** the settlement is situated 750m from the pipeline and 400m from the nearest house. • ***Health:*** the poor sewerage system and lack of potable water network results in poor health. • ***Project attitude:*** attitudes are generally positive, however, concern exists that agricultural fields will decrease in size due to the pipeline passing arable land, leading to loss of income. No irrigation is undertaken. • ***Land ownership & use:*** 50% of land is privately owned by inhabitants with another 40% communal land. Seasonal grazing occurs.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 40 (Map 40C) (KPs 767.5 – 787.6): Uzun Plateau, Sivas/Keysari Province Border

• ***Settlement livelihood:*** agriculture (grain), trade and transport are the main sources of livelihood. • ***Availability & skills:*** drivers and welders are available. 73% of those interviewed would accept temporary employment on the pipeline construction. • ***Accessibility:*** the settlement is 14km from Altinyayla district centre. • ***Information provision:*** 90% of the population is literate. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. There is no alternative water source. • ***Services:*** there is an electricity supply but no sewerage or waste disposal systems, there are no health care facilities. There is a primary school. • ***Settlement problems:*** problems include conflict within the settlement that divides the community in two. There are also transport difficulties and a lack of water.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Land*** Potential complications in expropriation process.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **See Overview of Land Acquisition Process in Appendix C9.**	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **See Overview of Land Acquisition Process in Appendix C9.**

Social Impact Table 40 (Map 40C) (KPs 767.5 – 787.6): Uzun Plateau, Sivas/Keysari Province Border

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Kizilhoyuk (S)			
• ***Demographics:*** there are 450 inhabitants with 70 households. • ***Safety:*** the settlement is situated 2.5km from the pipeline and 2.4km from the nearest house. • ***Health:*** a poor sewerage system leads to poor health. • ***Project attitude:*** attitudes towards the project are generally positive. • ***Land ownership & use:*** 50% of land is privately owned by inhabitants, with another 30% leased by the inhabitants. There is a lack of title deeds. Seasonal grazing occurs but there is no irrigation. • ***Settlement livelihood:*** agriculture (grain, vegetables), bee keeping, construction and trade are the main sources of livelihood. • ***Accessibility:*** it is 12.2km to district centre. There is poor accessibility to the settlement in January. • ***Information provision:*** 90% of the population is literate. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular and there is no alternative water source. There is electricity supply, but no sewerage or waste disposal system. • ***Services:*** there is a primary school and a market, but no health care centre. • ***Settlement problems:*** low incomes, poor sewerage system and poor roads are all problems for the settlement. • ***Other:*** there have been requests from inhabitants that the construction company improve roads and a sewerage system for the settlement.	***Accessibility to recruitment*** Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Altinyayla (S)			
• ***Demographics:*** there are 5,600 inhabitants. • ***Safety****:* the settlement is situated 7.5km from the pipeline. • ***Project attitude:*** attitudes towards the pipeline are positive.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations	Contractor will **consult** with authorities to determine maximum acceptable time	**If irrigation water is disrupted** longer than time considered acceptable by

Social Impact Table 40 (Map 40C) (KPs 767.5 – 787.6): Uzun Plateau, Sivas/Keysari Province Border

• ***Land ownership:*** 90% of land is privately owned by inhabitants, 4% is state owned. Irrigation occurs, however, there is no seasonal grazing. • ***Settlement livelihood:*** agriculture (diverse, including sugar beet), bee keeping, transportation, trade, education and local government are the main sources of livelihood. • ***Accessibility:*** the settlement is a district centre • ***Information provision:*** 90% of the population is literate. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. There is no alternative water source. • ***Services:*** there is a primary school, and a health care centre with a doctor and a midwife. • ***Settlement problems:*** problems include no insurance and financial problems.	of flow from spills or increase in sedimentation.	for disruption.	authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Denizyas (T)			
• ***Population****:* 2,050 inhabitants reside in the settlement. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive towards the project. • ***Land ownership & use:*** the primary landowners are the inhabitants (80%). No seasonal grazing occurs and irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (5 households produce honey for their own consumption), fishing, hunting, transport, manufacturing, construction, trade, education and local government. • ***Accessibility:*** The settlement is accessible all year. • ***Information provision:*** 85% of the population is literate. Television and the newspaper are the best information provision tools. • ***Infrastructure:*** piped water is supplied to households. • ***Settlement problems:*** poor roads, construction problems and unemployment are the main problems for the settlement.	***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing. ***Hunting*** Temporary reduction in game due to disturbance during construction.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure. Project to **establish level of hunting** in settlements prior to construction.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full. **Significance cannot be established at this time**

Social Impact Table 40 (Map 40C) (KPs 767.5 – 787.6): Uzun Plateau, Sivas/Keysari Province Border

		Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Tuzlacayir (L) **(T)**			
• ***Demographics:*** there are 100 inhabitants with seasonal migration of 35%. • ***Safety:*** the settlement is situated 1.3km from the pipeline, the nearest house is 1.2km from the pipeline. • ***Project attitude:*** attitudes towards the pipeline are mixed. The inhabitants are concerned about the project as the natural gas pipeline affected them badly. • ***Land ownership & use:*** the primary landowners are the inhabitants (70%). No seasonal grazing occurs but irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (seven households produce honey as their main source of income) and the local	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Irrigation***	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. Contractor will **consult** with	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **If irrigation water is**

Social Impact Table 40 (Map 40C) (KPs 767.5 – 787.6): Uzun Plateau, Sivas/Keysari Province Border

produce honey as their main source of income),and the local government are the main sources of livelihood. • ***Accessibility:*** it is 24km to the district centre of Refahiye. The settlement is accessible all year. • ***Information provision:*** 70% of the population is literate. Television, newspaper and the Muhtar are the best information provision tools. • ***Environmental & cultural sites:*** there is a mausoleum • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. A settlement fountain provides an alternative water source. • ***Settlement problems:*** the main problems are poor infrastructure, poor drinking water quality and unemployment.	Potential loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation. ***Accessibility to recruitment*** Decreased access to recruitment process. ***Negative experience*** Possible **opposition** to project and **increased sensitivity** to any negative impacts.	authorities to determine maximum acceptable time for disruption. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. BOTAŞ is currently determining how existing concerns can be identified and resolved. **Additional meetings** may be required in these communities during construction, to ensure that any negative impacts are	**disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No residual impact expected.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. Level of residual impact will depend on degree to which concerns are resolved prior to construction.

Social Impact Table 40 (Map 40C) (KPs 767.5 – 787.6): Uzun Plateau, Sivas/Keysari Province Border

		rapidly identified. **Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings.**	

Environmental Impact Table 41 (Maps 41A and 41B) (KPs 787.6 – 805.8): Uzun Plateau, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Truncated or severely eroded Mesic Loamy-skeletal Xerochrepts on scarps and upper slopes of rolling terrain. These are visibly eroded on the scarp north of the Zamanti River. • Mesic Typic Calcixerolls on undulating and lower slopes of rolling terrain. • Minor inclusions of fine-silty Xerofluvents near channels supporting grazed meadow and riparian vegetation.	Main potential impacts include: • soil erosion; • sediment yield; • soil productivity; • channel alteration.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
Landscape and Visual			
The route continues to follow the upland stony, open, sparsely-vegetated, and largely featureless landscape. (elevations between 1,600 and 1,800m) before descending c. 70m to cross the flood plain of the Zamanti River between KPs 796.4 and 797.0. Occasional shallow, V-shaped drainage channels cut across the RoW, but these become increasingly rare as one continues south-west along the pipeline route. Riparian vegetation is limited to major streams, in particular the Zamanti River whose valley bottom comprises marshland and wet meadows rich in orchids and wildlife. Landscape sensitivity is generally low, except in this locally high quality river setting. The RoW turns gradually southward towards Pinarbasi by passing over rolling terrain (elevation 1,600 - 1,700m) with minor elements of moderately steep land. South of KP 795 it drops 80m to cross two minor reaches of the Hilmiye tributary to the Zamanti River. Wetland vegetation occupies the stream's channels and minor portions of the flood plain, but this rapidly gives way to grazed meadow. BVS-041 and BVS-042 will be located at KP 788.5 and KP 797.2,	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. May be long-term or permanent where difficult to re-instate, or where ecological considerations prevent application of fertiliser. This is less important here than in previous locations due to the already eroded condition of the landscape. The wet meadows and marshland either side of the Zamanti River are extremely sensitive and will show a long-term/ permanent scar unless	• Cut irrigation during construction. Clean channel on completion of work. • Attempt a high rate of fertilisation using NPK + micro-nutrients in combination with mulch such as coir fibre • Apply 'Soils' reinstatement specifications above. Measures to reduce the impact of heavy machinery will be taken when crossing the valley bottom of the Zamanti River. These will include narrowing the route to the absolute minimum; removal, storage, nurture and replacement of turfs; and the use of moveable	**MODERATE IMPACT** The wet meadows/ marshland in the Zamanti valley will inevitably experience some damage from the route's crossing, but if undertaken with care and sensitivity, this will last no more than a year or two. **MINOR IMPACTS** elsewhere as exposed marl may retain its whitish colour and show as a white line across the landscape, although this may be less conspicuous here than in previous locations due to the already eroded condition

Environmental Impact Table 41 (Maps 41A and 41B) (KPs 787.6 – 805.8): Uzun Plateau, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
respectively. BVS-041 lies within cultivated land and BVS-042 in plain steppe. Approximately 350m^2 of permanent landtake required with each BVS. New access roads will be constructed to these sites c. 60 m in length for BVS-041 and c. 45m for BVS-042	care is taken with heavy machinery. Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	equipment mats on the underlying soils to spread vehicle weight and avoid deep rutting. Construction will be undertaken at the driest time of the year (ie between July and September). There will be no storage of materials, pipe or topsoil on sensitive marshy soils.	of the landscape.
Surface Waters			
The pipeline route crosses Zamanti River, which is an important for both aquatic vegetation and fauna. River channel is irregular and meandering with a rectangular cross-section at the meander inflection point. Width of crossing is 25m and the bank-full width is between 15 and 21m, although the floodplain is c. 750m wide. Bed consists of silt and river flow is perennial of a uniform and tranquil type. Bank side vegetation comprises reeds and sedges and land use type is hay and grazing. An irrigation offtake is approximately 3.5km upstream. Water quality samples taken 170m downstream of the crossing point indicate that this is a Class IV river.	Direct disturbance to bank and bed morphology through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in already poor water quality. Potential for short -term sedimentation and turbidity. Potential impacts on downstream ecology and water abstraction for human use.	Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, for the protection of surface waters, Including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench. Assess need for alternative water supply for downstream communities and provide where necessary if sedimentation and turbidity persist for more than 3 days at the community.	**MINOR IMPACT** Disturbance will be short-term and limited to the immediate working area. Sedimentation of Zamanti River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Ecology			
Important Ecological Factors The Zamanti River floodplain (KP 796.4 and KP 797.0) is identified as an Ecologically Sensitive Area, (ESA 36), largely because of its fragility. It is a broad, orchid-rich, marshy grass floodplain (c. 600m in length), crossed by the pipeline route north-west of Ucpinar Settlement, growing on deep layers	Loss of wet meadow and marsh habitats containing abundant orchids.	Zamanti River floodplain will be crossed with utmost sensitivity. The crossing will be undertaken outside of the breeding season, (ie	**MODERATE IMPACTS** Short-term disturbance to globally-threatened plants within ESA 37 and locally important flora, although not

Environmental Impact Table 41 (Maps 41A and 41B) (KPs 787.6 – 805.8): Uzun Plateau, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
of soft, wet, peat-like humus-rich sediments. Although no globally or nationally-threatened plants have been located, the marsh supports many flowering plants amongst which the abundance of Bog Orchids (*Orchis palustris*) is notable. The floodplain also acts as an important stopover point for migrant waders and a breeding site for other waders and riparian species. Totals counted within 1km either side of the pipeline centreline on 16.05.2001 include – Little Egret 5; Grey Heron 3; White Stork 1; Ruddy Shelduck 2; Common Crane 2 (nationally-threatened); Black-winged Stilt 3; Lapwing 4; Redshank 4; Wood Sandpiper 42; Ruff 125; Black-headed Wagtail 21; Yellow Wagtail 1; Whinchat 3 (nationally-threatened); Sedge Warbler 10; and Icterine Warbler 1 (nationally-threatened). The protection status for these species are given in Table 5.21, Section 5. The European Pond Turtle (globally-threatened) was recorded at the Zamanti River. The protection status for this species is given in Table 5.21, Section 5. ESA 37 is identified between KP 797.8 and KP 798.4 for the globally-threatened plant species (*Campanula strigillosa*). The IUCN status for this species is given in Table 5.20, Section 5. The Zamanti River supports breeding and migratory fish species of high commercial value - brown trout (*Salmo trutta magrosligma*), breeding between December to February, and European eel (*Anguilla anguilla*), breeding from April to August and migrating between September and March.	Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods. Temporary localised disturbance to globally-threatened reptile species between May and September inclusive. The European Pond Turtle typically mates in May, with eggs (up to 10 per clutch) laid amongst the roots of waterside vegetation in June. Incubation period is dependent upon variable by temperature, but is generally in the order of 70 days. Hatchlings emerge August – September. Habitat destruction of plain steppe in ESA 37 may result in the loss of individuals from populations of globally-threatened plants. Temporary disturbance to	April to July inclusive), to minimise disturbance to breeding birds and returning autumn migrants. Heavy machinery working on the marsh will use balloon tyres or be supported on moveable equipment mats plates or similar. Vegetation will be lifted as turfs, marked, nurtured and kept wet while being stored, and replaced in sequence. In advance of construction works associated with the Zamanti River crossing, riverside vegetation will be cleared between beginning of October and end of April, ie outside of the breeding season for the European Pond Turtle. Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 37. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as	globally or nationally-threatened, within ESA 36. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACTS** only to the globally-threatened European Pond Turtle, where the specified mitigation measures identified for the seasonal sensitivity are applied during the construction period. **MINOR IMPACTS** at most for all fish species if construction

Environmental Impact Table 41 (Maps 41A and 41B) (KPs 787.6 – 805.8): Uzun Plateau, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	commercially important fish and aquatic plants providing breeding sites for these species during construction across the Zamanti River.	described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during re-instatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 37.Construction activities at river crossings will not be permitted during the breeding season of fish species that are of high commercial value or that are designated has having conservation importance. For construction activity to be permitted during the breeding season of fish species with medium commercial value, the Contractor will be required to submit specific mitigation measures to avoid impacting breeding fish to BOTAŞ for approval. Such measures might include, but not be limited to, the following: preconstruction survey results indicating that spawning	takes place during August to November inclusive. At other times of year (varying by species), impacts will generally be **MINOR** on the basis of the rigid application of water crossing mitigation measures. Where construction is undertaken during the breeding season, impacts may be **MODERATE** on highly commercially valuable migrating brown trout and European eel. Additional mitigation will be required to allow passage of fish past the works during construction. Impacts to other fish species will be **MINOR**.

Environmental Impact Table 41 (Maps 41A and 41B) (KPs 787.6 – 805.8): Uzun Plateau, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		grounds are avoided, the provision of fish passages, etc, in addition to the generic mitigation measures that are required at all river crossings.	
Archaeology and Cultural Heritage			
Hilmiye Graveyard (1st Degree Site) – a Turkmen cemetery from the Ottoman Period, located to the west of the Pipeline. This site appears to have been destroyed. * This site has not yet been registered by the MoC and is provisionally assigned this classification. The site has been proposed for registration by the regional preservation council The following have also been proposed for registration: (i) Hacitim Hill; (ii) Roman Bridge and Road	Potential for site to experience direct impacts, such as ground disturbance, during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	The pipeline has been re-routed to avoid this site. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to the temporary disturbance of the site setting and peripheral features.

Kayseri Socio-Economic Overview

Demographics:
Kayseri is the third largest pipeline province (974,000 inhabitants) with 64% of its population living in urban areas (the second most urbanised of the pipeline provinces). The average household size is six, mirroring the survey average and reflecting a traditional, patri-local* family structure and a preference for more children. The province experiences the third highest density levels (56 inhabitants per km2). Some out-migration is experienced in both rural and urban areas. In some settlements, inhabitants migrate to Sariz, the district centre to enable access to secondary schools for their children (particularly in winter). Although there has been some out-migration, the culturally 'conservative' structure of some settlements (local residents are generally of the Avşar Turkish tribe) and relatively more abundant agricultural assets has worked against this trend. The findings suggest that historically there have been conflicts between the local residents and between different groups in the region. Until recently, intermarriage between settlements was not experienced and women were rarely exposed to 'outsiders'. This more conservative attitude was evident in the reluctance to allow females to attend consultation meetings although this was not always the case, and in one settlement, young single educated women requested work on the construction camps.

Land:
Private ownership, followed by communal ownership is most common. The province exhibits high levels of inequality and land polarisation. Local residents generally lack title deeds and instead, families have only the right of possession.

Livelihoods:
Local residents in Kayseri are relatively wealthier than in other parts of Inner Anatolia. However, non-protective policies of the 1980s had a negative effect on these settlements. Economies are based on agriculture and animal husbandry.

Infrastructure & Services:
Infrastructure is inadequate and the majority of local residents do not have adequate drinking water or sewerage systems. There is insufficient water for home use, irrigation and animal husbandry. Almost all settlements have access to grid electricity, but lack proper energy for heating. Literacy amongst surveyed respondents is quite high, with the exception of elderly women. Almost 70% have attended primary or secondary school and 3% have attended university. Some settlements have primary schools whereas in others, children use free transportation (provided by the State) to travel to the closest settlement/ district centre to obtain primary education. However, in winter students face problems, notably because roads are often blocked. There are no medical centres with the exception of one settlement. Instead, residents use mobile nursing services and facilities in the district centres. This situation is deemed insufficient in emergencies. There are no other social services within the province, with the exception of transportation.

Key Problems:
Water shortages, which in some cases contribute to conflict, were rated as the predominant settlement-level problem. Other significant problems raised by respondents were high agricultural product prices (eg for diesel oil, fertilizer), reduced agricultural profit, and that unemployment was particularly high amongst young adults.

Project Attitude:
Inhabitants have had experience of the NGP Project. Avsar local residents suggested that attention should be paid to these more conservative settlements during construction.

Source: Household and Settlement Survey (2001)

Social Impact Table 41 (Maps 41C) (KPs 787.6 – 805.8): Uzun Plateau, Kayseri Province

MAP 41: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There are two block valves.

MAP 41: MAP HIGHLIGHTS

- Major land uses: rain-fed agriculture, pastures and meadows.
- Pipeline passes to the west of Hacitim Hill, ceramic shards from the Hittite period were observed.
- One creek and one river bisect the pipeline.
- Seasonal migration of 10% occurs in all settlements.
- Main economic activity is agriculture.
- Bee keeping, fishing and hunting activities undertaken in area.

MAP 41: IMPACTED AND SURVEYED SETTLEMENTS

- ***Impacted:*** Two settlements on this map will be directly impacted by the pipeline project (Ucpinar and Hilmiye). Both have land intersected by the proposed pipeline (L); none are within 5km of a pump station; one (Hilmiye) is within 500m of the pipeline route (D); and one (Ucpinar) is within 2km of the block valve station (B). Settlements impacted by traffic have not yet been identified. Two settlements are within 2km upstream of a river/creek, Hilmiye is upstream of the Hilmiye creek, and Ucpinar is upstream of the Zamanti River.

- ***Surveyed:*** Two settlements were surveyed by telephone (T).
- ***Not Surveyed:*** Viransehir.
- ***Disclosure Meeting Location:*** Hilmiye

SITE SPECIFIC CHARACTERISTICS	ADDDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Ucpinar (L) (D) (B) (T)			
• ***Demographics:*** 70 inhabitants, with a seasonal migration of 10%. • ***Safety:*** the pipeline is 1km from the centre of the settlement and 600m from the nearest house. • ***Project attitude:*** generally positive, with high awareness. • ***Land ownership & use:*** 90% of land is privately owned by the local residents. Irrigation is undertaken and seasonal grazing occurs. • ***Settlement livelihood:*** agriculture and bee keeping (four households for own consumption) are the mains sources of livelihood. 60% of respondents are family labourers and 40% are farmers.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 41 (Maps 41C) (KPs 787.6 – 805.8): Uzun Plateau, Kayseri Province

respondents are family labourers and 40% are farmers. • ***Accessibility:*** the settlement is 39 km from the district centre (Pinarbaşi). It is accessible all year all year round. • ***Information provision:*** 100% of the population is literate. Best information provision techniques are TV, newspaper and via the Muhtar. • ***Environmental & cultural sites:*** plateau. • ***Settlement problems***: low income.	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Construction hazards: animals Trench poses safety hazard for livestock	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover)	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 41 (Maps 41C) (KPs 787.6 – 805.8): Uzun Plateau, Kayseri Province

	essential for nectar production. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Block Valve Station*** See Environmental Impact Tables and the Overview of the Land Acquisition Process in Appendix C9	**Community liaison meetings:** issue to be discussed at meetings before and during construction. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Hilmiye (L) (D) (T)			
• ***Demographics****:* 248 inhabitants with seasonal migration of 10%. • ***Safety:*** the pipeline is 800m from the centre of the settlement and 450m from the nearest house.	***Construction hazards: humans*** Working areas pose safety	**Road safety training** will be held in schools prior to	**Continued attention** to mitigation measures will be

Social Impact Table 41 (Maps 41C) (KPs 787.6 – 805.8): Uzun Plateau, Kayseri Province

450m from the nearest house. • ***Project attitude:*** generally positive with high awareness levels. • ***Land ownership & use:*** local residents privately own 80% of land. Diverse grazing occurs. There is no irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (one household for own consumption), fishing (30 households for own consumption) hunting, construction and trade are the main sources of livelihood. 50% of respondents are family labourers and 50% are farmers. • ***Accessibility:*** the settlement is 32 km from the district centre (Pinarbaşi). The roads are of poor quality but are accessible all year round. • ***Information provision:*** 90% of the population is literate. The best information provision source is TV. • ***Settlement problems***: poor roads and inadequate childcare.	hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Bees*** Disturbance of any stationary hives located within 300m of the route.	construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives	critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee

Social Impact Table 41 (Maps 41C) (KPs 787.6 – 805.8): Uzun Plateau, Kayseri Province

		must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**Significance cannot be established at this time.**
	Accessibility of Information Sectors of the population	**Communication with settlement** must take into account settlement	**Any change can highlight and exacerbate existing divisions** in communities.

Social Impact Table 41 (Maps 41C) (KPs 787.6 – 805.8): Uzun Plateau, Kayseri Province

	may not have access to project related information on employment opportunities, potential disruption to utilities etc.	characteristics to ensure equal access to information for all residents.	Mitigation measures will keep this to a minimum.

Environmental Impact Table 42 (Maps 42A and 42B) (KPs 805.8 – 819.7): Parallel to the Zamanti River to South-East of Altiesik Settlement, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soils types from the previous section continue in this section of the route: • Truncated or severely eroded Mesic Loamy-skeletal Xerochrepts on scarps and upper slopes of rolling terrain. • Mesic Typic Calcixerolls on undulating and lower slopes of rolling terrain. • Minor inclusions of Fine-silty Xerofluvents near channels supporting grazed meadow and riparian vegetation.	Main potential impacts include: • soil erosion; • sediment yield; • soil productivity; • channel alteration.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed. Furthermore, soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
Landscape and Visual			
The route continues south across stonier rolling plains with sparse steppe vegetation interspersed with non-intensive cereal fields. Electricity cables cross the route at KP 804. Bare slopes are an important feature of the landscape, with rainfed cereals occupying valley bottoms. Minor areas of low-density forest occupy some slopes. The uniform landscape, with few areas of distinction will be relatively resilient to change.	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. This may be long-term or permanent where difficult to re-instate, or where ecological considerations prevent application of fertiliser. However, given the existing character of the landscape these changes will be of moderate significance condition of the landscape.	Apply 'Soils' reinstatement specifications above. Attempt a high rate of fertilisation in combination with mulch such as coir fibre.	**MINOR IMPACT** Landscape is considered to be of low sensitivity and generally resilient to change.
Arhchaeology and Cultural heritage			
(i) Roman Bridge - 1st Degree site* (ii) Hacitimpinari ridge - 1st Degree;* (iii) Roman bridge - 1st Degree;*			

Environmental Impact Table 42 (Maps 42A and 42B) (KPs 805.8 – 819.7): Parallel to the Zamanti River to South-East of Altiesik Settlement, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
*This site has not yet been registered by the Ministry of Culture (MoC) and is provisionally assigned this classification			

Social Impact Table 42 (Maps 42C) (KPs 805.1 – 819.7):
Parallel to the Zamanti River to South-East of Altiesik Settlement, Kayseri Province

MAP 42: PROJECT INFORMATION

There are no pump stations, construction camps or block valve stations in the area.

MAP 42: MAP HIGHLIGHTS

- Major land use is rain fed agriculture, pastures and meadows (but no animal breeding).
- There is an archaeological site (Roman bridge) 600m west of pipeline.

MAP 42: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted****:* four settlements on this map will be directly impacted by the pipeline project. They all have land intersected by the proposed pipeline (L) (Tasoluk, Alamescit, Asagi Kizilcev, Altiesek). None are within 5km of a pump station, or within 2km of a block valve station, and none are within 500m of the pipeline route. Settlements impacted by traffic have not yet been identified. No settlements are downstream of a river.

- ***Surveyed****:* one settlement (Tasoluk) was surveyed in the field (S) and all four settlements were surveyed by telephone (T).

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Tasoluk (L) **(S) (T)**			
• ***Demographics:*** 85 inhabitants with 16 households and seasonal migration of 50%. • ***Safety:*** the pipeline is 2.6km from the centre of the settlement and 2.4km from the nearest residence. • ***Project attitude:*** generally positive with high awareness, although it will be important that passage for tractors across the pipeline construction area is possible, and that dedicated animal crossing points are established. Women with high school education are eager for any opportunities to work at the construction camps. The majority of respondents would welcome a construction camp. 36% of households would benefit from direct employment, 27% expressed concern of noise/dust and 18% expressed concern about road damage/traffic. • ***Land ownership & use:*** 90% of land is owned by the local residents. Grain is cultivated and there is livestock breeding. Seasonal grazing occurs in April & May and September &	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Drinking water for animals*** Increased sediment up to 1km downstream of river crossing. ***Accessibility of information*** Sectors of the population may not have access to project related	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. Settlement to be advised to water their animals upstream or more than 1km downstream. **Communication with settlement** must take into account settlement	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No residual impact.** **Any change can highlight and exacerbate existing divisions** in communities.

Social Impact Table 42 (Maps 42C) (KPs 805.1 – 819.7):
Parallel to the Zamanti River to South-East of Altiesik Settlement, Kayseri Province

October. There is no irrigation. Concern over the potential impact of dust associated with construction on cultivated land. • ***Settlement livelihood:*** agriculture and tourism are the main sources of livelihood. • ***Availability & skills:*** tractor drivers and vehicle drivers are available. 73% of respondents would accept a temporary job. • ***Accessibility:*** the settlement is 6km from the district centre. Roads are of poor quality and are not accessible during February and March. • ***Information provision:*** 100% of the population is literate. Best local information provision sources are TV, the newspaper, family and via the Muhtar. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. There is electricity supply and telephone systems but no sewerage or waste disposal system • ***Services:*** there is no primary school and no health care centre, however, there is access to a travelling health care team. • ***Settlement problems***: unemployment, low income, poor roads, no irrigation canals and supply of water for cattle is inadequate. • ***Other***: daily use of Zamanli stream 5km from the settlement for animal drinking water. Note: this stream is the settlement's only water source for animals and crosses the pipeline.	information on employment opportunities, potential disruption to utilities etc ***Sensitive crops (cotton)*** Dust may affect yields of crops essential for subsistence or commercial livelihoods. ***Accessibility to recruitment*** Decreased access to recruitment process	characteristics to ensure equal access to information for all residents. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	Mitigation measures will keep this to a minimum. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Alamescit (L) **(T)**			
• ***Demographics****:* 50 inhabitants with seasonal migration of 90%. • ***Safety:*** the pipeline is 3.5km from the centre of the settlement and 2.4km from the nearest residence. • ***Project attitude:*** generally positive with good awareness of the project. The majority of respondents would welcome a construction camp. • ***Land ownership & use:*** 100% of land is owned by the local residents. Predominantly subsistence agriculture is undertaken.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. .	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 42 (Maps 42C) (KPs 805.1 – 819.7):
Parallel to the Zamanti River to South-East of Altiesik Settlement, Kayseri Province

There is no irrigation and no seasonal grazing. • ***Settlement livelihood:*** agriculture is the main source of livelihood and 100% of respondents are family labourers. • ***Accessibility:*** the settlement is 21km from Pinarbasi district centre. Poor roads, however the settlement is accessible all year. • ***Information provision:*** Turkish & Cerkezish is spoken. 100% of the population is literate. Best information provision tools are TV, radio, friends & family, and via the Muhtar. • ***Infrastructure:*** piped water is supplied to households. There is a regular supply, no alternative water source • ***Settlement problems***: inadequate access to water, unemployment and poor roads.	***Accessibility to recruitment*** Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Asagi Kizilcev (L) (T)			
• ***Demographics****:* 50 inhabitants with seasonal migration of 20%. • ***Safety:*** the pipeline is 2.4km from the centre of the settlement and 2.2km from the nearest residence. • ***Project attitude:*** no hostility and good awareness. A construction camp would be welcomed. • ***Land ownership & use:*** 50% of land is privately owned by the local residents. Seasonal grazing occurs. Irrigation occurs. • ***Settlement livelihood:*** agriculture, bee keeping (two households for own consumption), manufacturing, construction, transport and trade are the main sources of livelihood. • ***Availability & skills:*** previous experience of a bridge construction project • ***Accessibility:*** 18km to Pinarbasi district centre. Poor quality roads. Accessible throughout the year. • ***Information provision:*** Turkish & Cerkezish is spoken. 100% of the population is literate. Best information provision tools are TV, radio, press, family, friends, and via the Muhtar.	***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

Social Impact Table 42 (Maps 42C) (KPs 805.1 – 819.7):
Parallel to the Zamanti River to South-East of Altiesik Settlement, Kayseri Province

• ***Environmental & cultural sites:*** graveyard. • ***Infrastructure:*** piped water is supplied to households however supply is irregular. The settlement fountain provides an alternative water source • ***Settlement problems***: inadequate access to water, infrastructure problems and poor roads.		sources of water to be provided.	
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 42 (Maps 42C) (KPs 805.1 – 819.7):
Parallel to the Zamanti River to South-East of Altiesik Settlement, Kayseri Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Altiesek (L) **(T)**			
• ***Demographics:*** 97 inhabitants with seasonal migration of 5%. • ***Safety:*** the pipeline is 2.5km from the centre of the settlement and 2.2km from the nearest residence. • ***Project attitude:*** positive with good awareness. A construction camp would be welcomed. • ***Land ownership & use:*** 90% of land is privately owned by local residents, of which 40% is leased by other local residents. Irrigation occurs. There is no seasonal grazing. • ***Settlement livelihood:*** main economic activity is agriculture. 60% of the population are family labourers. • ***Availability & skills:*** previous experience – Tekfen project • ***Accessibility:*** The settlement is not accessible during December or January. • ***Information provision:*** Turkish & Cerkezish is spoken. 75% of the population is literate. Best information provision sources are TV, radio, press and via the Muhtar. • ***Environmental & cultural sites:*** mausoleum • ***Infrastructure:*** piped water is supplied to households, regular supply and there is no alternative water source. • ***Settlement problems***: low income and unemployment.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility to recruitment*** Decreased access to recruitment process ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Environmental Impact Table 43 (Maps 43A and 43B) (KPs 819.7 – 834.3): North of Asagi Borandere Settlement to East of Karagoz Creek, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Typic Calcixerolls on undulating lands. • Loamy-skeletal Xerochrepts on slopes. • Mesic Typic Xerofluvents in floodplains.	Main potential impacts: • soil erosion. • sediment yield. • soil productivity. • channel alteration.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
The route continues over stony rolling plains with sparse steppe vegetation interspersed with non-intensive cereal fields. It crosses a major highway near KP 813 and then in quick succession, the Kirkpinar and Asmacasuyu Creeks. This 2km section presents a more varied landscape of heavily cultivated valleys (with hay meadows, cereals and pasture) and settlement (including the settlements of Asagi Borandere and Yukari Borandere, which lie close to the route). The lightly-forested Tahtali Mountains form an ever-more prominent backdrop. Landscape values are low. BVS-043 will be located at KP 826.5 within cultivated land. Approximately 350m^2 of permanent landtake will be required. A new access road will be constructed to the site of c. 20m^2 in length.	Formation of conspicuous whitish line across landscape where pale-coloured marl is exposed. This may be long-term or permanent where difficult to re-instate, or where ecological considerations prevent application of fertiliser. Most prominent in valley bottoms. Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	Attempt a high rate of fertilisation in combination with mulch such as coir fibre.	**MINOR IMPACT** Landscape considered to be of low sensitivity and generally resilient to change.
Noise			
Yukari Borandere settlement is located c. 212m from the centreline of the	Short-term noise impacts are	The following mitigation measures	**MINOR IMPACT**

Environmental Impact Table 43 (Maps 43A and 43B) (KPs 819.7 – 834.3): North of Asagi Borandere Settlement to East of Karagoz Creek, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Pipeline.	expected to occur at Yukari Borandere during soil stripping activities.	will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings and where possible, utilising existing screening, including that arising from the stockpiling of materials. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	Short-term noise impacts are expected to occur during soil stripping. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days.

Social Impact Table 43 (Maps 43C) (KPs 819.7 – 834.3):
North of Asagi Borandere Settlement to East of Karagoz Creek, Kayseri Province

MAP 43: PROJECT INFORMATION			
There are no pump stations or construction camps in the area. There is one block valve station.			
MAP 43: MAP HIGHLIGHTS			
• Rain fed agriculture is the main land use. There are also areas of pasture and irrigated agriculture, and low density forests. • The pipeline crosses the Kirkpinar river, the Asmacasuyu river and a national highway.			
MAP 43: SURVEYED AND IMPACTED SETTLEMENTS			
• ***Impacted:*** Two settlements on this map will be directly impacted by the pipeline project (Asagi Borandere, Yukari Borandere). They both have land intersected by the proposed pipeline (L) and both are within 500m of the pipeline route (D). No settlements are within 5km of a pump station. One settlement (Yukari Borandere) is within 2km of the block valve station (B). Settlements impacted by traffic have not yet been identified. One settlement (Asagi Borandere) is downstream of the pipeline on the Asmacasuyu River. • ***Surveyed:*** Two settlements (Asagi Borandere, Yukari Borandere) were surveyed by telephone (T). • ***Disclosure Meeting Location:*** Yukari Borandere			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Asagi Borandere (L) (D) (R) (T)			
• ***Demographics:*** 1,208 inhabitants with no seasonal migration. • ***Safety:*** the pipeline is 700m from the centre of the settlement and 500m from the nearest residence. • ***Project attitude:*** generally positive with no major concerns. In addition, the majority of respondents would welcome a construction camp. • ***Land ownership & use*****:** 90% of land is privately owned by the local residents. Irrigation is undertaken. There is no seasonal grazing. • ***Settlement livelihood:*** agriculture, bee keeping (one household produces honey for own consumption) and forestry are the main sources of livelihood. 75% of respondents are family labourers. • ***Availability & Skills:*** no previous experience. • ***Accessibility:*** 17.5km to the district centre (Pinarbaşi). The settlement is accessible all year.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 43 (Maps 43C) (KPs 819.7 – 834.3):
North of Asagi Borandere Settlement to East of Karagoz Creek, Kayseri Province

settlement is accessible all year. • ***Information provision:*** 75% of the population is literate. The best information provision tool is TV. • ***Infrastructure:*** piped water is supplied to households however supply is irregular. An artesian well is an alternative water source. • ***Settlement problems***: inadequate access to water and inadequate health care.	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Forestry Loss of a resource used by settlements. Increased expenditure on other fuel sources.	If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.

Social Impact Table 43 (Maps 43C) (KPs 819.7 – 834.3): North of Asagi Borandere Settlement to East of Karagoz Creek, Kayseri Province

		compensation will be facilitated by the Projects complaints procedure.	
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Access to information: Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 43 (Maps 43C) (KPs 819.7 – 834.3):
North of Asagi Borandere Settlement to East of Karagoz Creek, Kayseri Province

		include emphasising oral communication where literacy is low.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yukari Borandere (L) (D) (B) (T)			
• ***Demographics:*** 170 inhabitants with 10% seasonal migration. • ***Safety:*** the pipeline is 450m from the pipeline and 200m from the nearest residence. • ***Project attitude:*** generally positive with no major concerns. A construction camp would be welcome. • ***Land ownership & use*****:** 90% of land is privately owned by local residents. Irrigation activities are undertaken. There is no seasonal grazing of livestock. • ***Settlement livelihood:*** agriculture, bee keeping (six households produce honey for their own consumption), forestry, fishing (by one household, as one of many income sources) and trade are the main sources of livelihood. 60% of respondents are family labourers. • ***Accessibility:*** 21km to the district centre (Pinarbaşi). The settlement is accessible all year. • ***Information provision:*** 95% of the population is literate. The best information provision tools are TV and via the Muhtar. • ***Infrastructure:*** piped water is supplied to households however supply is irregular. There is no alternative water source. • ***Settlement problems:*** unemployment, delays in payment from selling agricultural products and forest fields.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee

Social Impact Table 43 (Maps 43C) (KPs 819.7 – 834.3): North of Asagi Borandere Settlement to East of Karagoz Creek, Kayseri Province

		must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Forest Loss of a resource used by settlements. Increased expenditure on other fuel sources.	If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow,

Social Impact Table 43 (Maps 43C) (KPs 819.7 – 834.3):
North of Asagi Borandere Settlement to East of Karagoz Creek, Kayseri Province

	in sedimentation. ***Access to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Block Valve Station*** See Environmental Impact Tables and Overview of the Land Acquisition Process in Appendix C9	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Environmental Impact Table 44 (Maps 44A and 44B) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Loamy-skeletal shallow Xerochrepts on slopes. • Channel sands, gravel, cobbles and boulders.	Main potential impacts: • soil erosion; • sediment yield; • soil productivity; • channel alteration.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings (erect a geo-fabric silt-fence type barrier between Kevenli Creek and construction).	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
Following the extensive plateau land to the north, the route now enters a more diverse terrain. The route enters the very narrow, steep-sided, rocky, Kirkgecit Valley and follows it for some 4km. The valley's, slopes are lined with juniper scrub and a small tree-lined river meanders through meadows. Mountainous terrain rises above it. The steepness of the valley, the intimacy of the scenery, and the large contrast between the valley floor and the harsher slopes provide landscape interest. Landscape sensitivity is moderate. At the southern end, the valley opens out into flower-rich lush meadows with a crystal clear river where landscape quality is high. The route climbs over a ridge at 1,960m asl from where striking views look southwards towards the snow-capped peaks of the Taurus mountains. The route then begins to descend through this undulating steppe terrain whose landform and sparse vegetation will be relatively resilient to the BTC Pipeline.	Intimacy of landscapes within the valley very vulnerable to impact since construction activities will be magnified by condensed views. Minor loss of trees and bushes. Wet meadows at southern entrance to valley particularly susceptible to damage. Thin soils on high level ridge may cause difficulties for reinstatement. Potential for short-term visual impact during construction for villagers in Yukan Borandere	• The pipeline has been re-routed away from the Kirkgecit Valley and now follows a ridgeline for about 6km, west of the current alignment, through sparse forests of juniper and oak and montane steppe habitat. • Reinstatement of pipeline route and re-establishment of any woodland vegetation that is lost (specific mitigation to be developed following site survey prior to the commencement of construction). • Particular attention will be paid to the control of dust, noise and	**MODERATE TO MINOR IMPACT** Residual impacts cannot be determined precisely at this stage since the re-route has not been subject to detailed survey. Upland habitat may be reluctant to re-establish quickly, but the re-route will affect a less sensitive landscape and predicted impacts are correspondingly reduced. **MINOR IMPACT** Given the relatively small size

Environmental Impact Table 44 (Maps 44A and 44B) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
BVS-044 will be located at KP 849.3 within cultivated land. Approximately 350m^2 of permanent landtake required. A new access road will be constructed of c. 20m in length. Yukan Borandere settlement lies c. 210m from the site.	settlement during construction of BVS-044.	to the control of dust, noise and traffic during construction at BVS-044.	of the block valve station and the temporary nature of construction activities, visual impacts are anticipated to be minor, subject to implementation of the specified mitigation measures.
Ecology			
Important Ecological Factors ESA 38 previously c. 10.5km of the previous route. This ESA is identified between KP 841.9 and KP 847.6 for eighteen globally-threatened plant species occur between KPs 833.9 – 846.7 (*Asyneuma linifolium spp. eximium, Phryna ortegioides, Silene caryophylloides spp. stentoria, Cerastium saccardoanum, Minuartia rimarum var. multiflora, Minuartia dianthifolia spp. cataonica, Senecio jurineifolius, Centaurea derderiifolia, Doronicum haussknechtii, Isatis huber-morathii, Salvia eriophora, Isatis aucheri, Crocus kotschyanus spp. cappadocicus, Thlaspi densiflorum, Graellsia davisiana, Muscari microstomum, Hyacinthella acutiloba* and *Fritillaria aurea*). This is the most concentrated area of globally-threatened plants along the entire route. In addition, another four globally-threatened plants (*Achillea goniocephala, Astragalus sparsipilis, Astragalus cymbibracteatus* and *Ferula longipedunculata*) are found adjacent to the route corridor parallel to ESA 38. The IUCN status for these species are given in Table 5.20, Section 5. Grey Wolf was recorded to the north-west of the route at KPs 835. This species is not globally-threatened and has no protection in Turkey, although it is protected under CITES, the Bern Convention and the EU Habitats Directive. Surveys were undertaken in mid-2002 to assess the ecology of the re-route between KP835 and KP 842. The surveys identified ESA 54 (KP 836.02-841.92) for the presence of a range of endemic species including two globally threatened endemic plant species – *Allium tauricola* and *Pimpinella anisetum*	Habitat destruction of forest and montane steppe may result in the loss of individuals from populations of globally-threatened plants. Potential for minor temporary impacts to wolves as hunting of this species is permitted in Turkey. However, this species is nomadic during spring and summer, which are the optimum months during which pipeline construction is likely to occur.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 38 and ESA 54. Diligence will be exercised in searching inside the corridor for those species known to occur just outside of the corridor. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture	**MODERATE IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for wolves with the application of the specified mitigation measures.

Environmental Impact Table 44 (Maps 44A and 44B) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
anisetum.		until replacement during reinstatement of the RoW. In areas where the presence of wolves has been confirmed, education of workers to be alert and aware of the potential for interactions will include refuse management on sites (particularly where construction camps are located). Furthermore, workers must not wander alone in areas where wolves may be present, especially at night. The hunting of wolves or any other wildlife by the BTC Project personnel or contractors will be strictly forbidden and rigorously enforced.	
Noise			
Kirkgecit settlement is located c. 65m from the centreline of the Pipeline. Blasting may also be required in this area of the pipeline route.	Short-term noise impacts are expected to occur at Kirkgecit during soil stripping, welding and lowering, backfilling, bending and trenching activities. Blasting works are also expected to give rise to noise and vibration impacts at Kirkgecit.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings;	**MODERATE IMPACT** Due to the proximity of Kirkgecit to the Pipeline, noise impacts are expected to occur during soil stripping, welding/lowering, backfilling; bending/trenching activities and during blasting. Although noise and vibration from blasting may give rise to annoyance to residents, it is unlikely to cause structural damage to buildings.

Environmental Impact Table 44 (Maps 44A and 44B) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	The Contractor will carry out detailed noise and vibration predictions once the specific blasting methods have been developed. The proposed method of working and mitigation measures will be agreed with the relevant authorities in advance of works taking place. Residents will also be notified in advance of works involving blasting.
Archaeology and Cultural Heritage			
Salderesi Area is a 1st Degree Site*, which comprises two previously identified archaeological sites (Mecit Hill and Salderesi settlement). This site consists of a low settlement and mound and the ruined remains of a settlement on the north-east slope of the hill. Ceramic shards and the remains of an ancient settlement were observed during route narrowing investigations. Alafli Tower is a 1st Degree.site* Settlement on NE slope of Mecit Hill is a 1st Degree site* * These sites have not yet been registered by the MoC and is provisionally assigned this classification. Salderesi area is Proposed for Registration The following areas are also proposed for registration: (i) Kirkgecit mound; (ii) Kirkgecit caravanserai; (iii) Tumulus (Kirkgecit village)	Potential for the site to experience direct impacts, such as ground disturbance, during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	The pipeline has been re-routed to avoid the Salderesi Area. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Impacts will be limited to the temporary disturbance of the site setting and peripheral features.

Social Impact Table 44 (Map 44C) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

MAP 44: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There is one block valve station.

MAP 44: MAP HIGHLIGHTS

- Major land use is pasture. There are also some small areas of non-agricultural land and rain-fed agriculture.
- There are four archaeologically important sites in the area.
- The pipeline crosses the Kevenli river.

MAP 44: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** Four settlements on this map will be directly impacted by the pipeline project (Kirkgecit, Orensehir, Karapinar, Tekneli). They all have land intersected by the proposed pipeline (L). Two (Kirkgecit and Tekneli) are within 500m of the pipeline route (D) and none are within 5km of a pump station. Two (Koyukoy and Tekneli) are within 2km of the block valve station (B). Settlements impacted by traffic have not yet been identified. No settlements are downstream of a river crossing.

- ***Surveyed:*** One settlement was surveyed in the field (Tekneli) (S) and three settlements were surveyed by telephone (T).
- ***Not surveyed:*** Kevenli, Kotukoy and Tumulus.
- ***Not on map:*** Orensehir

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Kirkgecit (L) (D) (T)			
• ***Demographics:*** 270 inhabitants with 80% seasonal migration. • ***Safety:*** the pipeline is 350m from the centre of the settlement and 65m from the nearest residence. • ***Land ownership & use*****:** 60% of land is communal. Seasonal grazing occurs. There is no irrigation. • ***Settlement livelihood:*** agriculture, hunting and trade are the main sources of livelihood. 45% of respondents are family labourers. • ***Availability & skills:*** welders, lathe operators and levellers are present in the settlement. • ***Accessibility:*** 16km to the district centre (Pinarbaşi). The settlement is accessible throughout the year.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 44 (Map 44C) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

• ***Information provision:*** 90% of the population is literate. The best information provision tool is TV. • ***Environmental & cultural site:*** historical remnant. • ***Infrastructure:*** piped water is supplied to households however supply is irregular. A local spring and a settlement fountain provide alternative water sources. • ***Settlement problems***: poor roads, infrastructure problems and unemployment		construction work.	
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage will be compensated for.**
	Construction hazards: animals Trench poses safety hazard for livestock	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**High likelihood of a few accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9**	**See Overview of the Land Acquisition Process in Appendix C9**
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

Social Impact Table 44 (Map 44C) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**Significance cannot be established at this time**
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Orensehir (L) (T)			
• ***Demographics:*** 178 inhabitants with 1% seasonal migration. ***Safety:*** 3.6km to pipeline. • ***Land ownership & use*****:** 90% of land is privately owned by the local residents. Irrigation activities are undertaken. There is no grazing. • ***Settlement livelihood:*** agriculture, bee keeping (7 households produce honey for own consumption), fishing (30 households fish, it is one of many sources of income), construction, trade and education are the main sources of livelihood. 5% of respondents are in regular paid jobs and 70% are family labourers. • ***Accessibility:*** 38km to district centre. The settlement is accessible throughout the year.	***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats **if** within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.

Social Impact Table 44 (Map 44C) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

throughout the year. • ***Information provision:*** 100% of the population is literate. The best information provision tools are TV and the newspaper. • ***Environmental & cultural sites:*** castle. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems***: insufficient food.	***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	complaints procedure. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Access to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Inhabitants or workers to translate as necessary.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Karapinar (L) (T)			
• ***Demographics:*** 807 inhabitants with 60% seasonal migration. • ***Safety:*** the pipeline is 1.7km from the centre of the settlement and 1.5km from the nearest residence.	***Irrigation*** Potential loss of flow from planned/ accidental	Contractor will **consult** with authorities to determine	**If irrigation water is disrupted** longer than time

Social Impact Table 44 (Map 44C) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

1.5km from the nearest residence. • ***Project attitude:*** according to the Muhtar, the inhabitants are generally positive with no major concerns. • ***Land ownership & use:*** 95% of land is privately owned by local residents. Irrigation activities are undertaken. There is no seasonal grazing. • ***Settlement livelihood:*** agriculture, bee keeping (one household produces honey for their own consumption) and construction are the main sources of livelihood. 100% of respondents are family labourers. • ***Accessibility:*** 18km to district centre. The settlement is accessible throughout the year. • ***Information provision:*** all local residents speak Turkish. 80% of the population is literate. The best information provision tool is TV. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. A local spring provides an alternative water source • ***Settlement problems***: poor roads and inadequate access to water.	disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to recruitment*** Decreased access to recruitment process. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	maximum acceptable time for disruption. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **No residual impact expected.** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 44 (Map 44C) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Tekneli (L) (D) (B) (S)			
• ***Demographics:*** 2,500 inhabitants with 287 households and seasonal migration of 60%. This is due to winter work in Adana. • ***Safety:*** the pipeline is 450m from the centre of the settlement and 100m from the nearest residence. • ***Disputes:*** there is some hostility and an inclination towards violence in the settlement among three dominant families. Women were not allowed to participate in the meeting to discuss the pipeline. • ***Project Attitude:*** mixed. There is concern regarding security measures and concern among the local residents about risk of explosion and sabotage of the pipeline. In addition, the pipeline route passes through arable land. 31% of households perceive benefits from direct employment, 15% perceive benefit from land compensation, 54% of households expressed concerns, 31% regarding noise/dust and 23% regarding road damage/traffic. • ***Land ownership & use*:** 90% of land is privately owned by local residents and 10% is share-cropped. There are no title deeds. Seasonal grazing of a diverse range of livestock occurs in spring, summer, autumn and in December. Irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture (sugar beet, clover, wheat, potato, barley, apples, pear); animal breeding (1,000 cattle and 6,000 sheep); bee keeping (two/three households), carpet weaving; mining; transport and trade are the main sources of income. 20% of the population has been unemployed for longer than a year, 40% are family labourers and 20% are seasonal labourers. Wealthy local residents undertake wet agriculture, have their own tractors and have irrigation canals. Poorer local residents tend to migrate to Adana in the winter to work. • ***Availability & skills:*** local residents have previous pipeline experience. The following construction skills are available: construction workers, moulders, stone, masons, turner, head of construction site, security personnel, lathe men, repairs men, tree	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Road safety training in** schools and for wider community prior to construction. **Community liaison meetings** prior to construction to include safety. **Community liaison meetings** during and immediately following construction to identify any land that has been affected. Consider erecting protective barrier fencing. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owners of need to move hives to a position at least 300m from the route. If moved during the productive season,	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from awareness raising. **Additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried

Social Impact Table 44 (Map 44C) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

construction site, security personnel, lathe men, repairs men, tree cutting, wall masters and welders. 85% of respondents would accept a temporary job. • ***Accessibility:*** 12km to Sariz district centre. The settlement is accessible throughout the year except during January and February due to heavy snow fall. • ***Information provision:*** 60% of the population is literate. TV is the best information provision tool. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. There is no alternative water source. There is electricity supply and a sewerage system, but no waste disposal system. • ***Services:*** there is a primary school with 25 students. The health centre is not staffed; instead the local residents have access to a travelling health team including a midwife and doctor. Traditional health activities are also undertaken. • ***Settlement problems***: education, income, inadequate access to water, unemployment and emigration of educated population. Hostility amongst families.		stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Conservative settlement Construction workers are more likely to offend inhabitants	**Construction workers to be reminded** of the importance of appropriate behaviour in daily **briefings. Any** interaction between	**Low likelihood of significant impacts.** Impacts arising from breeches of rules and procedures. All incidents to

Social Impact Table 44 (Map 44C) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

		construction workers and communities (eg use of local shop) to be carefully monitored	be rapidly resolved and used as examples to reinforce procedures.
	Skills & resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
	Block Valve Station See Environmental Impact Tables and Overview of the Land Acquisition Process in Appendix C9.		

Social Impact Table 44 (Map 44C) (KPs 834.3 – 850.2): Kirkgecit Valley, Kayseri Province

Environmental Impact Table 45 (Maps 45A and 45B) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Coarse-loamy to Coarse-silty Xerorthents on alluvial plains. • Mesic Fine-loamy to Loamy-skeletal Xerochrepts on sloping lands, these are probably skeletal on moderately steep and steeper lands.	Main potential impacts include: • soil erosion; • sediment yield; • soil productivity. Other potential impacts include: • channel alteration; • soil contamination.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Reforestation.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
Landscape and Visual			
The route descends to the richer agricultural lands around Sariz, proceeding along the western side of the Sariz River valley. Initially shallow soils become gradually deeper as the pipeline route passes southward and coarse grasses and sparse shrubs give way to rain-fed cereals and woodlands. Scattered trees and bushes line the small creeks flowing down to the main river, all framed by rounded mountains with exposed strata. Landscapes vary from low to moderate sensitivity. The route passes in close proximity to many settlements and, near KP 855, the main highway.	Short-term construction modifications of landscape, although highly visible during construction.	Apply 'Soils' reinstatement specifications above.	**MINOR IMPACT** If reinstatement successful, impacts will be restricted to short-term.
Ecology			
ESA 55 (KP 862.09 – 862.67) is identified for the presence of *Pimpinella anisetum*, an endemic planted listed by the IUCN as globally-threatened, which has been recorded at the edge of cultivated fields and within fallow areas.	Destruction of habitat peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 55. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same	**MINOR IMPACTS** Short to medium-term disturbance to internationally important flora and supporting habitats. Mitigation measures will minimise losses but as the globally-threatened species is a ruderal, disturbance effects are likely to be short term

Environmental Impact Table 45 (Maps 45A and 45B) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW.	are likely to be short term.
Archaeology and Cultural Heritage			
The settlement mound/tumulus of Killiktepe (1st Degree Site*) is located within the 100m Corridor. There are no architectural remains on the surface of the site, although there are ceramic shards dating back to various periods (Late Calcolithic, Early and Middle Bronze Ages, Hellenistic Roman and Middle Ages). Field surveys undertaken have not been able to determine whether this site is a settlement mound or tumulus. * This site has not yet been registered by the MoC and is provisionally assigned this classification. The following have been proposed for registration by the regional preservation council: (i) Gedik area; (ii) Kocakayanin Boynu; (iii) Kocakaya; (iv) Kizilburun Hill; (v)Yunaktasi Area; (vi) Eskihamam Area; (vii) Mezarliktepe Mound	Potential for site to experience direct impacts, such as ground disturbance, during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	Killiktepe will be delineated to avoid accidental damage during construction and fenced throughout the construction period. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Assuming Killiktepe is fenced, impacts will be limited to the temporary disturbance to the site setting and peripheral features.

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

MAP 45: PROJECT INFORMATION

There are no pump stations, construction camps or block valve stations in the area.

MAP 45: MAP HIGHLIGHTS

- Main land use is rain fed agriculture.
- Route passes close to Killiktepe Hill, ceramic shards from the Iron Age were found.
- The settlements in this area are large.
- The pipeline crosses the Sariz river and a national highway.

MAP 45: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** Seven settlements on this map will be directly impacted by the pipeline project (Yaylaci, Incedere, Corekdere, Kizilpinar, Sariz, Cavlak, Bahceli). Four have land intersected by the proposed pipeline (Yaylaci, Incedere, Corekdere, Kizilpinar) (L) and four are within 500m of the pipeline route (D). (Cavlak, Incedere, Sariz and Yaylaci). None are within 5km of a pump station, or a block valve station. Settlements impacted by traffic have not yet been identified. No settlements are 2km downstream of a river crossing.

- ***Surveyed:*** Four settlements were surveyed in the field (S) (Yaylaci, Sariz, Corekdere, Bahceli) and two settlements were surveyed by telephone (Kizilpinar, Incedere) (T).
- ***Not surveyed:*** Cavalak (300m from the pipeline), Killiktepe, Kuscu (1.5km from the pipeline), Kurdini (1.9km from the pipeline).

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Yaylaci (L) (D) (S)			
• ***Population:*** 800 inhabitants with 110 households, population has recently increased due to an increase in birth rate. • ***Safety:*** the pipeline is 600m from the centre of the settlement and 280m from the nearest residence. • ***Project attitude:*** generally positive. 46% of households expect to benefit from direct employment, 9% expect to benefit from land compensation. There were no major concerns. The majority of respondents would welcome a construction camp. • ***Land ownership & use*****:** local residents privately own 90 to 95% of land and 5% is communal. This is largely inherited land without title deeds. Seasonal grazing occurs during April, May and June and also	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

in September and October. Irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture (sugar beet, wheat, chick peas, beans, clover, apples, pears & walnuts), animal husbandry (1,000 sheep, 2,000 cattle), carpet weaving (silk carpets by younger and rugs by older local residents), bee keeping (minor), transportation, trade (small markets) and construction work are the main sources of livelihood. 40% of local residents are family labourers, only 1% have been unemployed for longer than a year, and 8% are seasonal labourers. • ***Availability & Skills:*** no previous pipeline experience. Local drivers, heavy machinery operators, repairs man, security personnel, food service, tree cutting, welders and construction workers are available. 73% of respondents would accept a temporary job. There are local sources of sand and stone that could be used in construction. • ***Accessibility:*** 5km to Sariz district centre. The settlement is accessible throughout the year except for January and February. Asphalt roads. • ***Information provision:*** 90% of the population is literate. The best information provision tools are TV, family, friends and via the Muhtar. • ***Environmental & cultural sites:*** spring/lake with thermal waters. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Services:*** electricity is available but there is no sewerage system or waste disposal system. Many services are provided by the nearest district centre (5km away). There is a primary school with 75-100 students. Although there is no health centre, there is a travelling health team. • ***Settlement problems:*** unemployment, poor waste disposal/ sewerage system and low incomes. It is, however, a relatively wealthy settlement. • ***Other:*** local residents are Avsar Turks.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees***	settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

	Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	are fully implemented.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility of recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Skills & resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements.

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Incedere (L) (D) (T)			
• ***Demographics:*** 680 inhabitants with 20% seasonal migration. • ***Safety:*** the pipeline is 600m from the centre of the settlement and 100m from the nearest residence. • ***Project attitude:*** generally positive with no major concerns. • ***Land ownership & use*****:** major land ownership is communal (60%). There is no seasonal grazing. Irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (three households produce honey as one of many income sources), hunting, fishing (five households fish as one of many income sources), forestry, mining, construction, transport, manufacturing, trade and education are the main sources of livelihood. 70% of respondents are family labourers. • ***Settlement accessibility:*** 3.5km to Sariz district centre. The settlement is accessible throughout the year except in December and January. • ***Information provision:*** 100% of the population is literate. The best information provision tool is the TV. • ***Environmental & cultural sites:*** historical remnant/statue. • ***Infrastructure:*** piped water is supplied to households however supply is irregular. The settlement is able to access water from a nearby neighbourhood as an alternative water source. • ***Settlement problems***: inadequate access to water and poor roads.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

		location.	complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Forest Loss of a resource used by settlements. Increased expenditure on other fuel sources.	If significant numbers of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and	**Significance cannot be established at this time**

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

		compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	
	Fishing Potential reduction in fisheries yield or damage to fisheries habitats **if** within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.
	Accessibility of recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Sariz (L) (D) (S)			
• ***Demographics:*** 900 inhabitants with 185 households. • ***Safety:*** the pipeline is 1.5km from the centre of the settlement and 500m from the nearest residence. • ***Project attitude:*** generally positive. Specifically, 74% of respondents expect to benefit from direct employment, 10% from land compensation. There were no major concerns. In addition, the majority of respondents would welcome a construction camp.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

• ***Land ownership & use:*** 58% of land is privately owned by local residents and 40% is communal. Grazing and seasonal irrigation occurs. • ***Settlement livelihood:*** agriculture (diverse, including sugar beet), bee keeping, diverse livestock, construction, transport and trade are the main sources of livelihood. 65% of respondents are family labourers. • ***Availability & Skills:*** no previous experience. Five out of 24 possible construction skills are available. 54% of respondents would accept a temporary job. • ***Settlement accessibility:*** 3km to district centre. The settlement has poor accessibility in February. • ***Information provision:*** 95% of the population is literate. TV, family and the Muhtar are the best information provision tools in the settlement. • ***Infrastructure:*** piped water is supplied to households however supply is irregular. There is no alternative water source. There is electricity supply but no sewerage or waste disposal system. • ***Services:*** there is a telephone network and mobile phone coverage. There is also a primary school and a travelling health care team. • ***Settlement problems***: lack of water and unemployment	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9**	**See Overview of the Land Acquisition Process in Appendix C9**
	Irrigation Loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Corekdere (L) **(S)**			
• ***Demographics:*** 900 inhabitants with 185 households. 30 households live abroad/ in the city and return to the settlement only in the summer. • ***Safety:*** the pipeline is 2.2km from the centre of the settlement and 2km from the nearest residence. • ***Disputes:*** there is an ongoing water dispute. There are two sources in the settlement, one of which is believed to cause cancer. This is the source most local residents use. A small number of families keep	***Construction hazards: animals*** Trench poses safety hazard for livestock	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

the source most local residents use. A small number of families keep the other source under their ownership. A lawsuit has been filed before the court on this matter. • ***Project attitude:*** generally positive. Specifically, 55% of households expect to benefit from direct employment, there were no major concerns. In addition, the majority of respondents would welcome a construction camp. However, there is a general feeling that *'they will forget us after they construct the pipeline'.* • ***Land ownership & use:*** 58% of land is privately owned by local residents, 40% is communal and 2% is state owned. Most local residents do not, however, have title deeds for their land. Instead the deeds are usually in the name of the deceased person. Seasonal grazing occurs during Spring, Summer and September and October. Irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture (wet and dry - sugar, beet, bean, potato, barley, wheat, rye, chickpea, clover); bee keeping (2-3 households), animal husbandry (cattle and sheep), construction, transport and trade are the mains sources of livelihood. Rug weaving occurs in almost all houses, 100 looms in summer and 200 in winter. 65% of respondents are family labourers. • ***Availability & Skills:*** no previous experience. Drivers, tree cutters and welders are available. 91% of respondents would accept a temporary job. There is also a local source of stone that could be used in construction. • ***Accessibility:*** 19km to Sariz district centre. The settlement has poor accessibility in January and February. • ***Information provision:*** 95% of the population are literate. The best local information provision tools are via the Muhtar and family members. • ***Infrastructure:*** there is piped water supply however supply is irregular. There is no alternative water source. There is electricity present but no sewerage or waste disposal systems. There is also telephone and mobile phone coverage • ***Services:*** there is a small market and a primary school that is	***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Accessibility to recruitment*** Decreased access to recruitment process.	**See Overview of the Land Acquisition Process in Appendix C9** Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**See Overview of the Land Acquisition Process in Appendix C9** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **No residual impact expected.**

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

currently being repaired with a World Bank loan. There is no health centre, but the local residents have access to a travelling health team. • ***Settlement problems***: lack of water, for both drinking and irrigation, lack of sewage system and unemployment. It is considered a rich settlement because a few people work abroad as work.			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kizilpinar (L) **(T)**			
• ***Demographics:*** 220 inhabitants with a seasonal migration of 65%. • ***Safety:*** the pipeline is 2.7km from the centre of the settlement. • ***Project attitude:*** generally positive with no major concerns. • ***Land ownership & use:*** 70% of land is privately owned by local residents No seasonal grazing or irrigation occurs. • ***Settlement livelihood:*** agriculture, bee keeping (three households produce honey as their main source of income), construction, transport and trade are the main source of livelihood. 99% of the workers are farmers. • ***Accessibility:*** 1.8km to district centre. The settlement is accessible throughout the year. • ***Information provision:*** 85% of the population is literate. The best information provision tools include radio, newspapers and TV. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. A local spring provides an alternative water source. • ***Settlement problems***: inadequate access to water, low income and poor roads	***Accessibility of recruitment:*** Decreased access to recruitment process. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar	***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison**	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **No residual impact expected.** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

	production.	**meetings:** issue to be discussed at meetings before and during construction.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Bahceli (L) **(T)**			
• ***Demographic:*** 3,760 inhabitants with 185 households. 10% seasonal migration. • ***Safety:*** 1.3km from the pipeline. • ***Project attitude:*** according to the Muhtar, inhabitants are generally positive with no major concerns. In addition, a construction camp would be welcome. • ***Land ownership & use:*** 80% of land is owned by local residents No seasonal grazing occurs. Irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (six households produce honey for their own consumption), hunting, fishing (two households fish, this forms one of many sources of income), manufacturing, trade & education are the main economic activities. 70% of the workforce are family labourers. • ***Accessibility:*** 0.5km to district centre. The settlement is accessible throughout the year. • ***Information provision:*** 85% of the population is literate. The best information provision tool is TV. • ***Infrastructure:*** piped, regular supply, no alternative water source • ***Settlement problems***: poor roads	***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing. ***Hunting*** Temporary reduction in game due to disturbance during construction.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisationfish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full. **Significance cannot be established at this time.**

Social Impact Table 45 (Map 45C) (KPs 850.2 – 867.3): Teknell Settlement to Altinsogut Settlement, Kayseri Province

		complaints procedure.	
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Access to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Environmental Impact Table 46 (Maps 46A and 46B) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soils types from the previous section continue in this section of the route: • Mesic Coarse-loamy to Coarse-silty Xerorthents on alluvial plains. • Mesic Fine-loamy to Loamy-skeletal Xerochrepts on sloping lands, these are probably skeletal on moderately steep and steeper lands.	Main potential impacts include: • soil erosion; • sediment yield; • soil productivity. Other potential impacts include: • channel alteration; • soil contamination.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Reforestation.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
Landscape and Visual			
The route continues along rolling terrain on the western side of the Sariz River valley. Stream crossings increase in frequency as the valley widens, and the river meanders broaden. The valley is characterised by richer agricultural lands around Sariz, and farmland with scattered trees and bushes along the small creeks flowing down to the main river. Patches of irrigated arable land also occur here. The route crosses the Sariz River just east of the settlement of Kurudere, in a beautiful valley of emerald green water-meadows, washed yellow with buttercups in spring, and with many trees lining the meandering river, all lying between steep rocky slopes. Landscape sensitivities here are high. BVS-045 will be located at KP 880.5 within cultivated land. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 40m in length. Kurudere settlement lies c. 310m from the site.	Wet meadows along the Sariz River valley particularly susceptible to damage. Short-term construction modifications of landscape, highly visible during construction. Potential for short-term visual impact during construction for villagers in Kurudere settlement during construction at BVS-045.	Measures to reduce the impact of heavy machinery will be taken when crossing the Sariz River valley. These will include route narrowing, and use of moveable equipment mats to spread vehicle weight and avoid deep rutting. Construction will be undertaken at the driest time of the year (July to September) or removal / replacement of turfs may be necessary if schedules dictate work during wetter periods (March to June). Particular attention will be paid to the control of dust, noise and	**MODERATE IMPACT** The wet meadows / marshland in the Sariz River Valley will be impacted by the pipeline crossing, but if undertaken with care and sensitivity, this will last no more than a year or two. Minor impacts elsewhere. **MINOR IMPACTS** Given the relatively small size of the block valve station and the temporary nature of construction activities, visual impacts are anticipated to be

Environmental Impact Table 46 (Maps 46A and 46B) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		traffic during construction at BVS-045.	minor, subject to implementation of the specified mitigation measures.
Surface Waters			
The pipeline route crosses Sariz River near KP 880. River channel is irregular and meandering with a rectangular cross-section and central channel bars. Width of crossing is 25m and the bank-full width is c. 1.5m, although the floodplain is between 25 and 125m wide. Bed consists of silt and sand and the flow is perennial and of a uniform and tranquil type. Bank-side vegetation comprises shrubs, reeds and trees and riparian vegetation is fragmentary. Natural width controls exist at bluffs either side of the overflow channel and two bridges lie 1.3km upstream at Kemer and 350m downstream at Kurudere. Water samples taken 450m upstream of the crossing point indicate that this is a Class IV river. Kurudere settlement is c. 0.5km downstream of the crossing point.	Direct disturbance to bank and bed morphology through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in already poor water quality. Potential for short -term sedimentation and turbidity.	Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, for the protection of surface waters, Including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench.	**MINOR IMPACT** Disturbance will be short-term and limited to the immediate working area. Sedimentation of Sariz River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Archaeology and Cultural Heritage			
Three archaeological sites may be potentially affected by pipeline construction in this section and lie within the 100m Corridor: • Karayurt Mound (1st Degree Site*) – this site, which is now covered by a modern settlement, is a 'Classical Site' consisting of traces of Roman and Byzantine structures. • Cukurpinar Area (3rd Degree Site*) – a flat settlement located to the west of the Pipeline. Architectural remains are visible on the surface. • Golbasi Rock (1st Degree Site*) – flat settlement located to the east of Kurudere Settlement. No architectural remains are visible on the surface. The artefacts found can be traced down from Late Calcolithic to Roman periods. • Yayagecidi - 1st Degree • Kemer Mound - 1st Degree; * These sites have not yet been registered by the MoC and are provisionally assigned these classifications.	Potential for direct impacts, such as ground disturbance, at all these archaeological sites during pipeline and block valve station construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of these sites.	Cukurpinar Area is avoided through re-routing of the Pipeline. However, the site will also be fenced throughout the construction period, as the route will still pass close to it. The pipeline has been re-routed to avoid Golbasi Rock and Karayurt Mound. Potential impacts will therefore be avoided. All block valve stations and their access roads have been located to avoid known archaeological sites. However, particular care will be taken during construction of	**MINOR IMPACT** Impacts will be limited to the temporary disturbance of the setting of these archaeological sites and their peripheral features. **MINOR to MODERATE IMPACTS** During field confirmation of the BVS-045 site, the exact location will be chosen taking into consideration proximity to Kurudere Mound and Golbasi Rock. However, given the relatively small size of the block valve station and the

Environmental Impact Table 46 (Maps 46A and 46B) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Karayurt Mound and Cukurpinar area have been proposed for Registration by the regional preservation council BVS-045 will be located within 50m of Kurudere Mound (which is outside the 100m Corridor and is proposed for registration) and 100m of Golbasi Rock. The new access road to this site, c. 40m in length, will be within 30m of Golbasi Rock.		BVS-045. Further on-site assessment of the site will be undertaken prior to construction to confirm suitability of location. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	distance away from the archaeological sites, any impacts will be minor and limited to the temporary disturbance of the sites' setting peripheral features.

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

MAP 46: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There is one block valve station.

MAP 46: MAP HIGHLIGHTS

- Main land uses are rain fed agriculture, irrigated agriculture and pasture.
- Route passes close to Kurudere mound.

MAP 46: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** 10 settlements on this map will be directly impacted by the pipeline project (Altinsogut, Daridere, Gumussail, Fettahdere, Ayranlik, Karayurt, Incemagara, Kemer, Kurudere, Yeni). All of these settlements have land intersected by the proposed pipeline (L) and four (Karayurt, Kuderere, Altinsogut, Kemer) have houses within 500m of the pipeline route (or the settlement centre within 1km of the pipeline)(D). None are within 5km of a pump station. Two (Kurudere and Kemer) are within 2km of the block valve station (B). Settlements impacted by traffic have not yet been identified. Two settlements are downstream of a river/creek; Kurudere is downstream of the pipeline on the Sariz river and Karayurt is on Tepe creek (R).

- ***Surveyed:*** two settlements (Ayranlit, Fettahdere) were surveyed in the field (S) and 14 settlements were surveyed by telephone (T).
- ***Not surveyed:*** Daridere (1.7km from pipeline), Mollahuseyin (1.9km from pipeline).
- ***Not on map:*** Yeni.
- ***Disclosure Meeting Location:*** Karayurt

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Altinsogut (L) (D) (T)			
• ***Demographics:*** 194 inhabitants. No seasonal migration. • Safety: the pipeline is 650m from the centre of the settlement and 600m from the nearest residence. • ***Project attitude:*** generally positive with no major concerns. A construction camp in the area would also be welcomed. • ***Land ownership & use:*** 50% of land is privately owned by local residents and 50% is communal. No seasonal grazing occurs. Irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (three households for own consumption), hunting, manufacturing, construction are the main sources of livelihood. 96% of workforce are family labourers.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

• ***Distance from settlement to district centre:*** the pipeline is 8km from the district centre (Sariz). • ***Settlement accessibility:*** 8km to Sariz district centre. The settlement has poor accessibility in December and January. • ***Information provision:*** Turkish is spoken. 95% of the population is literate. The best information provision tools include TV, radio and the telephone. • ***Environmental & cultural sites:*** a mausoleum • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. A settlement fountain provides an alternative water source • ***Settlement problems:*** poor roads and infrastructure problem		settlement is within 500 m of construction work.	
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage to be compensated for.**
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9**	**See Overview of the Land Acquisition Process in Appendix C9**
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In the event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**Significance cannot be established at this time.**
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport need to be **taken into account** in the recruitment strategy.	**No residual impact expected.**
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

		season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Gumussail (L) (T)			
• ***Demographics:*** 116 inhabitants with 60% seasonal migration. • ***Safety:*** the pipeline is 1.7km from the centre of the settlement and 1.6km from the nearest residence. • ***Project attitude:*** generally positive with no major concerns. • ***Land ownership & use:*** 95% of land is owned by local residents. No seasonal grazing occurs. Irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (10 households as their main source of income) and transport. 80% of local residents are family labourers. • ***Accessibility:*** 10km to Sariz district centre. The settlement has poor accessibility during December and January.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Sensitive vegetation used by bees*** Dust may affect yields of	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Effectiveness of dust suppression** methods to be monitored daily and	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts** predicted if dust suppression and monitoring measures

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

• ***Information provision:*** 100% of the population is literate. The best information provision tool is TV and the newspaper. • ***Infrastructure:*** piped, regular supply, there is no alternative water source. • ***Settlement problems:*** poor roads and inadequate access to water.	vegetation (eg grey clover) essential for nectar production. ***Accessibility to recruitment*** Decreased access to recruitment process	increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	are fully implemented. **No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Fettahdere (L) (S)			
• ***Demographics:*** 330 inhabitants with 81 households. The population is decreasing. This is due to migration of young population, and some residents only live in the settlement during summer. • ***Safety:*** the pipeline is 1.25km from the centre of the settlement and 650m from the nearest residence. • ***Disputes:*** uneasy relationship between the Muhtar and the imam. • ***Project attitude:*** mixed. The men positive about the project, but the women are concerned about the safety of children and animals. Specifically, 42% of households expect to benefit from direct employment, 15% expect to benefit from land compensation. There were no major concerns. In addition, the majority of respondents would welcome a construction camp. • ***Land ownership & use:*** 70% of land is owned by the local residents, 20% is communal, and 10% is leased. Local residents do not have title deeds. Seasonal grazing occurs during the spring and summer and in September & October. There is no irrigation. • ***Settlement livelihood:*** agriculture (wet and dry - wheat, barley, chickpea, bean, potato, famous for walnuts); animal husbandry	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Land*** Potential complications in expropriation process. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **See Overview of the Land Acquisition Process in Appendix C9** **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

chickpea, bean, potato, famous for walnuts); animal husbandry (cattle); and bee keeping are the main activities in the settlement (six households) The region is famous for its diverse flora and honey produced is regarded as very valuable. According to inhabitants bees fly over a distance of 4km and would be impacted by the construction of the pipeline, which is 1km from the settlement. Weaving (20 looms approx.) construction, transportation and manufacturing also carried out. 80% of adults of working age are family labourers and 10% have regular paid work. • ***Availability & skills:*** vehicle drivers are available. 58% of respondents would accept a temporary job. Stone and soil suitable for construction is available in the vicinity of the settlement. • ***Accessibility:*** 11km to Sariz district centre. The settlement has poor accessibility in February. • ***Information provision:*** 85% of the population is literate. The best information provision tools include TV, the Muhtar and via family members. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. There is electricity supply but no sewerage or waste disposal system. • ***Services:*** there is a school with 25 students, a market, and a travelling health team. • ***Settlement problems:*** unemployment, income, immigration. Poor settlement. No drinking water, because the piped water is not drinkable. There is no sewer system. Bee keepers from other provinces.	production. ***Accessibility to recruitment*** Decreased access to recruitment process	**meetings:** issue to be discussed at meetings before and during construction. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Ayranlik (L) (S)			
• ***Demographics:*** 600 inhabitants with 75 households, increasing in population due to high birth rates. • ***Safety:*** the pipeline is 1.1km from the centre of the settlement and	***Construction hazards: animals*** Trench poses safety hazard	**Livestock crossings** will be established at locations as	**Potential for accidents involving livestock.**

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

900m from the nearest residence. • ***Project attitude:*** the response to the project is mixed, 46% of inhabitants expect to benefit from direct employment, there were no major concerns. In addition, the majority of respondents would welcome a construction camp. • ***Land ownership & use:*** 40% of land is owned by local residents and 60% is communal. Most land owners do not have title deeds. Grazing occurs during all seasons of the year. Dry agricultural activities are carried out in the area covered by the pipeline. Irrigation occurs. • ***Settlement livelihood:*** agriculture (grain, herbs, potatoes, clover); animal husbandry (cattle & sheep); bee keeping; construction and rug weaving are all economic activities. 86% of the workforce are seasonal labourers. • ***Availability & Skills:*** there are four workers who worked in the construction of the Sivas natural gas pipeline. Other available skills are; driver, operator of heavy working machinery, security personnel, tree cutting, welder. 73% of respondents would accept a temporary job. Locally sourced sand and stone could be used in construction. • ***Accessibility:*** 9km to Sariz district centre. The settlement is accessible all year. There is a 14km asphalt road but 2km is constructed from loose binder dust. • ***Information provision:*** 90% of the population is literate. The best information provision tools are TV, family and via the Muhtar. • ***Infrastructure:*** piped water is supplied to households however the supply is irregular. There is no alternative water source. There is electricity supply but no sewerage or waste disposal system. There is telephone network and mobile phone coverage. • ***Services:*** there is a primary school, a health centre with a doctor, and a small market. • ***Settlement problems:*** lack of water, unemployment, waste disposal, dirty drinking water and garbage disposal.	for livestock ***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Skills & resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials	agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **See Overview of the Land Acquisition Process in Appendix C9.** Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in	Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **Potential positive benefits** to local settlements.

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

		sourcing of goods and supplies within Project constraints.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Karayurt (L) (D) (R) (T)			
• ***Demographics:*** 209 inhabitants with 25% seasonal migration. • Safety: the pipeline is 500m from the centre of the settlement and 300m from the nearest residence. • ***Project attitude:*** generally positive with no major concerns. • Local opinion on construction camp: the majority of respondents would welcome a construction camp. No major concerns were expressed. • ***Land ownership & use:*** 90% of land is owned by local residents. • ***Settlement livelihood:*** agriculture and bee keeping are the main sources of livelihood although bee keeping is only carried out by one family (for their own consumption). 100% of respondents were family labourers. No seasonal grazing occurs. • ***Availability & skills:*** no previous pipeline experience. • Settlement accessibility: 13km to Sariz district centre. The settlement has poor accessibility from November to January. • ***Information provision:*** 100% of the population is literate. TV is the main information provision tool. • ***Environmental & cultural sites:*** churches. • ***Infrastructure:*** piped water is supplied to households, however supply is irregular. There is no alternative water source. • ***Settlement problems:*** inadequate access to water.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

		season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Incemagara (L) (T)			
• ***Demographics:*** 215 inhabitants with 25% seasonal migration. • Safety: the pipeline is 1.1km from the centre of the settlement and 1km from the nearest residence. • ***Project attitude:*** generally positive with no major concerns. In addition, a construction camp would be welcome in the area. • ***Land ownership & use:*** 80% of land is privately owned by local residents. No seasonal grazing occurs. Irrigation activities are	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

residents. No seasonal grazing occurs. Irrigation activities are undertaken. • ***Settlement Livelihood:*** agriculture, bee keeping (two households produce honey for their own consumption), hunting, forestry, construction and tourism are the main sources of livelihood. 80% of the workforce are family labourers and 5% have regular paid work. • ***Accessibility:*** 10km to district centre. The settlement is accessible throughout the year. • ***Information provision:*** 95% of the population is literate. The best information provision tool is TV. • ***Environmental & cultural sites:*** rockeries. • ***Infrastructure:*** piped water is supplied to households however supply is irregular. There is no alternative water source. • ***Settlement problems:*** poor roads.	***Hunting*** Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	compensated. **Significance cannot be established at this time**
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Kemer (L) (D) (B) (T)			
• ***Demographics:*** 600 inhabitants with seasonal migration of 25%. Some residents only live there during the summer. • ***Safety:*** the pipeline is 1km from the centre of the settlement. • Project attitude: generally positive. Men in particular welcome the project but women are concerned about water channels being damaged by pipeline construction. • ***Land ownership & use:*** 95% of land is privately owned by local residents. No seasonal grazing occurs. The pipeline intersects with a water pipe that transports water to the settlement from west to east. • ***Settlement livelihood:*** agriculture, bee keeping (one household produces honey for their own consumption), construction, trade & education are the main activities in the settlement. 50% of the surveyed workforce are family labourers. • ***Accessibility:*** 17km to district centre. The settlement is accessible throughout the year. • ***Information provision:*** 100% of the population is literate. The best information provision tools include TV and the newspaper. • ***Environmental & cultural sites:*** caves. • ***Infrastructure:*** piped water is supplied to households however there supply is irregular. There is no alternative water source. • ***Settlement problems:*** unemployment.	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees***	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. **No significant impacts** predicted if dust suppression

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

	Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Accessibility to recruitment*** Decreased access to recruitment process ***Block Valve Station*** See Environmental Impact Tables and Overview of the Land Acquisition Process in Appendix C9	monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	and monitoring measures are fully implemented. **No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kurudere (L) (D) (B) (T)			
• ***Demographics:*** 162 inhabitants. No seasonal migration. • ***Safety:*** the pipeline is 450m from the centre of the settlement and 350m from the nearest residence. • ***Project attitude:*** generally positive with no major concerns. In addition, the majority of respondents would welcome a construction camp. • ***Land ownership & use:*** major landownership is share cropping (90%). No seasonal grazing or irrigation occurs. • ***Settlement livelihood:*** agriculture and construction. 80% of the workforce are family labourers. • ***Availability & Skills:*** previous construction experience from a drinking water project	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

drinking water project. • ***Settlement accessibility:*** 19km to district centre. The settlement is accessible throughout the year. • ***Information provision:*** 100% of the population is literate. The best information provision tool is TV. • ***Infrastructure:*** piped water is supplied to households however supply is irregular. There is no alternative water source. • ***Settlement problems:*** low income and employment.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Block Valve Station*** See Environmental Impact Tables and Overview of the Land Acquisition Process in Appendix C9.	construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage to be compensated for.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yeni (L) (T)			
• ***Demographics:*** 335 inhabitants with 5% seasonal migration. • Safety: the pipeline is 1.3km from the centre of the settlement and 1.25km from the nearest residence. • ***Project attitude:*** generally positive with no major concerns. In addition the majority of respondents would welcome a construction camp. • ***Land ownership & use:*** 90% of land is privately owned by local residents. No seasonal grazing occurs. Irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (four households produce honey for their own consumption), fishing (four households fish as main a source of their income) and trade are the main economic activities. 70% of the workforce are family labourers. • ***Accessibility:*** 0.5km to district centre. The settlement is accessible throughout the year.	***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats **if** within 2 km downstream of a river crossing. ***Irrigation***	**Fisheries mitigation measures** including: verification of fisheries, fish characterisationfish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure. Contractor will **consult** with	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full. **If irrigation water is**

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

• ***Information provision:*** 90% of the population is literate. The best information provision tool is TV. • ***Infrastructure:*** piped, regular supply, no alternative water source. • ***Settlement problems:*** poor roads and unemployment.	Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Accessibility to recruitment*** Decreased access to recruitment process.	authorities to determine maximum acceptable time for disruption. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Methiye (L) (T)			
• ***Demographics:*** 170 inhabitants with 25% seasonal migration. • ***Safety:*** the pipeline is 2.2km from the centre of the settlement. • ***Project attitude:*** generally positive with no major concerns. In addition the majority of respondents would welcome a construction camp. • ***Land ownership & use:*** 50% settlement owned & 50% communal. Seasonal grazing and irrigation occurs.		***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

• ***Settlement livelihood:*** agriculture, transport, tourism, education and construction are the main economic activities. 90% of the workforce are family labourers. • ***Availability & Skills:*** previous experience of mining projects. • ***Accessibility:*** 57km to district centre. The settlement is accessible throughout the year. • ***Information provision:*** Turkish and Cerkezish are spoken. 100% of the population is literate. The best information provision tool is TV. • ***Infrastructure:*** piped, but the supply is not regular, the local spring is an alternative water source. • ***Settlement problems:*** poor roads, inadequate health care, inadequate child care.		warned and alternative sources of water to be provided.	
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Access to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9.**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Accessibility to recruitment	Winter road closures, seasonal migration and poor	**No residual impact expected**

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

	Decreased access to recruitment process	transport will be **taken into account** in the recruitment strategy.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Pazarsu (L) (T)			
• ***Demographics:*** 175 inhabitants with 30% seasonal migration. • ***Safety:*** the pipeline is 5.5km from the centre of the settlement. • ***Project attitude:*** generally positive however local residents feel they do not have enough information about the project. The majority of respondents would welcome a construction camp in the area. • ***Land ownership & use:*** 85% of land is privately owned by local residents. No seasonal grazing and irrigation occurs. • ***Seasonal livelihood:*** agriculture & bee keeping (two households produce honey as their main source of income). 100% of the workforce are family labourers. • ***Accessibility:*** The settlement has poor accessibility during December and January. • ***Information provision:*** Turkish and Cerkezish are spoken. 100% of the population are literate. The best information provision tool is TV. • ***Environmental & cultural sites:*** mausoleum. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** unemployment, inadequate access to water and infrastructure problems.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility to recruitment*** Decreased access to recruitment process. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected.** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Tasligecit (L) **(T)**			
• ***Demographics:*** 63 inhabitants with 50% seasonal migration. • ***Safety:*** the pipeline is 4.25km from the centre of the settlement. • Project attitude: generally positive with no major concerns. The majority of respondents would welcome a construction camp. • ***Land ownership & use:*** 95% of land is privately owned by the local residents. No seasonal grazing occurs. Irrigation activities are undertaken. • ***Settlement livelihood:*** agriculture and bee keeping (three households for their own consumption) are the main economic activities. 100% of the workforce are family labourers. • ***Accessibility:*** The settlement is accessible throughout the year. • Information provision: Turkish & Cerkezish are spoken. 100% of the population is literate. The best information provision tool is TV. • ***Infrastructure:*** no piped water. Instead water is sourced from an artesian well. • ***Settlement problems:*** unemployment.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility to recruitment*** Decreased access to recruitment process. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected.** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 46 (Map 46C) (KPs 867.3 – 882.1): Altinsogut Settlement to South of Kurudere Settlement, Kayseri Province

	Drinking water Potential for disruption or contamination of drinking water during construction.	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	**No residual impact.**

Environmental Impact Table 47 (Maps 47A and 47B) (KPs 882.1 – 896.8): Karakoyun Mountain and Binboga Mountains Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soils types from the previous section continue in this section of the route: • Mesic Coarse-loamy to Coarse-silty Xerorthents on alluvial plains. • Mesic Fine-loamy to Loamy-skeletal Xerochrepts on sloping lands, these are probably skeletal on moderately steep and steeper lands.	Main potential impacts include: • soil erosion; • sediment yield; • soil productivity. Other potential impacts include: • channel alteration; • soil contamination.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Reforestation.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
Landscape and Visual			
Relief increases south of Sariz River as the rolling terrain gradually gives way to rocky hills and stony uncultivated soils with juniper scrub and a wealth of wildflowers. The route emerges across a wide, rolling agricultural plain with scattered trees near Yesilkent, framed by steep mountains with conspicuous, exposed, longitudinal, folded strata. Rain-fed cereals occupy these lands, giving way to grazing on the hilly slopes. Forests occupy upland areas east and west of the RoW. Landscape sensitivity is moderate. The RoW crosses riparian forest near KP 877. Elsewhere, a dense network of small streams drains uplands across the pipeline route. Highway crossings between KPs 875 and 880 receive clear views of the route.	Short-term construction modifications of landscape, highly visible during construction.	• Reinstatement of the BTC Pipeline. • Replant disturbed woodlots and riparian forests.	**MINOR IMPACT** If re-instatement successful, impacts will be restricted to short-term.
Ecology			
Important Ecological Factors ESA 39 is identified between KP 886.8 and KP 887.3 for the globally-threatened plant species *(Verbascum meliltenense*). The IUCN status for this species is given in Table 5.20, Section 5.	Habitat destruction of montane steppe and habitats peripheral to cultivated land may result in the loss of	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 39 - 40. Diligence will	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction

Environmental Impact Table 47 (Maps 47A and 47B) (KPs 882.1 – 896.8): Karakoyun Mountain and Binboga Mountains Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
ESA 40 is identified between KP 894.9 and KP 896.8 for four globally-threatened plant species (*Thlaspi densiflorum, Allium glumaceum, Arabis aubrietioides* and *Paracaryum reuteri*) that occur along the pipeline route. In addition, one globally-threatened species (*Galium cornigerum*) occurs just east of the corridor parallel to ESA 40. The IUCN status for these species within ESAs 39 and 40 are given in Table 5.20, Section 5. Lesser Kestrel (globally-threatened) was recorded breeding, (between April and July inclusive), in Yesilkent Settlement. The protection status for this species is given in Table 5.21, Section 5.	individuals from populations of globally-threatened plants. Regular movement of heavy machinery or location of pipe dumps, construction yards or camps in the vicinity of Yesilkent settlement may disturb a globally-threatened breeding bird during nesting, feeding or indirectly, through habitat loss if temporary facilities are located near the settlement during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	be exercised in searching inside the corridor for those species known to occur just outside of the corridor. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Preconstruction survey will establish the presence of possible nesting sites of the Lesser Kestrel within 500m of the pipeline route. If nesting sites are identified, avoidance of construction activity from April to July. Construction camps, pipe dumps/yards, borrow pits and fuel stores etc will not be	planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Impacts will be **MODERATE** if temporary construction facilities are located in the area during the breeding season.

Environmental Impact Table 47 (Maps 47A and 47B) (KPs 882.1 – 896.8): Karakoyun Mountain and Binboga Mountains Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		located within the vicinity of Yesilkent Settlement.	

Kahramanmaras Socio-Economic Overview

Demographics:
Kahramanmaras is the second largest of the pipeline provinces in terms of population with just over one million inhabitants, 20% of which (the highest of all surveyed provinces) live within a 4km corridor of the pipeline. Just under half of the province population live in urban areas and the province experiences the second highest survey density with 62 inhabitants per km^2. The average household size is six, mirroring the survey average. Rural areas are experiencing out-migration, whereas urban areas are experiencing in-migration. Population levels double during the summer months due to the in-migration of holidaymakers from Kadirli, Osmaniye and Adana. All individuals surveyed speak Turkish (the overwhelming majority being Sunni Muslims) and a very small percentage also speak Kurdish (0.35% of respondents). Settlements are more mixed in the northern area of the province, resulting in discernible tensions between groups of different origins. The area is characterized by religious conservatism.

Land:
The province is located in the transition zone between Central Anatolia in the north (relatively dry and mountainous) and the Cukurova region (the most fertile part of Turkey, with irrigation generally allowing two harvests per year). The northern portion of the province comprises Goksun district centre and surrounding settlements in a high altitude valley, all in close contact with each other. The southern portion, located on the lower slopes of the Taurus Mountains, has strong economic and cultural links with Adana province and Kadirli district centre, and benefits from more advanced living conditions and higher income levels. Private ownership, followed by communal ownership, is the main landownership form although there is high inequality and land polarisation. In the north, production of wheat and barley dominates due to the limited availability of irrigation (which, where present, allows for the production of sugar beet, beans, potato, maize and sunflowers). There is a preponderance of 'petty' landownership with subsistence agriculture dominating. In southern portions, the more widespread use of irrigation allows for greater product diversification. There is high use of fertilisers and agricultural machinery, and agricultural production is for national and international markets. The presence of irrigated cotton production and cheap labour has culminated in the area becoming a hub for textile factories.

Livelihoods:
Industrial activity is almost non-existent in the surveyed settlements, with the exception of Goksun (one of the two district centres surveyed). Overall, the province is ranked fifth of the pipeline provinces in terms of a combination of income and wealth assets of the surveyed settlements, and sixth in terms of average household income. Living conditions were thought to have deteriorated, particularly due to an increase in the cost of agricultural inputs, alongside only a small increase in product prices. Agriculture and livestock breeding are the main forms of livelihood. A significant number of people owe money to agricultural loan co-operations and few own land titles.

Infrastructure & Services:
Electricity, water and telephone networks are available (although regularity of electricity supply is a problem). Sewerage systems are present only in the municipality and district centres. Televisions, the basic source of obtaining national news, are present even in the poorest settlements. Average literacy rates are high (87% in surveyed settlements) despite the lack of schools in some settlements, although education levels are lower in the northern area of the province. Almost 40% of respondents have attained a primary school education, 31% a secondary education and 3% a university education.

Key Problems:
Inadequate 'livelihood possibilities' and the collapse of agriculture production were raised as the main problems. Health services are inadequate in all surveyed settlements with the exception of municipal and district centres, although at the provincial level Kahramanmaras has the second highest number (after Adana) of active settlement clinics of all the pipeline provinces (Ministry of Health). The lack of nurses and health centres in the surveyed settlements causes particular problems during emergencies.

Project Attitude:
Generally, surveyed settlements are positive about the pipeline project. However, in light of recent declines in agriculture profitability, relatively infertile lands and limited potential for irrigation, surveyed settlements have high employment expectations associated with the pipeline construction. A small proportion are concerned about damage to agricultural production, crops and land.

Source: Household and Settlement Survey (2001)

Social Impact Table 47 (Map 47C) (KPs 882.1 – 896.8): Karakoyun Mountain and Binboga Mountains Area, Kahramanmaras Province

MAP 47: PROJECT INFORMATION

There is no pump station, construction camp or block valve station in the area.

MAP 47: MAP HIGHLIGHTS

- Rain fed agriculture and pasture are the major land use types.
- Areas of riparian forest.
- Network of streams drain uplands across the pipeline route.
- Pipeline crosses two National highways.

MAP 47: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** four settlements will be directly impacted by the pipeline, three settlements (Dogankonak, Yesilkent, Yesilkent Koyu) have land intersected by the proposed pipeline (L); and one settlement (Yalak) is within 500m of the pipeline route (D). No settlements are within 5km of a pump station or construction camp (P/C), or within 2km of a block valve station (B). Settlements impacted by traffic have not yet been identified. No settlements are downstream of a river/creek pipeline crossing (R).

- ***Surveyed:*** Dogankonak, Yesilkent and Yesilkent Koyu were surveyed by telephone (T).
- ***Not surveyed:*** two settlements have not been surveyed, Yalak (800m from the pipeline, nearest house from the pipeline is 175m), Haydan (1.2km from the pipeline).
- ***Not on the map:*** Yalak.

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Dogankonak (L) (T)			
• ***Demographics:*** 199 with 100% seasonal migration. • ***Safety:*** nearest house 1km from pipeline, centre of settlement is 1.1km from the pipeline. • ***Project attitude:*** there are no major concerns, and according to the Muhtar a construction camp would be welcome. • ***Land ownership & uses:*** 80% of land is communal, there is seasonal grazing. There is no of seasonal irrigation. • ***Settlement livelihood:*** agriculture, construction, education and local government are the main sources of livelihood. • ***Accessibility:*** the settlement is accessible in winter and 26km to the district centre.	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Land***	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **See Overview of Land**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of Land Acquisition Process in**

Social Impact Table 47 (Map 47C) (KPs 882.1 – 896.8): Karakoyun Mountain and Binboga Mountains Area, Kahramanmaras Province

district centre. • ***Information provision:*** 90% of the population is literate. Local sources of information are phone and television. • ***Infrastructure:*** piped water is available. There is regularity of water supply. There is no alternative water source. • ***Settlement problems:*** inadequate access to water, and the need for forest fields.	Potential complications in expropriation process. ***Access to recruitment*** Decreased access to recruitment process	**Acquisition Process in Appendix C9.** Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Appendix C9.** **No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yesilkent 1 (L) (T)			
• ***Demographics:*** 83 inhabitants with 5% seasonal migration. • Safety: 850m from the pipeline. • ***Project attitude:*** generally positive with no major concerns. In addition the majority of respondents would welcome a construction camp. • ***Land ownership & use:*** 90% of land is owned by local residents. No seasonal grazing or irrigation occurs. • ***Settlement livelihood:*** agriculture and construction are the main economic activities. 60% of the workforce are family labourers. • ***Accessibility:*** 21km to district centre. The settlement is accessible throughout the year. • ***Information provision:*** 100% of the population is literate. The best information provision tool is TV. • ***Infrastructure:*** piped, regular supply, no alternative water source • ***Settlement problems:*** low income.	***Access to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. **Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.**

Social Impact Table 47 (Map 47C) (KPs 882.1 – 896.8): Karakoyun Mountain and Binboga Mountains Area, Kahramanmaras Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Yesilkent 2 (L) (T)			
• ***Demographics:*** 83 inhabitants. No seasonal migration. • ***Safety:*** 840m from the pipeline. • ***Project attitude:*** generally positive with no major concerns. In addition, the majority of respondents would welcome a construction camp. • ***Land ownership & use:*** 92% of land is subject to share-cropping. No seasonal grazing or irrigation occurs. • ***Settlement livelihood:*** agriculture, bee keeping (two households produce honey for own consumption), manufacturing, transport, trade, education and construction are the main economic activities. 75% of the workforce are farmers. • ***Accessibility:*** 21km to district centre. The settlement is accessible throughout the year. • ***Information provision:*** Turkish & Cerkezish is spoken. 99% of the population is literate. The best information provision tool is TV. • ***Environmental & cultural sites:*** churches. • ***Infrastructure:*** piped water is supplied to households. There is no alternative water source. • ***Settlement problems:*** watering canals must be rearranged, inadequate access to water, and animal farming should be supported by state.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Land*** Potential complications in expropriation process. ***Construction hazards: humans*** Working areas pose safety hazard to residents,	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **See Overview of Land Acquisition Process in Appendix C9.** **Road safety training** will be held in schools prior to construction commencing. **Community liaison**	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **See Overview of Land Acquisition Process in Appendix C9.** **Continued attention** to mitigation measures will be critical to prevent injury.

Social Impact Table 47 (Map 47C) (KPs 882.1 – 896.8): Karakoyun Mountain and Binboga Mountains Area, Kahramanmaras Province

	particularly small children. Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.**

Environmental Impact Table 48 (Maps 48A and 48B) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Coarse-loamy to Coarse-silty Xerorthents on alluvial plains. • Rocky land (KP 887 – 890). • Mesic Loamy-skeletal Xerochrepts on hills.	Main potential impacts include: • soil erosion; • sediment yield; • soil productivity; • channel alteration; • soil contamination; • waterlogging.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Reforestation. • Time construction to avoid irrigation periods. • Allow soils time to drain. Use equipment mats as required.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
The route crosses non-intensive cereal fields on undulating ground and steppe used for grazing animals on hillier terrain. Forests occupy upland areas east and west of the RoW. The route runs parallel and close to a main highway throughout this section. In addition, several settlements are in close proximity to the route, and other significant man-made elements in the landscape include electricity cables and an ancient tumulus at KP 895. Irrigated crops occur in the Goksun valley in the southern part of the section. Landscape sensitivities are low. Construction Camp C will be tentatively located at KP 908.5, although the precise location for this camp is still being finalised. The camp will occupy an area of c. 16.7ha.	Short-term construction modifications of landscape, highly visible during pipeline construction and through the presence of the temporary Construction Camp C during the construction period.	• Reinstatement of the BTC Pipeline. • Replant disturbed woodlots and riparian forests.	**MINOR IMPACT** If reinstatement is successful, impacts will be localised and restricted to short-term.

Environmental Impact Table 48 (Maps 48A and 48B) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Ecology			
Important Ecological Factors ESA 41 is identified between KP 902.9 and KP 909.7 for ten globally-threatened plant species (*Hedysarum candidissimum, Astragalus elbistanicus, Dactylorhiza osmanica var. anatolica, Arabis aubrietioides, Allium tauricola, Centaurea holtzii, Verbascum leianthoides, Paracaryum reuteri, Achillea magnifica* and *Phlomis brunneogaleata*) and one nationally-threatened plant (*Onobrychis sulphurea var. sulphurea*). In addition, one nationally-threatened plant (*Onobrychis sulphurea var. sulphurea*) occurs just west of the corridor parallel to ESA 41. The IUCN status for these species are given in Table 5.20, Section 5. Construction Camp C will be located within ESA 41. BVS-046 will be located at KP 905.0 on cultivated land and plain steppe also within ESA 41. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 30m in length. At KP 910.5 one Barred Warbler (nationally-threatened) was recorded. The protection status for this species is given in Table 5.21, Section 5.	Habitat destruction of plain steppe or areas peripheral to cultivated lands may result in the loss of individuals from populations of globally-threatened plants during pipeline and BVS construction and the location of the temporary construction camp within ESA 41. Potential for direct disturbance to a nationally-threatened bird during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 41. Diligence will be exercised in searching inside the corridor for those species known to occur just outside of the corridor. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. In addition, prior to construction of the Construction Camp C and BVS-046, a site specific survey	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACT** Based on the mitigation measures described, the small area of habitat affected and the temporary nature of construction activities, it is predicted that only minor impacts on the biological environment will occur as a result of construction activities at BVS-046. This assessment will be confirmed by the site-specific survey prior to construction. **MINOR IMPACTS** at most for the Barred Warbler, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding

Environmental Impact Table 48 (Maps 48A and 48B) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		will be undertaken by an ecological specialist to identify and locate threatened species at the site and at any surrounding areas potentially affected by construction activities. Based on the findings of this survey, appropriate mitigation will be determined. Shrubs, thickets and dense vegetation along the RoW will be cleared outside the breeding season for the Barred Warbler.	season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.
Noise			
Noise sensitive receptors are located at: • Keklikoluk settlement (Goksun District) including some outlying dwellings located directly adjacent to the pipeline route; and • Mehmetbey settlement (Goksun District) c. 80m from the centreline of the pipeline. Blasting works may also take place during pipeline construction within the vicinity of Keklikoluk settlement.	Noise impacts are expected to occur at: • Keklikoluk settlement during all phases of pipeline construction including soil stripping, trenching, pipe stringing, bending, welding/lowering and backfilling; • Mehmetbey settlement during soil stripping, welding/ lowering, backfilling, bending and trenching. Blasting works will also give rise to noise and vibration at Keklikoluk.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised.	**MAJOR IMPACT** Due to the proximity of the edge of Keklikoluk settlement to the Pipeline, noise impacts are expected to occur throughout the construction programme. Stockpiling of spoil, where possible, and mobile noise barriers, will be used to screen nearby dwellings from construction works to the maximum extent possible. However, those nearest may still be exposed to temporary construction noise levels that exceed 70dB(A). It is important to emphasise this is a cautious assessment. The construction programme will make

Environmental Impact Table 48 (Maps 48A and 48B) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers to screen dwellings from construction works, for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	provision for a further assessment based on the true numbers of receptors affected and separation distances of receptors from noise sources and take whatever actions are necessary to reduce impacts to an acceptable level. Blasting works will also give rise to noise and vibration at this settlement, which due to the proximity of the edge of the settlement to the Pipeline, could give rise to structural damage to outlying buildings, in addition to annoyance at residential properties. The Contractor will carry out detailed noise and vibration predictions once the specific blasting methods have been developed. The proposed method of working and mitigation measures will be agreed with the relevant authorities in advance of works taking place. Residents will also be notified in advance of works involving blasting. Noise impacts will also occur at Mehmetbey during soil

Environmental Impact Table 48 (Maps 48A and 48B) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			stripping, welding/lowering and backfilling.

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

MAP 48: PROJECT INFORMATION

There is a primary construction camp (Lot C) in the area, located on unregistered pastureland. It will require 16.74ha. There is also a block valve station in the area.

MAP 48: MAP HIGHLIGHTS

- Rain fed agriculture and pasture are the major land use types.
- Forests occupy upland areas east and west of the RoW.
- Route passes close to Mezarlik Hill and tumulus.
- Pipeline corridor runs alongside a National highway.
- Pipeline crosses two energy transmission lines and the Huseyinli River.

MAP 48: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** six settlements will be directly impacted by the pipeline project (Bozhoyuk, Keklikoluk, Mahmutbey, Mehmetby, Mursei, Tahirbey) and will have land intersected by the proposed pipeline (L). Four of these settlements (Mehmetbey, Keklikoluk, Tahirbey, Mahmutbey) are within 500m of the pipeline (D). Two settlements (Mehmutbey, Mahmutbey) are within 5km of a construction camp, one (Tahirbey) is within 2km of the block valve station (B), and none are near a pump station (C/P). One settlement, Mehmetbey is at a river crossing (Huseyinli river).

- ***Surveyed:*** one settlement (Bozhoyuk) was surveyed in the field (S). Five settlements (Keklikoluk, Mursei, Tahirbey, Mahmutbey, Mehmetbey) were surveyed on the telephone (T).
- ***Disclosure Meeting Location***: Mehmetbey

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Keklikoluk (L) (D) (T)			
• ***Demographics:*** 187 inhabitants, 50% of the population migrates. • ***Safety:*** nearest house 40m from pipeline, centre of settlement is 350m	***Construction hazards: humans***	**Road safety training** will	**Continued attention** to

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

from pipeline. • ***Project attitude:*** a construction camp would be welcome, although the people are concerned that the pipeline might cause an explosion. • ***Land ownership & use:*** 50% of land is communally owned, There is seasonal grazing. Crops grown are wheat, sunflowers, sugar beet, bean and chickpea, the land is not very fertile. • ***Settlement livelihood:*** agriculture and animal breeding activities are the main sources of livelihood, although some local residents are working in Germany. • ***Availability & skills:*** two out of 24 construction skills present. • ***Accessibility:*** the settlement is accessible all year, and is 22km from the district centre. • ***Information provision:*** 100% of the population is literate. Main source of information is television. • ***Services:*** there is an elementary school. • ***Infrastructure:*** piped water is available and regular. • ***Settlement problems:*** inadequate access to water.	Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Land*** Potential complications in expropriation process. ***Accessibility to information*** Sectors of the population	be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations as agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **See Overview of Land Acquisition Process in Appendix C9.** **Communication with settlement** must take into account settlement	mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of Land Acquisition Process in Appendix C9.** **Any change can highlight and exacerbate existing divisions** in communities.

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	may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Accessibility to recruitment*** Decreased access to recruitment process	characteristics to ensure equal access to information for all residents. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	Mitigation measures will keep this to a minimum. **No residual impact expected**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Mursei (L) (T)			
• ***Demographics:*** 290 inhabitants with 10% of the population migrating. • ***Safety:*** nearest house 1.8km from pipeline, centre of settlement is 2km from pipeline. • ***Project attitude:*** according to the Muhtar local residents would welcome a construction camp. • ***Land ownership & use:*** 90% of land is communally owned, and 10% privately owned by local residents. Sugar beet is grown. No irrigation is used. • ***Settlement livelihood:*** agriculture, bee keeping (three households), construction and trade are the main sources of livelihoods. • ***Accessibility:*** the settlement is accessible between February and November. The settlement is 18km from the district centre. • ***Information provision:*** 80% of the population is literate. Best local information provision mechanisms are the telephone and television. • ***Environmental & cultural sites:*** a mausoleum • ***Infrastructure:*** piped water is available with regular supply. There is no alternative water source. • ***Settlement problems:*** inadequate access to water, low incomes and the land is poor.	***Land*** Potential complications in expropriation process. ***Accessibility to recruitment*** Decreased access to recruitment process ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**See Overview of Land Acquisition Process in Appendix C9.** Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**See Overview of Land Acquisition Process in Appendix C9.** **No residual impact expected** **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6):
Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Bozhoyuk (L) (S)			
• ***Demographics:*** 2,500 inhabitants with 400 households. • ***Safety:*** centre of settlement is situated 2.8km from the pipeline. • ***Project attitude:*** community is not hostile to pipeline, their general attitude is positive and they hope that there will be temporary jobs in the construction phase. A construction camp would be welcome. • ***Land ownership & use:*** There is seasonal grazing all year. A diverse livestock. Seasonal irrigation undertaken. • ***Conflict over land rights & ownership:*** Occasional conflict between families/ tension between two different groups is observed. There are no ongoing unresolved disputes. A municipality with quite "nationalist" attitudes. The sub-settlement of Akboyum consists of citizens of Kurdish origin. • ***Settlement livelihood:*** the main economic activities are agriculture, forestry and animal husbandry. Trade and education are also important activities. Primarily wheat and some sugar beet are cultivated. • ***Availability and skills:*** 73% of respondents will accept a temporary job. • ***Accessibility:*** inaccessible in January and February. The settlement is 107km from the district centre.	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **See Overview of Land Acquisition Process in Appendix C9.** Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of Land Acquisition Process in Appendix C9.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6):
Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

• ***Information provision:*** 99% of the population is literate. The best sources of national information are TV, local news via settlement policeman and Muhtar. The best local source of information is the Muhtar. • ***Environmental & cultural sites:*** historical remains especially in the form of treasury and monuments are likely to be encountered during the construction process of the pipeline. Civilian architecture. • ***Infrastructure:*** piped water is available. There is no regularity of water supply and usually there are cuts and interruptions in water flow for 2-3 hours per day. There is no alternative water source. There is no sewerage system and inhabitants rely on the Municipality of Goksun to empty the cesspits because the Municipality of Bozhuyuk does not have the means to do so. Consequently they are not always emptied. • ***Services:*** phone, mobile systems are available. The municipality owns a tractor, an ambulance, a service vehicle, an official vehicle and a bus. Coffee houses, shops, transport and sport facilities are also available. There is a primary school with one teacher in the settlement. The school serves the neighbouring settlements. There is a multi-programmed high school. Health facilities include a clinic, with a doctor and a midwife. • ***Settlement problems:*** water supply and poverty. Political unrest is apparent, ethnic tension between two groups, discrimination in provision of services.	***Accessibility to recruitment*** Decreased access to recruitment process ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Forestry*** Loss of a resource used by settlements. Increased expenditure on other fuel sources.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	**No residual impact expected** **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Tahirbey (L) (D) (B) (T)			
• ***Demographics:*** 83 inhabitants, no migration occurs. • ***Safety:*** centre of settlement is situated 650m from pipeline. Nearest household is 600m from the pipeline. • ***Project attitude:*** according to the Muhtar, local residents would welcome a construction camp. There are no major concerns.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison**	**Continued attention** to mitigation measures will be critical to prevent injury.

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

welcome a construction camp. There are no major concerns. • ***Land ownership & use:*** 70% of land is communally owned. No seasonal grazing takes place. No use of temporary irrigation. • ***Settlement livelihood:*** agriculture and bee keeping (by two families, for their own consumption) are the main sources of livelihood. • ***Accessibility:*** accessible between March and November. The settlement is 14km to the nearest district centre. • ***Information provision:*** Turkish and Cerkezish. Population is 90% literate. Best local information provision mechanisms are television and phone. • ***Environmental & cultural sites:*** none. • ***Infrastructure:*** no piped water. The settlement fountain is the only source. • ***Services:*** there is an elementary school. • ***Settlement problems:*** inadequate access to water, emigration particularly of younger generations leaving behind an ageing population.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

	Land Potential complications in expropriation process.	**See Overview of Land Acquisition Process in Appendix C9.**	**See Overview of Land Acquisition Process in Appendix C9.**
	Drinking Water Potential for contamination of drinking water by sediment or accidental spills	**Alternative sources of water** will be provided during construction to settlements that use water channels for drinking that are crossed by the construction activities.	**No residual impact**
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility to recruitment Decreased access to recruitment process ***Block Valve Station*** Refer to Environmental Impact Tables and the Resettlement Action Plan	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6):
Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Mahmutbey (L) (D) (T)			
• ***Demographics:*** 150 inhabitants, 10% of the population migrates. Population mostly composed of old people. • ***Safety:*** centre of settlement is 550m from the pipeline. Nearest house 270m from the pipeline. • ***Project attitude:*** according to the Muhtar, the majority of inhabitants would welcome a construction camp. • ***Perceived benefits of construction camp:*** they expect to get positive benefits from the camp, they expect to sell fish, dairy products and poultry products. They expect employment benefits. They have concerns related to the construction workers. • ***Land ownership & use:*** 75% of land is privately owned by local residents. There is seasonal grazing of livestock. Seasonal irrigation is used. Land ownership at the construction camp site is unregistered large pastureland, there will be no affect to the cultivation. • ***Settlement livelihood:*** agriculture, commercial fishing and non-commercial fishing (one family) are the main sources of livelihood. • ***Availability and skills:*** two out of 24 construction skills present. The local residents claim that the level of education in the settlement is very high. There are skilled and unskilled workforce present, there was a newly graduated industrial engineer at the community meeting. • ***Accessibility:*** the settlement is accessible all year and is 11km from the district centre. • ***Information provision:*** 100% of the population is literate. Best local information provision mechanisms are television and newspaper • ***Infrastructure:*** no piped water is available. The local spring is the only source. • ***Settlement problems:*** inadequate access to water and unemployment • ***Other:*** it is a conservative Circassian settlement and they are particularly concerned about workers consuming alcohol in a picnic	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Drinking water*** Potential for contamination of drinking water by	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **Alternative sources of water** will be provided during construction to	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

area close to the settlement, however, they don't mind the workers coming into the settlement.	sediment or accidental spills	settlements that use water channels for drinking that are crossed by the construction activities.	**No residual impact**
	Irrigation Potential for loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Construction camps Primary receptors of impacts resulting from construction workers	**Monthly community liaison** meetings will be held. **Preferential employment** opportunities **Project to liase** with local health authorities BTC Company to look at opportunities to cooperate in providing **health awareness training**	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities.
	Conservative settlement Construction workers are more likely to offend	**Construction workers to be remind**ed of the importance of appropriate	**Low likelihood of significant impacts.** Impacts arising from

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6):
Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

	inhabitants	behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) will be carefully monitored.	breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**MITIGATION**	**RESIDUAL IMPACTS**
Mehmetbey (L) (D) (C) (T)			
• ***Demographics:*** 200 inhabitants with no migration. • ***Safety:*** the settlement centre is 225m from the pipeline. The nearest house 50m from pipeline. • ***Project attitude:*** generally positive, providing construction workers do not visit the settlement. Also, it was suggested that the pipeline should use unproductive lands on the other side of the highway. Very conservative settlement with strict rules and traditions. A minority are concerned about the possible disruption of the social harmony. • ***Perceived benefits of construction camp:*** local residents hope to benefit from the opportunity to sell dairy and fish products to camp workers. During the second consultation meeting, inhabitants were more positive compared to the first meeting. As the camp has moved closer to the settlement they expect more benefits. • ***Land ownership & uses:*** 95% of land is communally owned. There is seasonal grazing and seasonal irrigation is undertaken. At the camp site, land is uncultivated and not used, it was previously rented out to local residents in Kayseri. • ***Settlement livelihood:*** agriculture, fishing (nine families), construction, trade, education and dairy production. There are two fishing farms, one owned by a local resident and the other by a cooperative established by 83 local residents. Connected to these farms there are two fish restaurants. • ***Availability & Skills:*** two out of 24 construction skills. 10 to 15 people have worked in infrastructure projects including dam & road construction and one person has been a heavy earth mover operator	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

construction and one person has been a heavy earth mover operator for 15 years. There are both skilled and unskilled workers. No previous pipeline experience. • ***Accessibility:*** the settlement is accessible throughout the year although the roads are of poor quality. • ***Information provision:*** 98% of the population is literate. Best local information provision mechanisms are television and telephone. • ***Infrastructure:*** piped water is available. There is regularity of water supply. There is no alternative water source. Adequate water for settlement only, however, there may be possibility of extracting underground water. • ***Services:*** good electricity system and telephone network. No sewerage system, and not in mobile or satellite coverage area. Two fish restaurants, one small grocery store, three trucks, one minibus and six or seven tractors. No coffee shop. • ***Other:*** the settlement has asked that there be strict discipline of the construction workers. There is fear of theft and drunkenness. There is a problem with the neighbouring settlement of Mahmutbey, as the camp site is within their borders yet closer to Mehmetbey.		erected in areas of danger for livestock.	compensation will be facilitated by the Projects complaints procedure.
	Land Potential complications in expropriation process.	**See Overview of Land Acquisition Process in Appendix C9.**	**See Overview of Land Acquisition Process in Appendix C9.**
	Fishing Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility of information Sectors of the population may not have access to project related information	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

	on employment opportunities, potential disruption to utilities, etc.	for all residents.	
	Skills Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements.
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Conservative settlement Construction workers are more likely to offend inhabitants	**Construction workers to be remind**ed of the importance of appropriate behaviour in daily **briefings. Any** interaction between construction workers and communities (eg use of local shop) to be carefully monitored.	**Low likelihood of significant impacts.** Impacts arising from breeches of rules and procedures. All incidents to be rapidly resolved and used as examples to reinforce procedures.

Social Impact Table 48 (Maps 48C) (KPs 896.8 – 910.6): Keklikoluk Settlement to Mehmetbey Settlement, Kahramanmaras Province

	Construction camps Primary receptors of impacts resulting from construction workers	**Monthly community liaison** meetings will be held. **Preferential employment** opportunities **Project to liase** with local health authorities BTC Company to look at opportunities to cooperate in providing **health awareness training.**	**Low likelihood of significant impacts.** Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities.

Environmental Impact Table 49 (Maps 49A and 49B) (KPs 910.6 – 924.6): Goksun Plain, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Fine-silty Xerorthents in irrigated valley soils. • Mesic Coarse-silty Xerorthents where headlands begin to encroach on the valley. • Mesic Coarse-loamy Shallow Dystric Xerochrepts near southern headlands.	Main potential impacts include: • soil productivity; • sediment; • channel alteration; • soil contamination; • waterlogging.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Time construction to avoid irrigation periods. Allow soils time to drain. Use equipment mats as required.	**MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed. In areas where waterlogging occurs, water is predicted to remain in surface depressions for less than 3 months after construction.
Landscape and Visual			
The route enters the Goksun valley, an area of irrigated agriculture bordered by lightly-forested hills. Numerous tributaries cross the Pipeline to be diverted into fields or flow directly into the Huseyinli River. Shortly after crossing the Huseyinli River around KP 902, the valley suddenly broadens out into a flat plain, largely designated to irrigated agriculture. Forests cover slopes east and west of the valley; riparian forests occupy stream banks, and linear plantations mark field boundaries. Landscape sensitivities are low. The highway diverges towards Goksun town, which lies about 2km to the east. A dense population and the motorway render the Pipeline highly visible.	Short-term construction modifications of landscape, highly visible during construction.	• Reinstatement of the BTC Pipeline. • Replant disturbed woodlots, field boundary forests, and riparian forests.	**MINOR IMPACT** If reinstatement is successful, impacts will be localised and restricted to short-term.
Surface Waters			
The pipeline route continues to parallel Huseyinli River before crossing it. River channel is irregular and meandering, with a trapezoidal cross-section and pool and riffle bars. Some riffles have been constructed to increase	Direct disturbance to bank and bed morphology through physical works, and indirectly,	Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, for the	**MINOR IMPACT** Disturbance will be short-term and limited to the immediate

Environmental Impact Table 49 (Maps 49A and 49B) (KPs 910.6 – 924.6): Goksun Plain, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
backwater to irrigation offtakes. Width of crossing is 26m and the bank-full width is 13 – 14m, although the floodplain is between 26 – 130m wide. Bed consists of gravel and cobbles and the flow is perennial, of a pool and riffle type. Bank-side vegetation comprises grass, shrubs and deciduous trees and riparian vegetation is fragmented. Water samples taken 680m downstream of the crossing point indicate that this is a Class II river.	due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Therefore, potential for short-term sedimentation and turbidity. However, the water quality classification indicates that Huseyinli River is only slightly polluted and further degradation in quality will be avoided.	protection of surface waters, Including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench. Assess need for alternative water supply for downstream communities, such as Kurudere settlement, and provide where necessary if sedimentation and turbidity persist for more than 3 days at the community.	working area. Sedimentation of Huseyinli River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Groundwater			
The route passes over the Goksun Plain for the majority of this section, comprising areas of both unconfined and confined aquifer. Water samples were taken from the unconfined aquifer at four locations: • Well Site No. 10, (DSI 25297, Nebioglu Site), c. 2.3km east of the route (KP 914.6); • Well Site No. 11, (DSI 25294, Hacimirza Settlement), c. 3.8km east of the route (KP 914.6); • Well Site No. 12, (DSI 28483), c. 4.2km east of the route (KPs 916.4 – 917.7); • Well Site No. 13, (DSI 28486), c. 4km east of the route (KPs 917.7 – 919.4). Results indicate that groundwater quality is Class I, with the exception of groundwater taken from Well Site No. 10, which was Class II. BVS-047 will be located over the unconfined aquifer at KP 924.1 within cultivated land. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 30m in length.	Groundwater quality in much of this area is high and suitable for drinking water supply (post disinfection) and water supply for food industries. Potential for moderate and localised impacts to groundwater quality from construction of both the Pipeline and BVS-047.	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including: • No groundwater abstraction within 50m of springs or wells. Groundwater will not be abstracted for use as hydrotest water. • Construction camps and other temporary facilities will not be located in areas of Class 1 unconfined aquifers or within 50m of springs or wells. Soakaways will not be used as a means for disposal of treated wastes in such locations.	**MODERATE IMPACT** The presence of a Class I unconfined aquifer means that there is the potential for moderate impacts during pipeline and BVS construction. Strict adherence to the mitigation measures contained in the EMMP (see Appendix C1) and PPP (see Appendix C4) will be required.

Environmental Impact Table 49 (Maps 49A and 49B) (KPs 910.6 – 924.6): Goksun Plain, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• Fuels and other oils will not be stored in areas of Class 1 unconfined aquifers. If it is necessary to store fuels etc in such locations they will be stored in bunded areas on impermeable bases and the inventories will be kept to a practical minimum.	
Noise			
Caglayan settlement is located c. 217m from the centreline of the pipeline.	Short-term noise impacts are expected to occur at Caglayan settlement during soil stripping.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings and where possible, utilising existing screening, including that arising from the stockpiling of materials. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers to screen dwellings from construction	**MINOR IMPACT** Short-term noise impacts are expected to occur during soil stripping. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days.

Environmental Impact Table 49 (Maps 49A and 49B) (KPs 910.6 – 924.6): Goksun Plain, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		works for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	
Archaeology and Cultural Heritage			
There are two archaeological sites in this section within the 100m Corridor: • Gumgum Hill (3rd Degree Site - registered by the MoC). The site comprises five sites, of which the second largest crossed by the route at KP 912.6. Pottery pieces dating from the Late Roman and Byzantine periods were observed in the area during route narrowing investigations. However, it was noted that archaeological finds have been illegally removed from the site; • Tasoluk Settlement (Igdelik Mound) (3rd Degree Site - registered by the MOC*) – Classical monumental site. It consists of traces of Roman and Byzantine structures, mosaics, peribolos wall, towers, a large church and necropolis. Due to the thick alluvial deposit accumulated over the settlement, it is impossible to define its boundaries.	Gumgum Hill will potentially experience ground disturbance during pipeline construction. Tasoluk Settlement will experience structural damage as a result of construction activities.	The pipeline has been re-routed to avoid Gumgum Hill. Tasoluk Settlement will be further investigated prior to construction to establish the boundaries of the site and a safe route through. The classification of this site will also be confirmed during pre-construction archaeological surveys. If a safe route is not possible, salvage excavations will be carried out at this site prior to the commencement of construction activities. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ and a member of the Ministry of Culture. If blasting is required, then it will be conducted in such a way that it does not pose a threat to the integrity of buildings still standing	**MINOR IMPACT** Residual impacts cannot be determined precisely for Tasoluk Settlement at this stage and will be subject to further investigation prior to construction. Archaeological investigations prior to construction will establish the full extent of the site. However as investigations are expected to find a safe route through these sites, the ultimate scale of impact is likely to be minor and short-term in duration. Assuming Gumgum Hill is fenced, impacts will be limited to the temporary disturbance of the site setting and peripheral features.

Environmental Impact Table 49 (Maps 49A and 49B) (KPs 910.6 – 924.6): Goksun Plain, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		on the site. To avoid vibration impacts, percussive piling will be not allowed within 100m of Tasoluk Settlement.	

Social Impact Table 49 (Map 49C) (KPs 910.63 – 924.6): Goksun Plain, Kahramanmaras Province

MAP 49: PROJECT INFORMATION

A primary Construction Camp (Lot C) is located in the area (refer also to map 53). It is 16.74ha in size and located on unregistered pastureland. Two options were originally considered. This is the preferred site as the other option was located on cultivated land with trees. There is no pump station or block valve station in the area.

MAP 49: MAP HIGHLIGHTS

- Predominant land use is irrigated agriculture, there are also small areas of pasture.
- The Huseyinli River crosses the pipeline.
- Forests cover the slopes east and west of the valley.
- Pipeline crosses a National highway.
- There are two archaeological sites: Gumgum Hill; Igdelik Mound and an ancient settlement including ruins of a church and other buildings.

MAP 49: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** four settlements will be directly impacted by the pipeline project. They will each (Caglayan, Yenimhalle, Yiricek, Tasoluk) have land intersected by the proposed pipeline (L). Two of these (Tasoluk, Caglayan) are also situated within 500m of the pipeline (D). No settlements are within 500m of a pump station (P). Camkopru and Gumgum are near a construction camp (C). Tasoluk is within 2km of the block valve station (B). Settlements impacted by traffic have not yet been identified. One settlement is downstream of a river/creek crossing (Goksin is downstream of the Huseyinli river).The campsite location has been changed. As such there are no longer any settlements on this map near a construction camp.

- ***Surveyed:*** three settlements (Goksun, Yiricek, Tasoluk) were surveyed in the field (S). Two settlements (Caglayan, Yenimhalle) were surveyed via telephone (T).
- ***Disclosure Meeting Location:*** Tasoluk

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	*RESIDUAL IMPACTS*
Camkopru & Gumgum (C) (S)			
• ***Demographics:*** there are six households in Camkopru and five households in Gumgum. • ***Safety:*** Camkopry is 750m from the pipeline and Gumgum is 250m from the pipeline. Both are also near a primary construction camp. • ***Land ownership at construction campsite:*** the campsite is 16.74ha in size and is unregistered pasture land, used by the Mahmutbey settlement. • ***Project attitude:*** generally positive, although local residents are concerned about the security of the pipeline	**Construction camps** Primary receptors of impacts resulting from construction workers	**Monthly community liaison** meetings will be held. **Preferential employment** opportunities **Project to liase** with local health authorities.	**Low likelihood of significant impacts.** Possibility of Impacts arising from breaches of rules and procedures. All incidents need to be rapidly resolved and used as examples to reinforce procedures.

Social Impact Table 49 (Map 49C) (KPs 910.63 – 924.6): Goksun Plain, Kahramanmaras Province

concerned about the security of the pipeline. • ***Local opinion of construction camp:*** A construction camp would be welcomed and construction camp workers would be welcome in the settlement. • ***Perceived benefits of construction camp:*** women believe they will be able to sell fruit and vegetables to workers, in addition local residents are hopeful that the highway will be widened and speed limits implemented to reduce traffic accidents. • ***Perceived problems of construction camp:*** none • ***Settlement livelihood:*** both agriculture (sugar beat, sunflowers, beans, vegetables and fruit) and animal husbandry: bovine-milk. In Gumgum, trade and transport are an important source of livelihood. In Camkipru there is a store in the industrial district, and an oil station near the highway. • ***Accessibility:*** both settlements have good accessibility as they are close to the highway. • ***Infrastructure:*** good water supply in both settlements, however, there are frequent water cuts in both settlements. No sewerage system in Gumgum, and neither settlement receives mobile phone coverage. • ***Services:*** there is a small grocery shop and a picnic area in Camkopru. Four trucks and a tractor in Gumgum and a truck and a tractor in Camkopru. • ***Skills:*** unskilled workforce in both settlements. One local resident in Gumgum has a heavy truck driver's licence, and there is a drilling operator in Camkopru.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock.	BTC Company to look at opportunities to cooperate in providing **health awareness training** **Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be	**Low likelihood of significant health impacts.** **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities. Continued attention to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of

Social Impact Table 49 (Map 49C) (KPs 910.63 – 924.6): Goksun Plain, Kahramanmaras Province

		erected in areas of danger for livestock.	compensation will be facilitated by the Projects complaints procedure.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will consult with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	Communication with settlement must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	***RESIDUAL IMPACTS***
Caglayan (L) (D) (T)			
• ***Demographics:*** 865 inhabitants with 70 households, there is no migration. • ***Safety:*** the centre settlement is 250m from pipeline. Nearest house is 70m from the pipeline. • ***Project attitude:*** according to the Muhtar a construction camp would be welcome. • ***Land ownership & use:*** 70% of land is settlement owned, seasonal irrigation is used. There is no seasonal grazing. Agriculture, hunting, education and local government are the main sources of livelihood	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 49 (Map 49C) (KPs 910.63 – 924.6): Goksun Plain, Kahramanmaras Province

education and local government are the main sources of livelihood. • ***Accessibility:*** the settlement is accessible all year, the distance to from settlement to local district centre is 4km. • ***Information provision:*** 70% of the population is literate. Best local information provision mechanism is the television. • ***Infrastructure:*** piped water is available. There is regularity of water supply. There is no alternative water source. • ***Settlement problems:*** inadequate access to water.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Irrigation*** Loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance during construction.	**Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. **Communication with**	**Any additional damage will be compensated for.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Significance cannot be established at this time**

Social Impact Table 49 (Map 49C) (KPs 910.63 – 924.6): Goksun Plain, Kahramanmaras Province

	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc.	**settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	***RESIDUAL IMPACTS***
Goksun (C) (S)			
• ***Demographics:*** 36,247inhabitants with 10,000 households. There has been an increase in population. • ***Safety:*** settlement is situated 2km from pipeline and 1km from the nearest house. • ***Health:*** poor sewerage system with health implications. • ***Project attitude:*** generally positive. • **Local opinion of construction camp:** the majority of inhabitants would welcome it. • ***Perceived benefits of construction camp:*** yes • ***Perceived problems of construction camp:*** none. • ***Land ownership & use:*** local residents privately own 60% of land and lease a further 25%. Use of seasonal irrigation. Bee keeping. There is seasonal grazing. • ***Settlement livelihood:*** agriculture (wheat, sugar beat, sun flowers and animal feed); animal husbandry (bovine-milk); trade and transportation; bee keeping and fishing (many trout farms) are the main sources of livelihood. Milk collected from local residents and sent to Nigde for processing. • **Availability & skills:** skilled & unskilled workforce, one heavy truck and many smaller trucks and minibuses in the district. 51% of respondents would be willing to accept a temporary job.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc ***Skills*** Increased opportunity to provide skilled or semi-skilled labour or to source	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Potential positive benefits** to local settlements.

Social Impact Table 49 (Map 49C) (KPs 910.63 – 924.6): Goksun Plain, Kahramanmaras Province

• ***Accessibility:*** the settlement is accessible, there will be a two-way 17km long road, and an asphalted 8km road constructed around the district to enhance transportation and accessibility. Goksun is located at the crossroads of other provinces and is therefore very busy. • ***Information provision:*** 70% of the population is literate. Best local information provision mechanisms: newspapers and family members. • ***Infrastructure:*** piped water is supplied to households and businesses. There is regularity of water supply and no alternative water source. There are problems with the sewerage system. • ***Services:*** there is phone, mobile coverage, good electricity supply, coffee houses, shops, library, market, post office, bank, police, transport, sports facilities. There is a primary school and a health centre, with a doctor and a midwife. • ***Other settlement services (of potential use to construction workers):*** Two bank branches, ATM, many markets, coffee shops and a post office. • ***Settlement problems:*** lack of water, unemployment, education, poor sewage system and drought.	goods or materials **Fishing** Potential reduction in fisheries yield or damage to fisheries habitats within 2km downstream of a river crossing.	given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. **Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	***RESIDUAL IMPACTS***
Yeni Mah (L) (T)			
• ***Demographics:*** 2,300 inhabitants, there is no migration. • ***Safety:*** settlement centre is 6km from pipeline. • ***Project attitude:*** according to the Muhtar a construction camp would be welcome. People are concerned about land costs. • ***Land ownership & use:*** 90% of land is privately owned by local residents. There is no seasonal grazing. There is use of seasonal irrigation. Agriculture, hunting, construction, transport, trade and education are the main sources of livelihood. • ***Accessibility:*** the settlement is accessible all year. • ***Information provision:*** Turkish speaking settlement. Population is 80% literate. The best information provision mechanisms are	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Hunting*** Temporary reduction in	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Significance cannot be established at this time**

Social Impact Table 49 (Map 49C) (KPs 910.63 – 924.6): Goksun Plain, Kahramanmaras Province

newspapers and television. • ***Infrastructure:*** piped water with regular supply. No alternative source. • ***Settlement problems:*** Inadequate access to water and infrastructure problems.	game due to disturbance during construction. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	***RESIDUAL IMPACTS***
Yiricek (L) (S)			
• ***Demographics:*** 450 inhabitants with 125 households, there has been a decrease in population. • ***Safety:*** the centre of settlement is 1.9km from pipeline. • Health: poor sewerage with health implications. • ***Project attitude:*** community not hostile to the pipeline and generally positive. Local residents stated they would not let anyone on their land if money had not been deposited in their bank for acquisition. A construction camp would be welcome.	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Conflict over Land***	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Land boundaries to**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 49 (Map 49C) (KPs 910.63 – 924.6): Goksun Plain, Kahramanmaras Province

• ***Land ownership & use:*** 60% of land is privately owned by local residents and 20% is communal. Insignificant conflict between families, associated with land. There is seasonal grazing. Seasonal irrigation is undertaken. • ***Settlement livelihood:*** agriculture, hunting, animal husbandry. Key crops are sugar beet, beans, sunflower, maize and various fruits. • ***Availability & skills:*** one heavy machinery operator. 27% of inhabitants are willing to take on temporary jobs. • ***Accessibility:*** the settlement is accessible all year. Distance to the district centre is 4km. • ***Information provision:*** 80% of the population is literate. Muhtar is the main source of information. • ***Services:*** phone, mobile systems and transport. There is a primary school. • ***Infrastructure:*** a regular supply of piped water is available. There is no alternative water source. • ***Settlement problems:*** unemployment, education, insufficient health services and poor sewage system with health implications.	Exacerbation of existing conflicts ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance during construction. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential	**remain clearly demarcated** at all times. **Temporary fences** to be erected where there is a separation of more than one day between work teams. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This	**No significant residual impacts** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. Significance cannot be established at this time **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 49 (Map 49C) (KPs 910.63 – 924.6): Goksun Plain, Kahramanmaras Province

	disruption to utilities etc	should include emphasising oral communication where literacy is low and using appropriate channels of communication and media.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	***RESIDUAL IMPACTS***
Tasoluk (L) (D) (B) (S)			
• ***Demographics:*** 2,630 inhabitants with 438 households. The settlement has experienced an increase in population over the past five years. • ***Safety:*** the centre of the settlement is 600m from pipeline and the pipeline is 50m from nearest house. • ***Project attitude:*** the community not hostile to pipeline and the majority of inhabitants would welcome a construction camp. • ***Land ownership & use:*** privately owned (55%) and share cropped (20%). There is seasonal grazing in April, May, June, October, November and December. There are no significant disagreements among the local residents. Seasonal irrigation is undertaken. • ***Settlement livelihood:*** agriculture, local government and industry are the main sources of livelihood. The key crop is sugar beet. • ***Availability & Skills:*** heavy machinery drivers, repairmen, welders, and construction workers. 64% would accept temporary jobs. • ***Accessibility:*** the settlement is accessible throughout the year and is 6km to the district centre. • ***Information provision:*** 90% of the population is literate. The best local information provision mechanism is family, etc. • ***Environmental & cultural sites:*** unexcavated Roman and Byzantine ruins. Civilian architecture and graves. • ***Infrastructure:*** piped water is available. There is regularity of water supply. There is no alternative water source. Electricity networks are	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will

Social Impact Table 49 (Map 49C) (KPs 910.63 – 924.6): Goksun Plain, Kahramanmaras Province

present. • ***Services:*** telephone networks present, mobiles, coffee houses, shops, transport and sports facilities are available. There is a primary school and a health centre, with a midwife and a doctor. • ***Settlement problems:*** unemployment, education and poverty.	for livestock	Stock proof fencing will be erected in areas of danger for livestock.	be given The level of compensation will be facilitated by the Projects complaints procedure.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Skills Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials	**Information is highlighted to Contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements.
	Special Sites Refer to Environmental Impact Tables.		
	Block Valve Station		

Social Impact Table 49 (Map 49C) (KPs 910.63 – 924.6): Goksun Plain, Kahramanmaras Province

	Refer to Environmental Impact Tables and the Overview of the Land Acquisition Process in Appendix C9.		

Environmental Impact Table 50 (Maps 50A and 50B) (KPs 924.6 – 940.8): Goksun Plain and the Armutyucesi Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soils types from the previous section continue in this section of the route: • Mesic Fine-silty Xerorthents in irrigated valley soils. • Mesic Coarse-silty Xerorthents where headlands begin to encroach on the valley. • Mesic Coarse-loamy Shallow Dystric Xerochrepts near southern headlands.	Main potential impacts: • soil productivity; • sediment yield; • channel alteration; • soil contamination; • waterlogging.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Time construction to avoid irrigation periods. Allow soils time to drain. Use equipment mats as required.	**MINOR IMPACT** Soil productivity losses are predicted to last less than 3 months after construction is completed. In areas where waterlogging occurs, water is predicted to remain in surface depressions for less than 3 months after construction.
Landscape and Visual			
The route continues through the irrigated agricultural landscape before ascending over smooth ridge through mixed forests, and then along the side of a 10km long upland valley. The valley sides and the steeper slopes of the pale limestone mountains beyond are covered in juniper scrub and Cedar of Lebanon, while Meryemcilbeli Creek meanders through green water-meadows strewn with buttercups in the flat valley bottom. The landscape sensitivity of the valley is moderate to high, although the presence of an electricity transmission line along the valley detracts from views. Visibility is also restricted by the terrain.	Although construction will not take place in the wet meadows along Meryemcilbeli Creek, access from the adjacent road has the potential to cause visual impact.	• Replant disturbed woodlots, field boundary forests, and riparian forests. • Reinstatement of the BTC Pipeline. • Access from the main highway across the river valley will be restricted to the absolute minimum of crossing points and vehicle movements will be carefully controlled. • Moveable equipment mats will be used on the wet soils to spread vehicle weight and avoid deep rutting.	**MODERATE IMPACTS** The wet meadows/ marshland in the valley will show the scar of construction traffic, but if undertaken with care and sensitivity, this will last no more than a year or two. Some loss of juniper scrub, and residual impacts arising from thin stony soils limiting the success of reinstatement will result in longer-term/permanent visual effects. Minor impacts elsewhere.
Groundwater			
The pipeline route continues to pass over the Goksun Plain (unconfined	Potential for moderate and	Apply standard mitigation	**MINOR IMPACT**

Environmental Impact Table 50 (Maps 50A and 50B) (KPs 924.6 – 940.8): Goksun Plain and the Armutyucesi Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
aquifer) for c. 5.2km at the beginning of this section. Water samples taken from the unconfined aquifer at Well Site No. 14, (DSI 42035-A: Sirapinar Well), c. 880m west of route (KPs 924.0 – 925.2) indicate groundwater quality is Class II.	localised impacts to groundwater quality from construction activities.	measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including: • No groundwater abstraction within 50m of springs or wells. Groundwater will not be abstracted for use as hydrotest water. • No facilities (construction camps, pipe yards, fuel stores etc) will be located within 50m of springs or wells.	With the application of the specified mitigation measures described, only minor impacts are expected to occur, which will be short-term in nature.
Ecology			
Important Ecological Factors ESA 42 is identified between KP 936.8 and KP 938.5 for the globally-threatened plant species (*Gentiana boissieri*). The IUCN status for this species is given in Table 5.20, Section 5. ESA 43 begins at the end of this map (KP 940.0) and continues on to the next map (see Environmental Impact Table 51 and Map 51B for species description). Two nationally-threatened bird species were recorded along this route section – 1 Barred Warbler at KP 929.6 and 1 Northern Goshawk at KP 935.3. The protection status for these species are given in Table 5.21, Section 5.	Destruction of habitats peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 42 & 43. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1: • remove and keep top soil and sub-soil separate, protect top	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April,

Environmental Impact Table 50 (Maps 50A and 50B) (KPs 924.6 – 940.8): Goksun Plain and the Armutyucesi Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Shrubs, thickets and dense vegetation along the RoW will be cleared outside the breeding season for the Barred Warbler. Preconstruction survey will establish the presence of potential Northern Goshawk nest sites within the RoW. If nesting sites are identified, avoidance of construction activity from April to July.	and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.

Social Impact Table 50 (Map 50C) (KPs 924.6 – 940.8): Goksun Plain and the Armutyucesi Mountain Area, Kahramanmaras Province

MAP 50: PROJECT INFORMATION			
There are no pump stations, construction camps or block valve stations in the area.			
MAP 50: MAP HIGHLIGHTS			
• Land use includes irrigated agriculture, rain fed agriculture, non agricultural land and pasture. • Forests cover slopes east and west of the valley. • The pipeline crosses the Osungele creek and the Degirmendere irrigation pond. • A National highway passes through this section, but does not cross the pipeline corridor.			
MAP 50: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted:*** three settlements will be directly impacted by the pipeline project; all of these (Findikli Koyak, Kucuk Camurlu, Degirmendere) have land intersected by the proposed pipeline (L); no settlements are within 5km of a pump station or construction camp (P/C) and no settlements are within 500m of the pipeline route (D). Settlements impacted by traffic have not yet been identified. One settlement is downstream of a river/creek pipeline crossing (Degirmendere is downstream of Osungele creek) (R). • ***Surveyed:*** two settlements (Findikli Koyak, Degirmendere) were surveyed in the field (S). One settlement (Kucuk Camurlu) was surveyed on the telephone (T).			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	***RESIDUAL IMPACTS***
Findikli Koyak (L) **(S)**			
• ***Demographics:*** 950 with 135 households. There has been a recent decrease in population. • ***Safety:*** the centre of settlement is situated 2.25km from the pipeline, the nearest house in settlement is situated 1.9km from the pipeline. • ***Project attitude:*** the community is not hostile to the pipeline and are eager to receive expropriation payments for land with low yields. They would also welcome a construction camp. • ***Land ownership & use:*** 72% of land is communally owned, and 24% is privately owned. There is seasonal grazing in April, October and November. Seasonal irrigation is not used. • ***Settlement livelihood:*** agriculture, bee keeping, construction, transport, trade and education are the main sources of livelihood. • ***Availability & skills:*** machine operator, vehicle driver, driver and	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Land*** Potential complications in expropriation process. ***Skills***	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **See Overview of Land Acquisition Process in Appendix C9.**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of Land Acquisition Process in Appendix C9.**

Social Impact Table 50 (Map 50C) (KPs 924.6 – 940.8): Goksun Plain and the Armutyucesi Mountain Area, Kahramanmaras Province

welders are present. 73% of inhabitants are willing to accept temporary jobs. • ***Accessibility:*** the settlement is accessible and is 10km from the district centre. • ***Information provision:*** 100% of the population is literate. The local sources of information are newspaper, family members and the Muhtar. • ***Environmental & cultural sites:*** Roman and Byzantine ruins, military buildings • ***Infrastructure:*** piped water is available although the supply is not regular. There is no alternative water source. • ***Services:*** phone, mobile systems, market, sports facilities, transport and a primary school are present. • ***Settlement problems:*** lack of water, state support in agriculture and animal husbandry and lack of a sewage system.	Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials ***Special Sites*** Refer to Environmental Impact Tables.	**Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**Potential positive benefits** to local settlements
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	***RESIDUAL IMPACTS***
Degirmendere (L) (R) (S)			
• ***Demographics:*** 4,500 inhabitants with 510 households. There is no change in population. • ***Safety:*** the centre of the settlement is situated 1.5km from pipeline. Nearest house in the settlement is 1km from the pipeline. • ***Project attitude:*** the community is not hostile to the pipeline. Expectations that it may create employment. A majority of the people would welcome a construction camp. • ***Land ownership & use:*** 45% of land is privately owned and used by local residents, 30% is share cropped. Many parcels of land are owned by the State but cultivated by farmers without the title deeds. Sunflowers, wheat barley and sugar beet are cultivated. Seasonal irrigation is used. • ***Settlement livelihood:*** agriculture, hunting and local government are the main sources of livelihood.	***Conflict over land boundaries*** Exacerbation of existing conflicts ***Construction hazards: animals*** Trench poses safety hazard for livestock	**Land boundaries to remain clearly demarcated** at all times. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**No significant residual impacts** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 50 (Map 50C) (KPs 924.6 – 940.8): Goksun Plain and the Armutyucesi Mountain Area, Kahramanmaras Province

• ***Available Skills:*** machine operators, vehicle drivers, drivers and welders are available. 73% will accept a temporary job. • ***Accessibility:*** the settlement is accessible from March to December and is 13km from the district centre. • ***Information provision:*** 85% of the population is literate. Best local source of information is family etc. • ***Environmental & cultural sites:*** Roman and Byzantine ruins present in and around the settlement. Military buildings and caves. • ***Infrastructure:*** piped water is available although the supply is irregular. There is no alternative water source. • ***Services:*** phone, mobile, electricity network, coffee houses, shops, transport and sport facilities. There are three schools, one high school and two elementary schools. There is a Health Centre, with one doctor and one midwife. • ***Settlement problems:*** transport difficulties and unemployment.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance during construction. ***Accessibility to recruitment*** Decreased access to recruitment process ***Special sites*** Refer to Environmental Impact Tables.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Significance cannot be established** at this time **No residual impact expected**

Social Impact Table 50 (Map 50C) (KPs 924.6 – 940.8): Goksun Plain and the Armutyucesi Mountain Area, Kahramanmaras Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	*RESIDUAL IMPACTS*
Kucuk Camurlu (L) (T)			
• ***Demographics:*** 1,020 inhabitants, there is 15% migration. • ***Safety:*** the centre of the settlement is situated 3km from the pipeline. The nearest house is 2.2km from the pipeline. • ***Project attitude:*** local residents would generally welcome a construction camp. There are no major concerns regarding the project. • ***Land ownership:*** 80% of land owned is communal. • ***Settlement livelihood:*** agriculture, bee keeping (two households for their own consumption) and construction are the main activities. • ***Accessibility:*** settlement is inaccessible from December to February. The distance from settlement to district centre is 19km. • ***Information provision:*** The literacy rate is 90%. Key sources of local information are the telephone and television. • ***Environmental & cultural sites:*** mausoleum, forest. • ***Infrastructure:*** piped water, no regularity of water supply. Alternative source is a stream. • ***Settlement problems:*** Inadequate access, watering canals must be rearranged and unemployment.	***Land*** Potential complications in expropriation process. ***Accessibility of recruitment*** Decreased access to recruitment process. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**See Overview of Land Acquisition Process in Appendix C9.** Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during	**See Overview of Land Acquisition Process in Appendix C9.** **No residual impact expected** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 50 (Map 50C) (KPs 924.6 – 940.8): Goksun Plain and the Armutyucesi Mountain Area, Kahramanmaras Province

		construction.	

Environmental Impact Table 51 (Maps 51A and 51B) (KPs 940.8 – 962.3): Kayranlik Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Mesic Fine-silty Xerorthents in irrigated valleys. • Mesic Coarse-silty Xerorthents where headlands encroach on valleys. • Mesic Coarse-loamy or Loamy-skeletal Shallow Dystric Xerochrepts on stony uplands. • Mesic Coarse-silty Xerorthents on lower slopes adjoining valley. • Rock outcrops. The pressure reduction station (IPT1) will be located at KP 951.4.	Main potential impacts include: • soil erosion; • soil productivity; • sediment yield; • channel alteration; • potential for existing soil contamination at the IPT1 site; • waterlogging.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Reforestation. • Time construction to avoid irrigation periods. Allow soils to drain. Use equipment mats as required. • A soil survey of the IPT1 site will be undertaken prior to construction activities commencing to identify areas of existing contamination.	**MINOR IMPACT** Soil erosion predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
The route continues along the side of the upland valley whose sides and the steeper slopes of the pale limestone mountains beyond are covered in juniper scrub and Cedar of Lebanon. The small river continues to meander through green water meadows strewn with buttercups in the flood plain. At the southern end in particular, landscape sensitivity is very high. The limestone mountains have eroded into huge rounded blocks and the first of the Black Pine forests, characteristic of the Taurus mountains, appear.	Impacts likely to be locally significant although visibility limited by terrain. Although construction will not take place in the wet meadows along the river, access from the main route has the potential to cause visual	• Apply 'Soils' reinstatement specifications above. • Access from the main highway across the river valley will be restricted to the absolute minimum of crossing points and vehicle movements will be carefully controlled.	**MODERATE IMPACT** The wet meadows/ marshland in the valley will show the scar of construction traffic, but if undertaken with care and sensitivity, this will last no more than a year or two.

Environmental Impact Table 51 (Maps 51A and 51B) (KPs 940.8 – 962.3): Kayranlik Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Here the river diverges, plunging down a steep rocky gully, while the route descends sharply past the medieval Meryemcil Castle and into the irrigated valley of the Karapinar around Geben. The route skirts west of the town through the head of an intensively farmed and irrigated basin. It then climbs again into another scenically attractive area of pine forest-clad mountains, over a pass at 1,730m asl, and down again along the valley of the Karapinar Creek past broad-leaved trees and bushes. The route then cuts southwestwards again through more pine-clad mountains up to 1,600m asl before descending very sharply into a broad flat-bottomed valley. IPT1 will be located within cultivated land and will require a permanent landtake of approximately 3.17ha. In addition, there will be a temporary campsite during the construction period, which will occupy 3.49ha and will lie c. 1km from IPT1. The IPT1 site occupies a flat valley c. 3.5km south-west of the settlement of Geben and c. 8.6km north-east of the settlement of Cokak; at an altitude of c. 1,300m. BVS-048 will be located at KP 943.2 within cultivated land. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to c. 125m in length.	impact. Construction will open a straight, narrow avenue through dense scenic forest. Most views during pipeline construction will be within a short distance of the construction works although longer distance views will be possible from the tops of some of the surrounding hills. Potential impacts and their management during BVS construction will be the same as those during pipeline construction.	• Moveable equipment mats will be used on the wet soils to spread vehicle weight and avoid deep rutting. IPT1 has been located within the rural environment to minimise its impact on residential properties. In general IPT1 will be visible over a smaller distance than the four pump stations due to the smaller size of the facility and its location in a valley surrounded on most sides by hills. The site terrain at IPT1 is generally flat so landform screening will generally be inappropriate. Indigenous and locally characteristic trees and scrubs will form the landscaping planting scheme. More detailed measures to reduce potential landscape and visual impacts will be developed in conjunction with detailed design and construction planning.	Some loss of juniper scrub, and residual impacts arising from thin stony soils limiting the success of reinstatement will result in longer-lasting/permanent visual effects. Conspicuous visual impact in highly scenic area, but unlikely to have much more adverse effect than a firebreak. **MINOR IMPACT** Due to the remote location of IPT1, there are no high sensitivity residential viewers that will experience views of the site during construction. In addition, although, recreational users in the vicinity of IPT1 are considered to be moderately sensitive viewers, the site will be visible over a relatively small area during construction.. This impact will be localised and will occur only in the short-term during construction (see Section 7.2.2 for an assessment of operational landscape and visual impacts).

Environmental Impact Table 51 (Maps 51A and 51B) (KPs 940.8 – 962.3): Kayranlik Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Surface Geology and Geohazards			
Faults The route crosses Cokak Fault at KP 960.2. Cokak Fault is part of a complex and only partly understood system of faults in the Taurus Mountains. It is a reverse/right-lateral fault, c. 3km long, thought to be connected with the Kiziloluk fault, forming a longer structure of c. 15-20km. The main fault has 14 fault planes distributed over a zone 8m wide with four subsidiary splays identified across an area of 700m.	See *Section 8*.	See *Section 8*.	See *Section 8*.
Surface Waters			
The Geben Reservoir is currently under construction to the east of the route between KPs 943.8 – 945.7. It will have reservoir volume of 14,700,000m³ and will provide irrigation water to an area of c. 3,530ha. The reservoir will receive flows from Meryemcil Creek, which is crossed by the pipeline route c. 1.25km downstream of the reservoir.	Potential for indirect disturbance at Geben Reservoir, due to run-off containing suspended solids from working areas resulting in a reduction in water quality in the pond. Potential for short-term sedimentation and turbidity.	Apply standard mitigation measures in Section 6.4 and the RP, Appendix C2, to control sedimentation and turbidity in Meryemcil Creek, such as sediment filters/trapping devices, settling ponds and trench de-watering. However, this impact will not be transmitted as far as the reservoir.	**MINOR IMPACT** Disturbance will be limited to the immediate working area of Meryemcil Creek. Sedimentation of Meryemcil Creek will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Ecology			
Important Ecological Factors ESA 43 continues from the previous map and is identified between KP 940.0 (see Map 50B) and KP 943.8 for eight globally-threatened plant species (*Verbascum luridifolium, Alkanna cappadocia, Tanacetum haradjanii, Allium tauricola, Gentiana boisseri, Helianthemum antitauricum, Erodium micropetalutum* and *Galium antitaurica*). The IUCN status for these species are given in Table 5.20, Section 5. ESA 44 occurs between KP 955.9 and KP 961.0 and is identified for eight globally-threatened plant species (*Thlaspi cilicicum, Centaurea antitauri, Cephalanthera kotschyana, Corydalis solida sp. tauricola, Johrenia silenoides, Cyclamen pseudo-ibericum, Chionodoxa forbesii* and *Bupleurum zoharii*). In addition, one globally-threatened plant (*Verbascum luridifolium*) occurs just outside the corridor south-east of KP 960.2. The	Habitat destruction of maquis, mixed forest, and habitats peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to the Dipper, nationally-threatened bird, during nesting, feeding or indirectly, through habitat loss if construction is undertaken	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 43 and 44. Diligence will be exercised in searching inside the corridor for those species known to occur just outside of the corridor. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if	**MODERATE IMPACT** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). . **MINOR IMPACTS** at most for breeding birds, where pipeline

Environmental Impact Table 51 (Maps 51A and 51B) (KPs 940.8 – 962.3): Kayranlik Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
IUCN status for these species are given in Table 5.20, Section 5. At KP 953.7, 1 Dipper (nationally-threatened) was recorded. The protection status for these species are given in Table 5.21, Section 5. Grey Wolf was recorded at KP 948, KP 955.1 and near KP 960.2. This species is not globally-threatened and has no protection in Turkey, although it is protected under CITES, the Bern Convention and the EU Habitats Directive. At KP 949.6, Golden Jackal (nationally-threatened) was recorded. Globally-threatened mammals were recorded at KP 953.7, (Mehely's Horseshoe Bat, Forest Dormouse, Caucasian Squirrel). The protection status for these species are given in Table 5.21, Section 5.	during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods. Minor temporary disturbances are expected to globally-threatened mammals during seasonal sensitivities (see EMMP, Appendix C1): • the Mehely's Horseshoe Bat gives birth in late spring and hibernates in hollow trees, ruins, tunnels, garrets or caves from September/October to spring (May). • breeding season for the Forest Dormouse is between May and August, but in warmer areas the season may extend beyond this period. Potential for minor temporary impacts to wolves as hunting of this species is permitted in Turkey. However, this species is nomadic during spring and summer, which are the optimum months during which pipeline construction is likely to occur.	the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Preconstruction surveys will establish whether suitable Dipper nesting sites are available within 250m of the Karapinar Creek crossing. If this is the case, construction activity is to be avoided between April and July. Preconstruction surveys during the summer months will establish the presence and abundance of Mehely's Horseshoe Bat and seek to identify summer colonies and potential winter hibernation roosts. Hollow trees within the RoW of the Pipeline will be removed during the late summer months to prevent their use as winter	construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACT** at most to globally-threatened mammals during the construction period where the specified mitigation measures are applied for the seasonal sensitivities identified for each species. **MINOR IMPACTS** at most for wolves with the application of the specified mitigation measures.

Environmental Impact Table 51 (Maps 51A and 51B) (KPs 940.8 – 962.3): Kayranlik Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		roosting sites and to allow construction to continue during the autumn, winter and early spring periods. Caves, ruins or underground cavities, which have been identified as hibernation roosts (particularly those close to camps and works sites), will be secured, and placed out of bounds, to avoid their disturbance by workers. Preconstruction surveys for the Forest Dormouse of dense woodland in the RoW; if present route clearance will be undertaken during the autumn or winter period. In areas where the presence of wolves has been confirmed, education of workers to be alert and aware of the potential for interactions will include refuse management on sites (particularly where construction camps are located). Furthermore, workers must not wander alone in areas where wolves may be present, especially at night. The hunting of wolves or any other wildlife by the BTC Project personnel or contractors will be strictly forbidden and rigorously enforced.	

Environmental Impact Table 51 (Maps 51A and 51B) (KPs 940.8 – 962.3): Kayranlik Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Archaeology and Cultural Heritage			
The route passes through the archaeological site of Meryemcil Castle (1st Degree Site - registered by the MoC) north of KP 945. The majority of the castle ruins are still standing and a tumulus lies to the north of the castle. The MoC have given this site larger boundaries than previously identified during field surveys. The site has been proposed for registration by the preservation council	Meryemcil Castle will potentially experience structural damage during pipeline construction. Other potential impacts will include vibration. In addition, indirect impacts may arise from construction activities that will affect the visual/historical setting of the site	The extent of Meryemcil Castle will be investigated during further field surveys prior to construction. This will determine the need for detailed surface research and/or rescue excavations at this site. Further investigation will delineate this site and identify a safe route through. Specific mitigation to be developed following site investigations. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ If blasting is required, then it will be conducted in such a way that it does not pose a threat to the integrity of buildings still standing on the site. To avoid vibration impacts, percussive piling will be not allowed within 100m of the site.	**MODERATE TO MINOR IMPACTS** Residual impacts cannot be determined precisely for this site at this stage since the extent is unknown. Archaeological investigations prior to construction will establish the full extent of the site. However as investigations are expected to find a safe route through the site, the ultimate scale of impact is likely to be minor and short-term in duration.

Social Impact Table 51 (Map 51C) (KPs 940.8 – 962.3): Kayranlik Mountain Area, Kahramanmaras Province,

MAP 51: PROJECT INFORMATION

A pressure reduction station (IPT1) will be located on a relatively flat 3.17ha site surrounded by mountainous terrain. It is privately owned land 3.5km south-west of Geben settlement. A temporary construction camp (3.49ha) will be located 1km south-west of IPT1. There will also be a block valve station in the area.

MAP 51: MAP HIGHLIGHTS

- Land use includes irrigated agriculture, rainfed agriculture, non-agricultural land and pasture.
- The pipeline crosses the Karapinar Creek, the Koyunyolu Creek and the Geben Dam.
- Fairly dense forests and shrub land.
- The route passes close to foot of the hill of Meryemcil Castle, the majority of the castle ruins are still standing and a tumulus lies north of the castle.

MAP 51: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** two settlements are impacted by the pipeline (Geben and Cokak), both have land intersected by the pipeline (L) and are within 5km of a pump station (P). The centre of one settlement (Cokak) is within 1km of the pipeline (D). No settlements are within 2km of the block valve station (B). Settlements impacted by traffic have not been identified. One settlement is downstream of a creek crossing (Geben is downstream of the Koyunyolu creek) it is also downstream of the Geben Dam intersected by the pipeline (R).

- ***Surveyed:*** one settlement (Geben) was surveyed via telephone (T), one settlement (Cokak) was surveyed in the field (S).

- ***Disclosure Meeting Location***: Geben

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Geben Municipality (L) (P) (R) (T)			
• ***Demographics:*** 7,250 inhabitants, 8% of population migrates. 350 households (Camili Quarter); 375 households (Bogazici Quarter). No winter migration. • ***Safety:*** the centre of settlement is situated 1.5km from pipeline. Nearest house situated 750m from pipeline. Distance to pressure reduction station is 2.5km. Centre of Camili Mah is situated 300m from the pipeline, and the nearest house is 25m from the pipeline. • ***Project attitude:*** The pressure reduction station is welcome, as would be a construction camp. There are no major concerns regarding the project.	**PRESSURE REDUCTION STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pressure reduction station. See Sections 6 and 7 and the Overview of Land Acquisition Process in		

• ***Pressure reduction station land ownership:*** state land, which is not currently being used. • ***Perceived benefits of pressure reduction station:*** access to employment opportunities, possible upgrading of roads, increased settlement incomes. • ***Perceived problems of pressure reduction station:*** concern that construction of the pipeline could damage lands, water canals, creeks, rivers and settlement infrastructure. • ***Land ownership & use:*** the settlement owns 40% of land, and 40% is communal land. 66% of households have legal land titles. The average land holding is 2.9ha incorporating 5 plots. 78% of households own or cultivate land. Primary land use is grain, 66% of the households surveyed undertake irrigation, primary livestock is cattle, and seasonal grazing is undertaken. • ***Settlement livelihood:*** agriculture, bee keeping (two households), manufacturing, transport, trade, education. • ***Accessibility:*** the settlement is accessible all year. It is 27km from settlement to the local district centre. There are two roads from the settlement to the pressure reduction station: Goksun road, which is commonly used by local residents and another which travels between cultivated land directly from the Camili. • ***Information provision:*** 60% of the population is literate. Local information sources are TV and newspaper. Within the Camili and Bogazici quarters of the settlement, there is a 100% literacy rate. • ***Environmental & cultural sites:*** castle, plateau. • ***Infrastructure:*** piped water is available. There is regularity of water supply. There is no alternative water source. In the Camili and Bogazici quarters, there is electricity, medium standard of water supply, a settlement dump, and a good telecommunications system but no mobile phone coverage. • ***Settlement problems:*** inadequate access to water, unemployment. • ***Other:*** as the pressure reduction station is located within a valley and surrounded by forest, it is not visible from Geben. • ***Health:*** in the Camili and Bogazici quarters, there is poor nutrition, poor sanitary conditions, insufficient health care services and poverty.	Appendix C9. **PIPELINE IMPACTS:** ***Irrigation*** Potential loss of flow from planned/accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc **Specific to the Camili and Bogazici quarters of Geben:** ***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. **Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Land*** Potential complications in expropriation process.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **See Overview of Land Acquisition Process in Appendix C9.**	**Any additional damage to be compensated for.** **Potential for accidents involving livestock. .** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of Land Acquisition Process in Appendix C9.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Cokak (L) (P) (D) (S)			
• ***Demographics:*** 520 inhabitants with 340 households, winter migration occurs. There has been an increase in population. • ***Safety:*** the centre of the settlement is situated 1km from pipeline and 8.4km from the pressure reduction station. The nearest house is 750m from the pipeline. • ***Project attitude:*** generally positive, although there is some concern over the potential interruption to agricultural activities, damage to infrastructure and land, and possibility of increased traffic through the settlement. • ***Local opinion of pressure reduction station:*** welcome • ***Perceived pressure reduction station benefits:*** employment at IPT1 and in pipeline construction. Extra income.	**PRESSURE REDUCTION STATION IMPACTS:** The settlement will be a primary receptor of impacts resulting from construction of the pressure reduction station. See Sections 6 and 7 and the Overview of Land Acquisition Process in Appendix C9.		

• ***Pump station land ownership:*** State land that is not used. • General land ownership & use: state owned (10%). • ***Settlement livelihood:*** agriculture (grain, vegetables and fruit trees); hunting, forestry, seasonal construction, transport, trade and education. • ***Accessibility:*** adequate road quality, distance to from settlement to local district centre is 18km • ***Information provision:*** The literacy rate is 99%. • ***Information provision mechanisms:*** radio and television. • ***Infrastructure:*** piped water is available, however, there is no regularity of water supply. Local streams provide an alternative water source. There is an electricity service and good telecommunications. • ***Services:*** there is a Health Centre, a travelling health team, travelling midwife and a primary school. • ***Settlement problems:*** financial problems, unemployment.	**PIPELINE IMPACTS:** ***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Forests*** Loss of a resource used by settlements. Increased expenditure on other fuel sources.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.

		width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**Significance cannot be established at this time**
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility to recruitment Decreased access to recruitment process	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**

Environmental Impact Table 52 (Maps 52A and 52B) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Rock outcrops • Mesic Coarse-loamy or Loamy-skeletal Shallow Dystric Xerochrepts on stony uplands • Mesic Coarse-silty Xerorthents on valley locations.	Main potential impacts include: • soil erosion; • sediment yield; • channel alteration; • soil productivity; • soil contamination.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Reforestation.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
Landscape and Visual			
Mixed segments of undulating, rolling, hilly, and steeply dissected terrain provide a transition between the Taurus Mountains and foothills north of the Cukurova plain. The route passes along a broad flat-bottomed valley used primarily for mixed crops but retaining a significant cover of broad-leaved trees. Landscape sensitivities are moderate along this valley where the hay fields and arable crops together with the trees along the river form a soft landscape that contrasts with the stony valley slopes and the dark brooding angular forms of the mountains beyond.	Mostly short-term construction modifications of landscape although greater impacts associated with tree loss.	Full reinstatement of the BTC Pipeline. Apply 'Soils' reinstatement specifications above.	**MINOR IMPACT** Small loss of trees along riverbanks and in hedgerows and copses.
Surface Geology and Geohazards			
Faults Route crosses the Kiziloluk Fault near KP 963.9, which forms part of a complex and poorly understood system of faults in the Taurus Mountains. This fault is c. 12 – 17 km long and c. 3 m wide, forming the southeastern boundary of the Cokak Plane basin. It is a class B fault and believed with to be connected to the Cokak 2 Fault.	See *Section 8*.	See *Section 8*.	See *Section 8*.
Ecology			
Important Ecological Factors			**MODERATE IMPACT**

Environmental Impact Table 52 (Maps 52A and 52B) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
ESA 45 continues from the previous map and occurs between KP 962.1 and KP 964.3. This ESA is identified for the globally-threatened plant species (*Grammosciadium confertum*). In addition, two globally-threatened plants (*Helianthemum antitauricum* and *Tanacetum haradjanii*) occur just outside the corridor north of Akifiye settlement. The IUCN status for these species are given in Table 5.20, Section 5. ESA 46 commences on this map at KP 974.5 and continues on to the next map (see Map 53B) until KP 981.6. This ESA is identified for twelve globally-threatened plant species (*Lamium garganicum sp. nepetifolium, Verbascum hadschinense, Kundmannia syriaca, Corydalis solida spp. tauricola, Sideritis cilicica, Chionodoxa forbesii, Bupleurum zoharii, Trifolium rousseanum, Silene inclinata, Cephalanthera kotschyana, Micromeria cremnophila sp. amana* and *Allium tchihatschewii*). The IUCN status for these species are given in Table 5.20, Section 5. At KP 965, Blasius' Horseshoe Bat, Caucasian Squirrel (both globally-threatened) and Eurasian Badger were recorded. The protection status for these species are given in Table 5.21, Section 5.	Destruction of habitats peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Minor temporary disturbances are expected to globally-threatened mammals during seasonal sensitivities (see EMMP, Appendix C1): • the Blasius' Horseshoe Bat gives birth in late spring and hibernates in colonies of up to 300 individuals in ruins, caves or cavities from September/October to spring (May). The main threat to the Caucasian Squirrel is through illegal hunting.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESAs 45 and 46. Diligence will be exercised in searching inside the corridor for those species known to occur just outside of the construction corridor. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Preconstruction surveys during the summer months will establish the presence and abundance of the species and seek to identify	Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACT** at most to globally-threatened Mehely's Horseshoe Bat during the construction period where the specified mitigation measures are applied for the seasonal sensitivities identified. **MINOR IMPACTS** at most for Caucasian Squirrel with the application of the specified mitigation measures.

Environmental Impact Table 52 (Maps 52A and 52B) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		summer colonies and potential winter hibernation roosts. Hollow trees within the RoW of the pipeline route will be removed during the late summer months to prevent their use as winter roosting sites and to allow construction to continue during the autumn, winter and early spring periods. Caves, ruins or underground cavities, that have been identified as hibernation roosts (particularly those close to camps and works sites), will be secured and placed out of bounds to avoid their disturbance by workers.	
Noise			
Altinboga settlement in Andirin District is located c. 182m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Altinboga settlement during soil stripping activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings;	**MINOR IMPACT** Short-term noise impacts are expected to occur during soil stripping. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days.

Environmental Impact Table 52 (Maps 52A and 52B) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		• existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	

Social Impact Table 52 (Map 52C) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

MAP 52: PROJECT INFORMATION

There are no pump stations, or construction camps or block valve stations in this area.

MAP 52: MAP HIGHLIGHTS

- Major land use is irrigated agriculture with some rainfed agriculture, forests and shrubberies.
- Many of the hills are classified as rubble land.
- The Karasu Creek runs within the pipeline corridor.
- The pipeline crosses an energy transmission line.

MAP 52: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** three settlements will be directly impacted by the pipeline project (Akifiye, Orhaniye, Altinboga). They will each have land intersected by the pipeline (L), two of them are within 500m of the pipeline (Akifiye, Altinboga), (D), none are within 5km of a pump station (P), or within 2km of a block valve station (B). Settlements impacted by traffic have not been studied. Two settlements are downstream of a river/creek crossing (Kiziloluk and Altinboga are downstream of a creek).

- ***Surveyed:*** one settlement (Akifiye) was surveyed in the field (S). Two settlements (Orhaniye, Altinboga) were surveyed via telephone (T).
- ***Not surveyed:*** two settlements were not surveyed, Kiziloluk (1.25km from the pipeline) and Karanebili (1.5km from the pipeline).
- ***Not on the map:*** Orhaniye.
- ***Disclosure Meeting Location:*** Altinboga

SITESPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Akifiye (L) (P) (D) (S)			
• ***Demographics:*** 500 inhabitants with 110 households. There has been a decrease in population. • ***Safety:*** the centre of settlement is situated 500m from the pipeline. The nearest house is 75m from the pipeline. • ***Health:*** malnutrition was raised as a major problem. • ***Project attitude:*** there is no hostility towards the pipeline. The majority of local residents would welcome a construction camp. • ***Land ownership & use:*** 85% is privately owned and used by the settlement. There is seasonal grazing. Seasonal irrigation is used. • ***Conflict over land rights & ownership:*** land has been fragmented essentially through inheritance without completing the transfer	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 52 (Map 52C) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

essentially through inheritance without completing the transfer formalities with the land registry. Also the sale of land to seasonal visitors causes problems where they are made without proper legal documents, these sales also cause further fragmentation of land. • ***Settlement livelihood:*** agriculture, animal breeding, fishing, forestry, construction, trade, tourism and land sales are the main sources of livelihood. Maize, chickpea, wheat, barley, clover are cultivated. • ***Availability & skills:*** five out of 24 construction skills. 82% of inhabitants are willing to accept temporary jobs. • ***Accessibility:*** the settlement is accessible all year and is 14km from the district centre. • ***Information provision:*** 98% of the population is literate. Local sources of information are family members and the Muhtar. • ***Infrastructure:*** piped water is available. There is no regularity of water supply. There is no alternative water source. • ***Services:*** phone, coffee houses, market, transport and sports facilities are available. There is a school and a midwife. • ***Settlement problems:*** no sewage system, poor water supply to houses at high altitudes, infertile soil, leading to only one harvest per year and no formal garbage collection.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Forests*** Loss of a resource used by settlements. Increased expenditure on other fuel sources. ***Conflict over land*** Exacerbation of existing conflicts ***Land*** Potential complications in expropriation process.	settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure. **Land boundaries to remain clearly demarcated** at all times. **See Overview of Land Acquisition Process in**	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement. **No significant residual impacts** **See Overview of Land Acquisition Process in Appendix C9**

Social Impact Table 52 (Map 52C) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

		Appendix C9	
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Orhaniye (L) **(T)**			
• ***Demographics:*** 275 inhabitants with no seasonal migration. • ***Safety:*** the centre of the settlement is situated 1.6km from pipeline. • ***Project attitude:*** according to the Muhtar a construction camp would be welcome and there are no major concerns regarding the pipeline. • ***Land ownership:*** 40% of land is owned by local residents. 40% is communal land. There is seasonal grazing. • ***Settlement livelihood:*** agriculture, bee keeping, forestry, construction, transport, trade and education are the main sources of livelihood. • ***Accessibility:*** the settlement is not accessible throughout the year.	***Construction hazards: animals*** Trench poses safety hazard for livestock ***Land*** Potential complications in	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **See Overview of Land Acquisition Process in**	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of Land Acquisition Process in**

Social Impact Table 52 (Map 52C) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

• ***Information provision:*** 60% of the population is literate. The main source of information is television. • ***Environmental & cultural sites:*** 'healthy' water. • ***Infrastructure:*** piped water, no regularity of water supply. A settlement fountain is an alternative source. • ***Settlement problems:*** inadequate access to water, inadequate healthcare and inaccessibility.	expropriation process. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Appendix C9** **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**Appendix C9** **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 52 (Map 52C) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Altinboga (L) (D) (T)			
• ***Demographics:*** 200 inhabitants with 50% migration. • ***Safety:*** the centre of the settlement is situated 400m from the pipeline. The nearest house is 150m from the pipeline. • ***Project attitude:*** the attitude is generally very positive, but inhabitants need more information on the pipeline. Majority of local residents would welcome a construction camp. • ***Land ownership & uses:*** 90% of land is owned by the settlement. There is seasonal grazing. Seasonal irrigation is used. • ***Settlement livelihood:*** agriculture, bee keeping (10 families), fishing (99 families own consumption), forestry, construction and education are the main sources of livelihood. Key crops are millet, wheat and barley. • ***Accessibility:*** the settlement is accessible throughout the year and is 6km from the district centre. • ***Information provision:*** 90% of the population is literate. Local sources of information are television and newspapers. • ***Environmental & cultural sites:*** graveyard, plateau. • ***Infrastructure:*** no piped water is available. There is no regularity of water supply. The alternative water source is the local spring. • ***Services:*** a telephone network has been set up, but no connection is available yet. Electricity network available. • ***Settlement problems:*** no sewage system is available and no drinking water network.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage to be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts**

Social Impact Table 52 (Map 52C) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Forests Loss of a resource used by settlements. Increased expenditure on other fuel sources.	If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.

Social Impact Table 52 (Map 52C) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

	Fishing Potential reduction in fisheries yield or damage to fisheries habitats within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.
	Irrigation Potential for loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**

Social Impact Table 52 (Map 52C) (KPs 962.3 – 977.0): Tril Mountain Area, Kahramanmaras Province

	Drinking water Potential for disruption or contamination of drinking water during construction.	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	**No residual impact.**

Environmental Impact Table 53 (Maps 53A and 53B) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soils types from the previous section continue in this section of the route: • Rock outcrops. • Mesic Coarse-loamy or Loamy-skeletal Shallow Dystric Xerochrepts on stony uplands. • Mesic Coarse-silty Xerorthents on valley locations.	Main potential impacts include: • soil erosion; • sediment yield; • channel alteration; • soil productivity; • soil contamination.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Reforestation.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
Landscape and Visual			
The route descends around the eastern edge of Andirin, a small mountain market town at 1,000m asl, and then again descends sharply down hillsides clothed in trees and bushes with small terraced fields, the greenery of these south-facing slopes now reflecting the humid influence of the Mediterranean Sea. Further south, the landscape sensitivities are generally moderate. The diverse terrain provides visual interest but with some diminution in quality where the forests have been felled and replaced by juniper scrub and maquis on the thin limestone soils between the jagged rocky outcrops.	Some loss of trees and bushes from field boundaries and in denser areas of maquis. Short-term construction modifications of landscape.	Apply 'Soils' reinstatement specifications above.	**MINOR IMPACT** Small loss of trees and bushes along field boundaries and in denser areas of maquis.
Ecology			
Important Ecological Factors ESA 46 continues on this map for c. 11km (see Environmental Impact Table 52 and Map 52B for description of species and mitigation measures to be applied in this ESA). BVS-049 will be located at KP 977.7 on cultivated land within ESA 46. Approximately 350m^2 of permanent landtake required. A new access road will be constructed of c. 35m in length.	Permanent loss of plain steppe habitat during construction at BVS-049 within ESA 46. Minor temporary disturbance	Prior to construction of BVS-049, a site specific survey will be undertaken by an ecological specialist to identify and locate threatened species at the site and at any surrounding areas	**MINOR IMPACT** Based on the mitigation measures described, the small area of habitat affected and the temporary nature of construction activities, it is predicted that only minor

Environmental Impact Table 53 (Maps 53A and 53B) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
At KP 981.5, Grey Wolf was recorded. At KP 982.7, Striped Hyena (globally-threatened) was recorded. Approximately 350m west of the Pipeline at KP 985.0, the Mediterranean Horseshoe Bat (globally-threatened) was recorded. The protection status for these species are given in Table 5.21, Section 5.	to globally-threatened bat during seasonal sensitivities (see the EMMP, Appendix C1): • breeding and hibernation periods for globally-threatened bat species, from September to May. Potential for minor temporary impacts to wolves as hunting of this species is permitted in Turkey. However, this species is nomadic during spring and summer, which are the optimum months during which pipeline construction is likely to occur. Although, the globally-threatened Striped Hyena has no legal protection in Turkey, hunting of this species may pose a potential impact.	potentially affected by construction activities. Based on the findings of this survey, appropriate mitigation will be determined. The area of sensitive habitat in ESA 46 affected by construction activities will be minimised to the minimum necessary for safe working. Preconstruction bat surveys during the summer months will establish the presence and abundance of the species and seek to identify summer colonies and potential winter hibernation roosts. Hollow trees within the RoW of the pipeline route will be removed during the late summer months, under the close supervision of an ecologist approved by BOTAŞ, to prevent their use as winter roosting sites and to allow construction to continue during the autumn, winter and early spring periods. Caves, ruins or underground cavities, that have been identified as hibernation roosts (particularly those close to camps and works sites), will be secured and placed out of bounds to avoid their disturbance by workers. In areas where the presence of	impacts on the biological environment will occur as a result of construction activities at BVS-049. This assessment will be confirmed by the site-specific survey prior to construction. **MINOR IMPACTS** at most to the globally-threatened Mediterranean Horseshoe Bat during the construction period where the specified mitigation measures are applied for the seasonal sensitivities identified. **MINOR IMPACTS** at most for the Striped Hyena and the Grey Wolf with the application of the specified mitigation measures.

Environmental Impact Table 53 (Maps 53A and 53B) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		the Striped Hyena and Grey Wolf has been confirmed, the hunting of these mammals or any other wildlife by the BTC Project personnel or contractors will be strictly forbidden and rigorously enforced. Furthermore, workers must not wander alone in areas where wolves may be present, especially at night. The hunting of either mammal or of any other wildlife by the BTC Project personnel or contractors will be strictly forbidden and rigorously enforced, since correct identification of protected species cannot be guaranteed.	
Noise			
The following noise sensitive receptors have been identified: • Kastal settlement located c. 99m from the centreline and a provincial highway crossing; • Ahetli settlement, located c. 150m from the Pipeline; • Yahyalar settlement located c. 252m from the Pipeline and a provincial highway crossing. Blasting works will also be required adjacent to Kastal settlement, located c. 99m from the pipeline route.	Noise impacts are expected to occur at Ahetli settlement during soil stripping and welding/lowering activities. Kastal settlement will experience noise impacts during soil stripping, welding/lowering and backfilling, and during excavation and pilling works associated with the highway crossing. Blasting will also give rise to noise and vibration at Kastal	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings;	**MAJOR IMPACT** Noise impacts are predicted to occur to outlying dwellings in Kastal settlement during soil stripping, welding/lowering, backfilling and piling operations. In addition, vibration impacts are expected to occur during piling. Stockpiling of spoil, where possible, and mobile noise barriers, will be used to screen nearby dwellings from construction works to the maximum extent possible. However, those nearest may

Environmental Impact Table 53 (Maps 53A and 53B) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	settlement. Yahyalar settlement will also experience noise impacts during piling works associated with a highway crossing.	• existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	still be exposed to temporary construction noise levels that exceed 70dB(A). It is important to emphasise this is a cautious assessment. The construction programme will make provision for a further assessment based on the true numbers of receptors affected and separation distances of receptors from noise sources and take whatever actions are necessary to reduce impacts to an acceptable level. Noise and vibration impacts are also expected to occur during blasting at Kastal settlement. Although this may give rise to annoyance to residents, it is unlikely to cause structural damage to buildings. The Contractor will carry out detailed noise and vibration predictions once the specific blasting methods have been developed. The proposed method of working and mitigation measures will be agreed with the relevant authorities in advance of works taking place. Residents

Environmental Impact Table 53 (Maps 53A and 53B) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
			will also be notified in advance of works involving blasting. **MINOR IMPACT** Noise impacts are also predicted to occur to outlying dwellings at Yahyalar settlement during piling and at Ahetli settlement during soil stripping and welding/lowering.
Archaeology and Cultural Heritage			
Minnetpinari (3rd Degree Site*) – flat settlement located to south-east of the Pipeline within the 100m Corridor. No architectural remains have been discovered on the surface. * This site has not yet been registered by the MoC and is provisionally assigned this classification. The site has been proposed for registration by the preservation council	Potential for site to experience direct impacts, such as ground disturbance, during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of the site.	Minnetpinari will be fenced throughout the construction period to avoid accidental damage. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MINOR IMPACT** Assuming Minnetpinari is fenced, impacts will be limited to the temporary disturbance of the site setting and peripheral features.

Social Impact Table 53 (Maps 53C) (KPs 977.0 – 992.6):
North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

MAP 53: PROJECT INFORMATION			
There is a primary construction camp (Lot C) in the area. It is located on 16.74ha of unregistered pastureland (Refer also to May 49). There is also a block valve station in the area.			
MAP 53: MAP HIGHLIGHTS			
• Major land use is non-agricultural land, general shrubbery. • The route passes through a narrow canyon, through which flow minor streams. • The pipeline crosses a National highway and an unclassified road.			
MAP 53: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted:*** 25 settlements will be directly impacted by the pipeline project. 12 settlements (Yesilyurt, Yenimahalle, Tufanpasa, Cicekli, Altinoluk, Cokceli, Basdogan, Torun, Haciveliusagi, Tokmakli, Kesim, Kumarli) will have land intersected by the pipeline (L) (C). Six settlements (Ahetil Mah, Andirin, Kesim, Kumarli, Tokmakli, Altinoluk) are within 500m of the pipeline (D). None are within 2km of the block valve station (B). Settlements impacted by traffic have not been identified. No settlements are downstream of a river/creek crossing. • ***Surveyed:*** seven settlements were surveyed in the field (S) (Andirin, Cokceli, Kumarli, Buyukpinar, Eleker, Karaduldular). Nine settlements were surveyed via telephone (T). • ***Not surveyed:*** Ahetil Mah (500m from the pipeline), Karataslik (1.9km from the pipeline), Yesilyurt, Torun, Karaduldular, Hacimirza, Aliclibucak, Koccakoz. • ***Not on map:*** Yenimahalle, Torun, Buyukpinar, Karadurdular, Elekler, Hacimirza, Ortatepe, Aliclibucak, Koccakoz. • ***Disclosure Meeting Location:*** Kesim			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Buyukpinar (C) **(S)**			
• ***Demographics:*** 16 inhabitants with three households. It is a sector of Caglayan settlement. • ***Distance of proposed camp to nearest house:*** 1km • ***Distance of proposed camp to nearest land plot:*** the proposed camp area includes some land of the local residents. • ***Camp site land ownership:*** private land with legal title. No share cropping. • ***Project attitude:*** positive. • ***Local opinion of construction camp:*** generally welcoming. The settlement welcomes construction workers into their settlement	***Construction camp Impacts*** The settlement will be a primary receptor of impacts resulting from construction workers	**Monthly community liaison** meetings will be held. **Preferential employment** opportunities. **Project to liase** with local health authorities. BTC Company to look at	**Low likelihood of significant impacts.** Potential for impacts arising from breaches of rules and procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures.

Social Impact Table 53 (Maps 53C) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

settlement welcomes construction workers into their settlement. • ***Perceived benefits of construction camp:*** employment opportunities in the camp and pipeline construction, increased settlement income and the opportunity to provide indirect services such as milk to camp workers. • ***Perceived problems of construction camp:*** none. • ***Settlement livelihood: agriculture:*** wheat & barley (subsistence & sale), sugar beat (sale), animal feed (subsistence) and vegetables (subsistence); animal husbandry: cattle (subsistence & sale) and poultry (subsistence). There is grazing from April to October. More than 50% of the land is irrigated. • ***Skills:*** one car available for use by construction workers only. • ***Accessibility:*** poor quality road, that is not accessible for short periods of time in winter months (December to January). • ***Infrastructure:*** no piped water, instead local residents use a common settlement well. Regular electricity supply, no sewerage system, telephone system but no mobile coverage. • ***Services:*** no market or shop, there are no schools. • ***Information provision:*** of the female population only one woman is literate. The main information sources: TV, radio, family, friends & neighbours • ***Settlement problems:*** unemployment, low income, poor sewerage system and insufficient water supply for the land.		opportunities to cooperate in providing **health awareness training**	**Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities.
	Construction hazards: humans Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from awareness raising. **Additional damage to be compensated for.**
	Construction hazards: animals Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be

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		for livestock.	facilitated by the Projects complaints procedure.
	Drinking water Potential for disruption or contamination of drinking water during construction	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the project.	***No residual impact***
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected**

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SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Elekler Mah (C) (S)			
• ***Demographics:*** 100 inhabitants with 18 households. Is a quarter of Caglayan settlement. • ***Camp site land ownership:*** 16.74ha of unregistered pasture land used by Mahmutbey local residents. • ***Project attitude:*** generally positive. • ***Local opinion of construction camp:*** generally welcoming, and construction workers would be welcome in the settlement. • ***Perceived benefits of construction camp:*** employment opportunities in camp and pipeline construction. • ***Perceived problems of construction camp:*** none. • ***Settlement livelihood:*** agriculture (sugar beat, sunflowers, beans, vegetables and fruit); animal husbandry (bovine-milk for subsistence; trade and seasonal construction are the main sources of livelihood. Local residents are not interested in indirect employment opportunities. • ***Previous experience:*** no pipeline experience, however 10-15 persons have worked on dam and road construction projects. • ***Accessibility:*** good quality asphalt road. • ***Infrastructure:*** existing water supply is only just sufficient to meet the needs of the local residents. • ***Services:*** problems with electricity network (need new transformer), no sewerage system, in mobile coverage area. • ***Other settlement services (of potential use to construction workers):*** no market or coffee shop.	***Construction camp Impacts:*** Primary receptor of impacts resulting from construction workers	**Monthly community liaison** meetings will be held. **Preferential employment** opportunities **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training**	**Low likelihood of significant impacts.** Potential for impacts arising from breaches of rules and procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Karadurdular (C) (S)			
• ***Camp site land ownership:*** 16.74ha of unregistered pasture land used by Mahmutbey local residents. • ***Project attitude:*** positive. Camp workers welcome in settlement. • Perceived benefits of construction camp: opportunities for employment	***Construction camp Impacts:*** Primary receptor of impacts resulting from construction	**Monthly community liaison** meetings will be held.	**Low likelihood of significant impacts.** Potential for impacts arising

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of unskilled workers in camp and on pipeline construction. • ***Perceived problems of construction camp:*** none • ***Settlement livelihood:*** agriculture, (sugar beat, beans, chickpea, wheat, and animal feed); animal husbandry: (bovine and ovine milk for subsistence and sale of poplar trees. • ***Infrastructure:*** adequate water supply • ***Services:*** adequate electricity supply. No sewerage system. Within mobile phone coverage. • ***Other settlement services (of potential use to construction workers):*** no market or coffee shop, three tractors • ***Skills:*** two electricity technicians and one security person who worked on dam construction	workers	**Preferential employment** opportunities **Project to liase** with local health authorities. BTC Company to look at opportunities to cooperate in providing **health awareness training**	from breaches of rules and procedures. All incidents will be rapidly resolved and used as examples to reinforce procedures. **Low likelihood of significant health impacts**. **Benefits** from raising health awareness of workforce (many of whom are local). Further positive benefits dependent on scale of social investment activities.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Andirin (D) (S)			
• ***Demographics:*** 10,144 with 2,400 households, there has been an increase in the population over the past five years. • ***Safety:*** the centre of settlement is situated 700m from the pipeline. The nearest dwelling is 25m from the pipeline. • ***Project attitude:*** there is no hostility towards the pipeline and a construction camp would be welcome. • ***Land ownership & uses:*** 35% of land is privately owned and 40% share cropped. There is seasonal grazing. No use of seasonal irrigation. • ***Settlement livelihood:*** agriculture, construction, transport, trade, education and tourism are the main sources of livelihood. Key crops are grain, timber, fruit trees. • ***Available Skills:*** four out of 24 construction skills, 53% of inhabitants are willing to take on temporary jobs. • ***Accessibility:*** the settlement is accessible all year.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Additional damage to be compensated for.**

Social Impact Table 53 (Maps 53C) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

• ***Information provision:*** 90% of the population is literate. Main sources of local information are family members and the Muhtar. • ***Infrastructure:*** piped water is available. There is regularity of water supply. There is no alternative water source. • ***Services:*** phone, mobile, coffee houses, shops, library, market, post office, bank, police and transport services are available. There is a school, a health centre, midwife and doctor. • ***Settlement problems:*** lack of water, unemployment, poor sewage system causes diseases, transport difficulties, change in head of district and unplanned construction.	affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Accessibility to recruitment*** Decreased access to recruitment process.	immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include using appropriate channels of communication and media. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected**

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SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Yenimahalle (L) **(T)**			
• ***Demographics:*** 2,655 with 5% seasonal migration. • ***Project attitude:*** there are no major concerns, a construction camp would be welcome. • ***Land ownership:*** 95% of land is privately owned by local residents. There is no seasonal grazing. Seasonal irrigation is not used. • ***Settlement livelihood:*** agriculture, hunting, forestry, construction, transport, trade, education and local government are the main sources of livelihood. • ***Accessibility:*** the settlement is accessible from February to November. • ***Information provision:*** 80% of the population is literate. Local source of information is TV, radio. • ***Environmental & cultural sites:*** a castle • ***Infrastructure:*** piped water is available. There is no regularity of water supply. Tanked water is transported to the settlement. • ***Settlement problems:*** inadequate access to water, inadequate access and unemployment.	***Hunting*** Temporary reduction in game due to disturbance during construction. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Accessibility to recruitment*** Decreased access to recruitment process. ***Forestry***.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. If a significant number of	**Significance cannot be established at this time.** **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected.** **Significant impact** where

Social Impact Table 53 (Maps 53C) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

	Loss of a resource used by settlements. Increased expenditure on other fuel sources.	trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	more than 10% of trees are cut on forestry land used by any one settlement.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Tufanpasa (L) (T)			
• ***Demographics:*** 1,915 inhabitants with no seasonal migration. • Safety: settlement is situated 23m from the pipeline. • ***Project attitude:*** according to the Muhtar there are no major concerns, a construction camp would be welcomed. • ***Land ownership & use:*** 50% of land is privately owned. There is no seasonal grazing. No use of seasonal irrigation. • ***Settlement livelihood:*** agriculture, manufacturing, transport, trade, education, local government and tourism are the main sources of livelihood. • ***Accessibility:*** the settlement is accessible throughout the year, the distance from the settlement to the district centre is 1km. • ***Information provision:*** 90% of the population is literate. Local information source is TV. • ***Environmental & cultural sites:*** none. • ***Infrastructure:*** piped water is available. There is regularity of water supply. There is no alternative water source. • ***Settlement problems:*** inadequate access to water and unemployment.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.**

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SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Cicekli (L) (T)			
• ***Demographics:*** 620 inhabitants with no seasonal migration. • ***Safety:*** settlement is situated 3km from the pipeline. • ***Project attitude:*** according to the Muhtar there are no major concerns, a construction camp would be welcome. • ***Land ownership:*** 80% of land is privately owned, there is no seasonal grazing. No use of seasonal irrigation. • ***Settlement livelihood:*** agriculture and local government are the main sources of livelihood. • ***Accessibility:*** the settlement is not accessible, the distance from settlement to local district centre is 5km • ***Information provision:*** 80% of the population is literate. Local source of information is TV. • ***Infrastructure:*** piped water is available. There is no regularity of water supply. There is an alternative water source, the settlement fountain. • ***Settlement problems:*** inadequate access to water, inadequate access and there is no mosque.	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In the event of a spill** settlement to be immediately warned and alternative sources of water to be provided. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Alinoluk (L) (D) (T)			
• ***Demographics:*** 487 inhabitants with no migration. • ***Safety:*** the settlement centre is situated 282m from pipeline. • ***Project attitude:*** according to the Muhtar there are no major concerns, a construction camp would be welcome. • ***Land ownership & use:*** 75% of land is privately owned. There is no seasonal grazing. No significant disagreements over land rights and	***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be

Social Impact Table 53 (Maps 53C) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

seasonal irrigation is not used. • ***Settlement livelihood:*** agriculture, animal husbandry, bee keeping (one family), construction, transport, trade and education are the main sources of livelihoods. • ***Accessibility:*** the settlement is accessible between March & November. The distance from settlement to local district centre is 5km. • ***Information provision:*** 95% of the population is literate. Local source of information is phone, television. • ***Environmental & cultural sites***: a castle, forest. • ***Infrastructure:*** piped water is available. There is regularity of water supply. There is no alternative water source. • ***Services:*** electricity and telephone systems are available. There is an elementary school. There is no settlement clinic, a midwife visits once a month. • ***Settlement problems:*** inadequate access, unemployment, no sewage system and the amount of water supplied to settlement is insufficient.		for livestock.	facilitated by the Projects complaints procedure.
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Construction hazards: humans Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

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		Protective barrier fencing will be erected where a settlement is within 500 m of construction work.	
	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage to be compensated for.**
	Accessibility to recruitment Decreased access to recruitment process.	Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Gokceli (L) (S)			
• ***Demographics:*** 500 inhabitants with 80 households, there has been a decrease in population over the past five years. • ***Safety:*** settlement centre is situated 1.5km from pipeline • ***Health:*** serious health problems originating through marriages among relatives. • ***Project attitude:*** there is no hostility towards the pipeline, and a construction camp would generally be welcome. • ***Land ownership & use:*** 75% is privately owned, there is seasonal grazing all year. Seasonal irrigation is not used. • ***Settlement livelihood:*** agriculture and animal husbandry are the main sources of livelihood. Key crops are wheat, barley, fruit, trees. • ***Availability & Skills:*** machinery operator, vehicle driver, driver, and welders. 100% of respondents are willing to accept temporary jobs.	***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Drinking water*** Potential for disruption or contamination of drinking water during construction.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No residual impact.**

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welders. 100% of respondents are willing to accept temporary jobs. • ***Accessibility:*** the settlement is accessible from March to December. It is102km from the district centre. It is 2km from Andirin, the district centre. • ***Information provision:*** 98% of the population is literate. The main sources of local information are family members and the Muhtar. • ***Environmental & cultural sites:*** military buildings. • ***Infrastructure:*** piped water is not available. There is no regularity of water supply. There is a community well. • ***Services:*** phone, mobile, transport, school, there is no health centre, doctor, midwife, settlement clinic or health personnel. The health clinic at Andirin the district centre is used, it is 2km away. • ***Settlement problems:*** lack of water, unemployment and land problems	***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Accessibility to recruitment*** Decreased access to recruitment process. ***Health*** Potential health impacts on construction workers.	by the project. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include using appropriate channels of communication and media. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy. **Information is highlighted to Contractor** so that they can ensure that their workers are protected.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected.** **No residual impact**.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Basdogan (L) (T)			
• ***Demographics:*** 990 inhabitants with no seasonal migration. • ***Safety:*** the settlement centre is situated 1.75km from pipeline. • ***Project attitude:*** there will be concerns if the pipeline passes through the quarter. A construction camp will be welcome. • ***Land ownership & uses:*** 80% of land is privately owned. There is seasonal grazing. No use of seasonal irrigation. • ***Settlement livelihood:*** agriculture and tourism are the main sources of livelihood.	***Construction hazards: animals*** Trench poses safety hazard for livestock.	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

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• ***Accessibility:*** the settlement is accessible all year, the district from the settlement to the district centre is 8km. • ***Information provision:*** 98% of the population is literate. Sources of local information are the TV and newspapers. • ***Infrastructure:*** piped water is not available. There is no regularity of water supply. There is a common depot. • ***Settlement problems:*** inadequate access to water and inadequate accessibility.			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Haciveliusagi (L) (T)			
• ***Demographics:*** 640 inhabitants with no seasonal migration. • ***Safety:*** settlement is situated 2km from pipeline. • ***Project attitude:*** there are no major concerns, a construction camp would be welcome. • ***Land ownership & uses:*** 90% of land is privately owned. There is no seasonal grazing. No use of seasonal irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (one family, for their own consumption) and hunting, forestry, construction, transport, education, trade, local government are the main sources of livelihood. • ***Accessibility:*** according to the Muhtar the settlement is accessible all year, the distance from the settlement to the district centre is 13km • ***Information provision:*** 90% of the population is literate. Main local source of information is TV. • ***Infrastructure:*** piped water is available. There is no regularity of water supply. There is a common depot as an alternative water source. • ***Settlement problems:*** inadequate access to water, inadequate access and unemployment.	***Hunting*** Temporary reduction in game due to disturbance during construction. ***Forestry*** Loss of a resource used by settlements. Increased expenditure on other fuel sources.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be	Significance cannot be established at this time. **Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.

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		facilitated by the Projects complaints procedure.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Tokmakli (L) (D) (T)			
• ***Demographics:*** 810 inhabitants with no seasonal migration. • ***Safety:*** the centre of settlement is situated 750m from pipeline. • ***Project attitude:*** a construction camp would be welcome but inhabitants would like more information. • ***Land ownership & uses:*** 80% of land is privately owned, there is no seasonal grazing. Inhabitants use seasonal irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (five families, for their own consumption), hunting, forestry, construction, transport, education, trade and local government are the main sources of livelihood. • ***Accessibility:*** the settlement is accessible all year, the distance from the settlement to the district centre is 15km. • ***Information provision:*** 85% of the population is literate. Local information is TV. • ***Infrastructure:*** piped water is available. There is no regularity of water supply. There is a settlement fountain as an alternative water source. • ***Settlement problems:*** inadequate access to water, low income and unemployment.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.

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	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Forest Loss of a resource used by settlements. Increased expenditure on other fuel sources.	If a significant number of trees on forestry land are cut, discuss with settlement & appropriate authorities to identify **acceptable compensation.** The level of compensation will be facilitated by the Projects complaints procedure.	**Significant impact** where more than 10% of trees are cut on forestry land used by any one settlement.
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is

Social Impact Table 53 (Maps 53C) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

	of flow from spills or increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	unexpected loss of flow, affected land-users will be compensated. **Significance cannot be established at this time.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kumarli (L) (D) (S)			
• ***Demographics:*** 670 inhabitants with 135 households, there has been an increase in population over the past five years. • ***Safety:*** the centre of settlement is situated 1.5km from pipeline. The nearest house 70m from pipeline. • ***Project attitude:*** there is no hostility towards the pipeline, however, there are some concerns about recently purchased vacant land, which will be intersected by the pipeline. A construction camp would be welcome. • ***Land ownership & use:*** 85% of the land is privately owned, 7% is share cropping, seasonal grazing in April, May, Summer, October, November. Land is heavily fragmented and without title deeds. Use of seasonal irrigation. • ***Settlement livelihood:*** agriculture, bee keeping, fishing, trade and local government are the main sources of livelihood. Key crops are	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 53 (Maps 53C) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

grain, vegetables, fruit trees, cotton. • ***Availability & skills:*** machinery operator, vehicle driver, 46% of respondents are willing to take on a temporary job. • ***Accessibility:*** the settlement is accessible all year round and is 22km from the district centre. • ***Literacy:*** 90% of the population is literate. Local information source is family. • ***Infrastructure:*** piped water is available. There is no regularity of water supply. There is a no alternative water source. • ***Services:*** phone, mobile, coffee houses, shops, sports facilities and a primary school. • ***Settlement problems:*** lack of water, education, bad settlement roads, dust and insufficient health facilities.	Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected.	**Any additional damage to be compensated for.**
	Construction hazards: animals Trench poses safety hazard for livestock	**Livestock crossings** will be established at locations agreed with the community. **Stock poof fencing** will be erected in areas of danger for livestock.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.
	Conflict over land Exacerbation of existing conflicts.	**Land boundaries to remain clearly demarcated** at all times. **Temporary fences** will be erected where there is a separation of more than one day between work teams.	**No significant residual impacts.**
	Bees Disturbance of any stationary hives located within 300m of the route.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.

Social Impact Table 53 (Maps 53C) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

	Fishing Potential reduction in fisheries yield or damage to fisheries habitats **if** within 2 km downstream of a river crossing.	**Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure.	**No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
	Accessibility to information Sectors of the population may not have access to	**Communication with settlement** must take into account settlement characteristics to ensure	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will

Social Impact Table 53 (Maps 53C) (KPs 977.0 – 992.6): North of Andirin Settlement to Ahetli Settlement, Kahramanmaras Province

	project related information on employment opportunities, potential disruption to utilities, etc. ***Accessibility to recruitment*** Decreased access to recruitment process.	equal access to information for all residents. This should include using appropriate channels of communication and media. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	keep this to a minimum. **No residual impact expected.**

Environmental Impact Table 54 (Maps 54A and 54B) (KPs 992.6 – 1016.8): West of Andirin River and North of Tokmakli Settlement to West of Atlantis Reservoir, Kahramanmaras/Osmaniye Province border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Rock outcrops. • Mesic Coarse-loamy or Loamy-skeletal Shallow Dystric Xerochrepts on stony uplands. • Mesic Coarse-silty Xerorthents on valley locations. • Mesic Fine-silty Xerorthents in irrigated valleys. • Mesic Coarse-silty Xerorthents where uplands encroach on valleys. • Thermic Orthic Calcixerolls (commonly truncated on steep slopes).	Main potential impacts include: • soil erosion; • sediment yield; • soil productivity. Other potential impacts include: • channel alteration; • waterlogging; • soil contamination.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation - see typical drawings. • Reforestation. • Time construction to avoid irrigation periods. Allow soils to drain. Use equipment mats as required.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
The route emerges onto the plain at the northern end of the Aslantas Barrage Lake and turns westwards crossing the fast-flowing and clear waters of the Kesis River (a tributary that feeds the lake). A steep limestone canyon with high scenic value lies just upstream of the crossing point. The route then travels west and south across the much gentler rounded, and more heavily populated landscapes of the Taurus foothills to Kadirli, a mixture of rolling rain-fed agricultural land, olive groves, and heavily-wooded gullies of moderate to low sensitivity. The Aslantas National Park, designated partly for its high landscape value, lies to the south of the route here, but the route is too distant to have any visual impact on this.	Formation of conspicuous whitish line across landscape if pale-coloured marl is exposed. May be long-term or permanent where difficult to re-instate, or where ecological considerations prevent application of fertiliser. Otherwise short-term construction modifications of landscape components.	Apply 'Soils' reinstatement specifications above.	**MINOR IMPACT** Exposed marl may retain its whitish colour and show as a white line across the landscape. However, landscape fairly resilient to impact. Some loss of trees and bushes along river banks, field boundaries, and patches of maquis.
Surface Waters			
Kesis River channel is sinuous with a trapezoidal cross-section and pool	Direct disturbance to bank	Apply standard mitigation	**MINOR IMPACT**

Environmental Impact Table 54 (Maps 54A and 54B) (KPs 992.6 – 1016.8): West of Andirin River and North of Tokmakli Settlement to West of Atlantis Reservoir, Kahramanmaras/Osmaniye Province border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
and riffle bars. Width of crossing is 30m, with a bank-full width of >13m and no floodplain. Bed consists of cobbles and boulders and the flow is perennial, of a pool and riffle type at low flows. High flows drown out pool and riffle sequence and the flow becomes uniform and rapid or steep and tumbling. Bank-side vegetation comprises deciduous trees and truncated bars lying c. 5 – 6m above the channel are managed for cereals, hay and other crops. Water samples taken c. 250m downstream of the crossing point indicate that this is a Class III river. Cebicli Quarter and Aslantas Dam/reservoir are both downstream of the crossing point.	and bed morphology through physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Water quality indicates that Kesis River is polluted and further degradation in quality will be avoided. Potential for medium-term sedimentation and turbidity. There will be no impact to the water quality in Aslantas Reservoir.	measures in Section 6.4 and the RP, Appendix C2, for the protection of surface waters, Including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench.	Disturbance will be short-term and limited to the immediate working area. Sedimentation of Kesis River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Ecology			
Important Ecological Factors ESA 47 is identified between KP 994.3 and KP 997.7 for the globally-threatened plant species (*Ophrys reinholdii spp. leucotaenia*). This species is classified by the World Conservation Union (IUCN) as Endangered (defined as: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating), and is the rarest plant in global terms to be found along the route. The IUCN status for these species are given in Table 5.20, Section 5. At KP 1002.35 1 Barred Warbler and 1 Black Francolin (both nationally-threatened) were recorded and another Black Francolin was recorded at KP 1003.68. The protection status for these species are given in Table 5.21, Section 5. Approximately 80m west of the route near KP 1016.5, Mehely's Horseshoe Bat, Schreiber's Long-fingered Bat, (both globally-threatened) and the Striped Hyena were recorded. The protection status for these species are given in Table 5.21, Section 5.	Habitat destruction of maquis and habitats peripheral to cultivated land may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 47. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the

Environmental Impact Table 54 (Maps 54A and 54B) (KPs 992.6 – 1016.8): West of Andirin River and North of Tokmakli Settlement to West of Atlantis Reservoir, Kahramanmaras/Osmaniye Province border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
At KP 995.7, Common Tortoise (globally-threatened), also known as the Asia Minor Spur-thighed Tortoise, was recorded. The protection status for this species is given in Table 5.21, Section 5. BVS-050 will be located at KP 994.8 on cultivated land within ESA 47. Approximately 350m^2 of permanent landtake required. A new access road will be constructed of c. 45m in length.	Minor temporary disturbance to globally-threatened bat species during seasonal sensitivities (see the EMMP, Appendix C1): • the Mehely's Horseshoe Bat gives birth in late spring and hibernates in hollow trees, ruins, tunnels, garrets or caves from September/October to spring (May). • the Schreiber's Long-Fingered bat gives birth to young from October – November; and hibernates in cold climates or curtails activity in cold weather between September/October and spring in hollow trees, ruins or caves). This species also migrates up to 200km between summer and winter retreats. The globally-threatened Striped Hyena has no legal protection in Turkey, and therefore hunting of this species may pose a potential impact. Potential temporary disturbance to the Asia Minor	sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during re-instatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 47. Shrubs, thickets and dense vegetation along the RoW will be cleared outside the breeding season for the Barred Warbler. Clearance of trees, shrubs and thickets in advance of the construction to be undertaken outside the April – July period for the Black Francolin. Preconstruction surveys for the both bat species during the summer months will establish the presence and abundance of the species and seek to identify summer colonies and potential winter hibernation roosts. Hollow trees within the RoW of the Pipeline will be removed during the late summer months to prevent their use as winter roosting sites and to allow	RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACT** at most to a globally-threatened bat species during the construction period where the specified mitigation measures are applied for the seasonal sensitivities identified. **MINOR IMPACTS** at most for the Striped Hyena with the application of the specified mitigation measures. **MINOR IMPACTS** only to the globally-threatened Common Tortoise, where the specified mitigation measures identified for the seasonal sensitivity are applied during the construction period. **MINOR IMPACT** Based on the mitigation measures described, the small area of habitat affected and the temporary nature of construction activities, it is predicted that only minor

Environmental Impact Table 54 (Maps 54A and 54B) (KPs 992.6 – 1016.8): West of Andirin River and North of Tokmakli Settlement to West of Atlantis Reservoir, Kahramanmaras/Osmaniye Province border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	Spur-thighed Tortoise during its identified seasonal sensitivity. This species lays eggs in scoops and hollows in the earth, with eggs (up to 12 per clutch) laid in May-June and hatchlings emerge from August to September. Hibernation is between October/November and March/April. Permanent loss of plain steppe habitat at the BVS-050 site within ESA 47.	construction to continue during the autumn, winter and early spring periods. Caves, ruins or underground cavities, which have been identified as hibernation roosts (particularly those close to camps and works sites), will be secured, and placed out of bounds, to avoid their disturbance by workers. In areas where the presence of the Striped Hyena has been confirmed, the hunting of this mammals or any other wildlife by the BTC Project personnel or contractors will be strictly forbidden and rigorously enforced. Preconstruction surveys to establish locations and population densities of tortoises. Mature individuals and hatchings will be translocated to appropriate habitats in advance of construction. In areas of known concentrations, construction activities will be avoided during the May-September period. Prior to construction of BVS-050, a site specific survey will be undertaken by an ecological specialist to identify and locate	impacts on the biological environment will occur as a result of construction activities at BVS-050. This assessment will be confirmed by the site-specific survey prior to construction

Environmental Impact Table 54 (Maps 54A and 54B) (KPs 992.6 – 1016.8): West of Andirin River and North of Tokmakli Settlement to West of Atlantis Reservoir, Kahramanmaras/Osmaniye Province border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		threatened species at the site and at any surrounding areas potentially affected by construction activities. Based on the findings of this survey, appropriate mitigation will be determined. The area of sensitive habitat in ESA 47 affected by construction activities will be minimised to the minimum necessary for safe working.	
Noise			
Cebicli settlement is located c. 188m from the centreline of the Pipeline.	Short-term noise impacts are expected to occur at Cebicli settlement during soil stripping activities.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the	**MINOR IMPACT** Noise impacts are expected to occur during soil stripping activities, as it may not be possible to utilise spoil to screen dwellings from the works. Noise impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days.

Environmental Impact Table 54 (Maps 54A and 54B) (KPs 992.6 – 1016.8): West of Andirin River and North of Tokmakli Settlement to West of Atlantis Reservoir, Kahramanmaras/Osmaniye Province border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		use of mobile noise barriers for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	
Archaeology and Cultural Heritage			
There are three archaeological sites in this section located within the 100m Corridor: • Oren Dosu (3rd Degree Site – registered by the MoC) – a flat settlement, dating back to the Roman period, located to the north of the pipeline route. The settlement is totally destroyed and only the column supports are visible. The graveyard is covered with trees. • Urlu Cemetery (1st Degree Site*) is on the edge of the 100m Corridor and the site dates back to the Ottoman Period. • Catak Mevkii (Ruin-1), (2nd Degree Site*), – a graveyard dating back to the Ottoman period, located on the Catak ridge and overlooking the Hancerli Dere Valley. The pipeline route will now cross this site as a result of a previous route change to avoid a landslide area. * These sites have not yet been registered by the MoC and are provisionally assigned these classifications. Urlu Graveyard and Ruin 1 (Çatak location) have been proposed for Registration by the preservation council	Potential for direct impacts, such as ground disturbance, at all two sites during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of these sites.	Oren Dosu is avoided through re-routing of the Pipeline. However, the site will also be fenced throughout the construction period, as the route will still pass close to it. Urlu Cemetery will be fenced throughout the construction period to avoid accidental damage. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ. If blasting is required, then it will be conducted in such a way that it does not pose a threat to the integrity of the column supports still standing on the site. To avoid vibration impacts, percussive piling will be not allowed within 100m of Oren Dosu.	**MINOR IMPACT** Assuming Oren Dosu and Urlu Cemetery sites are fenced, impacts will be limited to the temporary disturbance of the setting of the sites and peripheral features.

Osmaniye Socio-Economic Overview

Demographics:
Osmaniye is the fourth smallest of the pipeline provinces with a population of 438,000, of whom only 3% live in the pipeline corridor. The average household size is six (corresponding with the survey average). Urban areas are relatively stable, whereas rural areas experience out-migration. Osmaniye is in a state of transition and is recognised as a developing province. All survey respondents are Sunni Muslim. Turkish is the primary language. Kurdish and Circasian are spoken by a small percentage of respondents as a second language.

Land:
Land is primarily privately owned, followed by State ownership. Land is relatively evenly distributed and 82% of surveyed respondents (the second highest of the surveyed provinces) are involved in agriculture and own, or cultivate land. Agricultural activities are the main source of income, with grain being the main output. The province is primarily situated on the Cukurova plain, the most fertile area of Turkey, with land usually cultivated twice a year. Animal husbandry is generally carried out for subsistence purposes. Some mountain settlements are relatively isolated, they are located in the Taurus Mountains, have scattered housing, and are referred to as '*forest settlements'*. Irrigation is used by some of these settlements.

Livelihoods:
Osmaniye is ranked the lowest (tenth) of the survey provinces in terms of average household income and also has a low ranking for combined income and assets (eg wealth). It is the only surveyed southern province with limited agricultural and industrial diversification. Non-agricultural activities are limited and trade is difficult in the forest settlements.

Infrastructure & Services:
All surveyed settlements along the pipeline corridor have access to grid electricity, telecommunications and water infrastructure. However, electricity supply is irregular (and insufficient for heating) and drinking water is reportedly often polluted, therefore local residents depend on imported water tanks for drinking water.
Sewerage infrastructure is lacking. The average literacy rate is 84% for the surveyed population (literacy rates drop amongst elder women) and Osmaniye exhibits the second highest percentage of surveyed inhabitants with primary school education (54%) and secondary education (21%). Only 1% of respondents had attained a university level education.

Key Problems:
Erosion is a problem for 'forest settlements', although the most frequently raised settlement problems were: unemployment and low income; insufficient sewerage or irrigation infrastructure, poor roads and poor access to clean water.

Project Attitude:
Surveyed settlements generally perceive the project positively and have high expectations for employment. They have some reservations regarding risks associated with the project such as damage to roads and traffic during harvest periods. 5% of respondents are particularly concerned about noise and dust from construction activities.

Source: Household and Settlement Survey (2001)

Social Impact Table 54 (Map 54C) (KPs 992.6 – 1016.8): West of Andirin River and North of Tokmakli Settlement to West of Atlantis Reservoir, Kahramanmaras/ Osmaniye Province border

MAP 54: PROJECT INFORMATION

There are no pump stations or construction camps in the area. There is one block valve station.

MAP 54: MAP HIGHLIGHTS

- Land use: rain fed agriculture, shrubs, forest and irrigated agriculture.
- Most of the route follows the summit of a ridge, bound east and west by small streams.
- There is an energy transmission line that bisects the pipeline
- The pipeline traverses through two rivers, the Kesis River and the Anditin River, which lead to the Aslantas Dam.
- Unclassified roads link local settlements and the pipeline crosses a provincial highway twice.

MAP 54: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** three settlements will be directly impacted by the pipeline project, one (Kesim) has land intersected (L) by the proposed pipeline; and two (Tokmakli and Cebicli) are within 500m of the pipeline route (D) and Tokmakli is within 2km of the block valve station. None of the settlements are within 5km of a pump station. Settlements impacted by traffic have not yet been identified. Two settlements are located within 2km down stream of a pipeline river crossing; Tokmakli is on the Andirin River, 1km downstream of the pipeline; and Cebicli is located 500m downstream of the Kesis river pipeline crossing. (R).

- ***Surveyed:*** Bektasli was surveyed in the field (S) and one settlement (Kesim) was surveyed by telephone (T).
- ***Not surveyed:*** Cebicli (200m from the pipeline), Tokmakil (250m from the pipeline), Baktasli (750m from the pipeline).

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Kesim (L) (T)			
• ***Demographics:*** 465 inhabitants although experiencing a decrease in population levels. No seasonal migration. • ***Safety:*** the nearest house is 75m from the pipeline and the settlement centre is 500m from the pipeline. • ***Project attitude:*** the local residents are generally aware of the Project and the Muhtar is of the opinion that they would welcome a construction camp and have no major hostilities towards the pipeline. • ***Land ownership & use:*** 75% of land is owned by local residents. There is no seasonal grazing of livestock and no fishing activities are undertaken. Bee-keeping takes place, with honey consumed by the	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 54 (Map 54C) (KPs 992.6 – 1016.8): West of Andirin River and North of Tokmakli Settlement to West of Atlantis Reservoir, Kahramanmaras/ Osmaniye Province border

undertaken. Bee-keeping takes place, with honey consumed by the households. Hunting is carried out by local residents. Seasonal irrigation channels are used. • ***Settlement livelihood:*** agriculture, bee keeping and hunting, construction are main activities. 90% of respondents are family labourers. Local residents have had previous construction experience eg the Tefken project. • ***Accessibility:*** 19 km from the district centre. No accessibility problems during winter. • ***Information provision:*** according to the Muhtar, all local residents speak Turkish and are literate. TV is the most important source for both local and national information. • ***Infrastructure:*** no piped water. An artesian well is the main water source. • ***Settlement problems:*** unemployment and inadequate access to water.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitivity to vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300 meters from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be	**Any additional damage will be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 54 (Map 54C) (KPs 992.6 – 1016.8): West of Andirin River and North of Tokmakli Settlement to West of Atlantis Reservoir, Kahramanmaras/ Osmaniye Province border

		discussed at meetings before and during construction.	
	Hunting Temporary reduction in game due to disturbance during construction.	**Project to establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**Significance cannot be established at this time**
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	If irrigation water is disrupted longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be **compensated**.
	Drinking water Potential for disruption or contamination of drinking water during construction.	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	**No residual impact.**

Social Impact Table 54 (Map 54C) (KPs 992.6 – 1016.8): West of Andirin River and North of Tokmakli Settlement to West of Atlantis Reservoir, Kahramanmaras/ Osmaniye Province border

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Bektasli (S)			
• ***Demographics:*** 315 inhabitants with 60 households. • ***Safety:*** settlement is situated 1.75km from pipeline. • ***Project attitude:*** no hostility towards the pipeline. There are some fears about the pipeline damaging the drinking water resources and lines, roads and telephone lines. Concerns about expropriation of land, and the effect of the pipeline on their crops. A construction camp would be welcome. • ***Land ownership & use:*** 85% of land is owned and used by the local residents, 10% of land is rented from others and used by local residents, 5% is communal land. There is seasonal grazing of livestock in April, Summer, October, November. There are no disagreements amongst local residents. Some land is registered under the name of deceased persons causing concern over land titles and compensation. Use of seasonal irrigation. • ***Settlement livelihood:*** agriculture and bee keeping. Key crops are sugar beet and cotton. • ***Availability & skills:*** machine operators, vehicle driver and drivers. 64% of respondents are willing to take on temporary jobs. • ***Accessibility:*** the settlement is not accessible all year round and is 20km from the district centre. • ***Information provision:*** 100% of the population is literate. Local source of information is the family. • ***Environmental & cultural sites:*** civilian architecture, military buildings • ***Infrastructure:*** piped water is not available. There is no regularity of water supply. There is a common depot as an alternative water source. • ***Services:*** phone, mobile, sewage system available, electricity infrastructure, market, transport and a school. • ***Settlement problems:*** lack of water and problems with quality of water,	***Irrigation*** Potential for loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Accessibility to recruitment*** Decreased access to recruitment process.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No residual impact expected.**

Social Impact Table 54 (Map 54C) (KPs 992.6 – 1016.8): West of Andirin River and North of Tokmakli Settlement to West of Atlantis Reservoir, Kahramanmaras/ Osmaniye Province border

• unemployment, insufficient health facilities and lack of a sewage system.			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kesim (L) (D) (T)			
• ***Demographics:*** 420 inhabitants with no seasonal migration. • ***Safety:*** the centre of settlement is situated 600m from pipeline. • ***Project attitude:*** according to the Muhtar there are no major concerns. A construction camp would be welcome. • ***Land ownership & use:*** 70% of land is privately owned. No seasonal grazing is undertaken. Use of seasonal irrigation. • ***Settlement livelihood:*** agriculture, trade, local government. • ***Settlement accessibility:*** the settlement is not accessible, the distance from the settlement to the district centre is 15km. • ***Information provision:*** 100% of the population is literate. • ***Environmental & cultural sites:*** plateau • ***Infrastructure:*** piped water is available. There is regularity of water supply. There is a no alternative water source. • ***Settlement problems:*** unemployment.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Environmental Impact Table 55 (Maps 55A and 55B) (KPs 1016.8 – 1032.9): West of Karatepe Aslantas National Park, Osmaniye Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Thermic Orthic Calcixerolls (commonly truncated on steep slopes). • Thermic Sandy Orthic Quartzipsamments.	Main potential impacts include: • soil erosion; • sediment yield; • soil productivity. Other potential impacts include: • channel alteration; • waterlogging.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation – see typical drawings. • Reforestation. Co-ordinate construction with farmers. Avoid construction on freshly irrigated soils: allow them to drain. Use equipment mats as required.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
The route travels south-west across gentle, rounded, and more heavily populated landscapes of the Taurus foothills, a mixture of rolling rain-fed agricultural land, olive groves, and heavily wooded gullies. It crosses some dissected and hilly terrain made up of heavily eroded, thick beds of white marl interbedded with sandstone conglomerate. Numerous narrow, flat-bottomed stream channels adjoin moderately steep and steep slopes leading to gently rounded summits cloaked in broad-leaved woodland and maquis. Fields congregate about summits, on flood plains, and on gently sloping land; woodlands and maquis occupy steep wastelands North of the settlement of Kaniagali, the route finally emerges onto the	Formation of conspicuous whitish line across landscape if pale-coloured marl is exposed. Likely to be less conspicuous here than elsewhere since agricultural activities will camouflage it. Short-term construction modifications of landscape components.	Apply 'Soils' reinstatement specifications above.	**MINOR IMPACT** Agricultural landscape is considered resilient to change. Therefore, only minor impacts are expected.

Environmental Impact Table 55 (Maps 55A and 55B) (KPs 1016.8 – 1032.9): West of Karatepe Aslantas National Park, Osmaniye Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Cukurova Plain (c.40m asl), a wide, sweeping, flat plain, immensely fertile and largely turned over to irrigated arable agriculture. Landscapes in the northern part are expansive and mostly featureless - endless fields of cereals with occasional scattered trees or small copses interrupted sporadically by large or small irrigation canals. At this point it is less than 3km away from the Karatepe Aslantas National Park, designated partly for its high landscape value, but the route is too distant to have any visual impact upon this. Landscape sensitivities along the route are low. BVS-051 will be located at KP 1029.7 on cultivated land. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 30m in length.	Potential impacts and their management during BVS construction will be the same as those during pipeline construction.		
Groundwater			
The route passes over the Cukurova (Adana-Ceyhan) Plain, which is an unconfined aquifer, for c. 2.6km at the end of this section. The dominant aquifer type is unconfined with a thickness of 100m. The groundwater quality in this zone is poor due to seawater intrusion.	Potential for moderate and localised impacts to groundwater quality from construction activities.	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including: • No groundwater abstraction within 50m of springs or wells. Groundwater will not be abstracted for use as hydrotest water. • No facilities (construction camps, pipe yards, fuel stores etc) will be located within 50m of springs or wells.	**MINOR IMPACT** With the application of the specified mitigation measures described, only minor impacts are expected to occur, which will be short-term in nature.
Ecology			
Important Ecological Factors ESA 48 is identified between KP 1026.5 and KP 1028.5 for four globally-threatened plant species (*Ophrys transhyrcana spp. amanensis, Centaurea calcitrapa spp. cilicica, Centaurea lycopifolia* and *Anthemis pungens*). The IUCN status for these species are given in Table 5.20, Section 5.	Habitat destruction of maquis or areas peripheral to cultivated lands may result in the loss of individuals from	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 48. The feasibility of	**MODERATE IMPACTS** Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction

Environmental Impact Table 55 (Maps 55A and 55B) (KPs 1016.8 – 1032.9): West of Karatepe Aslantas National Park, Osmaniye Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
At KP 1022.4, 1 Black Francolin (nationally-threatened) was recorded. The protection status for this species is given in Table 5.21, Section 5.	populations of globally-threatened plants. Potential for direct disturbance to a nationally-threatened bird during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods.	translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Clearance of trees, shrubs and thickets in advance of the construction to be undertaken outside the April – July period for the Black Francolin.	planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for a nationally-threatened breeding bird, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW.
Noise			
Hourly measurements were taken at Kaniagali Quarter of Cigcik Settlement (L_{eq} value of 60.5 dBA), which may have been slightly higher than expected due to windy conditions at the time of survey. Kaniagali is located c.200m from the pipeline centreline.	Short-term noise impacts are expected to occur at Kaniagali during soil stripping.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that	**MINOR IMPACT** Short-term noise impacts are expected to occur during soil stripping activities, as it may not be possible to utilise spoil to screen dwellings from the works. Noise impacts are

Environmental Impact Table 55 (Maps 55A and 55B) (KPs 1016.8 – 1032.9): West of Karatepe Aslantas National Park, Osmaniye Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	likely to occur. However, this will be short-term in nature, lasting only for a few days.
Archaeology and Cultural Heritage			
The old settlement of Karagedik Area lies to the east of the Pipeline on the edge of the 100m Corridor. This Medieval settlement has been totally destroyed. The MoC has not yet registered the site. Karagedik area has been proposed for registration by the regional preservation council	Potential for direct impacts, such as ground disturbance, at this site during pipeline construction. Indirect impacts may arise from construction activities that will affect the	The pipeline has been re-routed to avoid the old settlement of Karagedik. Potential impacts will therefore be avoided. Construction will be carried out under the supervision of an archaeologist authorised BOTAŞ.	**MINOR IMPACT** Impacts will be limited to the temporary disturbance of the site setting and peripheral features.

Environmental Impact Table 55 (Maps 55A and 55B) (KPs 1016.8 – 1032.9): West of Karatepe Aslantas National Park, Osmaniye Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	visual/historical setting of the site.		

Social Impact Table 55 (Map 55C) (KPs 1016.8 – 1032.9): West of Karatepe Aslantas National Park, Osmaniye Province

MAP 55: PROJECT INFORMATION			
No pump stations, construction camps or block valve stations in the area.			
MAP 55: MAP HIGHLIGHTS			
• Little agricultural land. • Most of the route follows the summit of a ridge, bound east and west by small streams. • An energy transmission line bisects the pipeline. • Unclassified roads link local settlements.			
MAP 55: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted:*** four settlements on this map will be directly impacted by the pipeline project. Three settlements (Cigcik, Yukari Bozkuyu, Asagi Bozkuyu) have land intersected by the proposed pipeline (L) and one settlement (Kaniagali mah) is within 500m of the pipeline route (D). No settlements are within 5km of a pump station (P), or within 2km of a block valve station. Settlements impacted by traffic have not yet been identified. No settlements are located down/upstream of a river. • ***Surveyed:*** two settlements (Cigcik, Asagi Bozkuyu) were surveyed in the field (S) and two settlements (Yukari Bozkuyu, Asagi Bozkuyu) were surveyed by telephone (T). • ***Not surveyed:*** Kaniagali Mah (350m from the pipeline) and Koyyeri (1.6km from the pipeline).			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Cigcik (L) (S)			
• ***Demographics:*** 900 inhabitants with approximately 180 households. This varies because some households live in the district centre and use their home and because 10% of inhabitants are seasonal labourers migrating from the settlement for agricultural or construction work. • ***Safety:*** the nearest household is 1,000m from the pipeline and the centre of the settlement is 1,500m. Cereal stubble is burnt (which is illegal in Turkey). • ***Health:*** insufficient sewage disposal is blamed for causing diseases. • ***Disputes:*** none • ***Project attitude:*** inhabitants would generally welcome a construction camp but are uninterested in the pipeline maybe because most of the forestland marked for the pipeline belongs to the state. Women were	***Sensitive crops (cotton)*** Dust may affect yields of crops essential for subsistence or commercial livelihoods ***Irrigation*** Potential loss of flow from	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. Contractor will **consult with authorities** to determine	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. If irrigation water is disrupted longer than time considered

Social Impact Table 55 (Map 55C) (KPs 1016.8 – 1032.9): West of Karatepe Aslantas National Park, Osmaniye Province

generally more interested. 64% of inhabitants have no concerns, 18% have a range of concerns including protection of forestland, burning of stubble, damage to roads by heavy machinery and pipeline security. 55% of inhabitants feel that they will benefit from direct employment, 18% are not sure what benefits there might be and 18% raised a range of 'other' benefits. • ***Land ownership & use:*** 70% of land is privately owned by local residents and 10% is communal. The forest near the settlement is primarily state owned (80%). Grazing (of cattle, sheep, poultry and goats) is carried out all year round. Land was expropriated in 1986, for the erection of a high voltage line. Grain, timber, fruit trees and cotton are grown. There are no fisheries or bee keeping. Permanent irrigation channels are present. • ***Settlement livelihood:*** agriculture, forestry, construction, transport, and trade. 10% of local residents are seasonal labourers migrating out of the settlement for work. • ***Availability & Skills:*** no previous experience. Six out of 24 construction skills including heavy machinery operators, heavy vehicle operator, welders and electricians having worked in the iron and steel factories in Adana and Iskenderun. 91% of respondents would accept a temporary job. • ***Settlement accessibility:*** the settlement is accessible all year round. It is 9km from Kadirli district centre. • ***Information provision:*** 90% of local residents are literate. Local information is obtained through families, whereas the Muhtar is the main source of national information. • ***Services:*** transport, market and restaurant facilities. There is a school with two teachers and 25 students. Higher grade students are transported to Kadirli. There are no health facilities, instead local residents travel to Yukaribozkuyu settlement. Doctors and nurses of the health group directorate of Kadirli neighbourhood make door-to-door health visits once every five months. • ***Infrastructure:*** there is piped water with regular supply. No alternative source is used. Electricity infrastructure is available. No sewerage systems or waste systems. Waste disposed of primarily	planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Accessibility to recruitment*** Decreased access to recruitment process ***Skills*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities,	maximum acceptable time for disruption. Winter road closures, seasonal migration and poor transport will **be taken into account** in the recruitment strategy **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Communication with settlement** must take into account settlement characteristics to ensure	acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be **compensated**. **No residual impact expected** **Potential positive benefits to local settlements.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will

Social Impact Table 55 (Map 55C) (KPs 1016.8 – 1032.9): West of Karatepe Aslantas National Park, Osmaniye Province

sewerage systems or waste systems. Waste disposed of primarily through recycling. Some households use solar energy. • ***Settlement problems:*** unemployment, low income, poor sewage system spreading diseases and repercussions from the current economic crisis in Turkey. Water for irrigation is a major need.	potential disruption to utilities, etc.	equal access to information for all residents. This should include using appropriate channels of communication and media.	keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Asagi Bozkuyu (L) (S) (T)			
• ***Demographics:*** 700 inhabitants with 140 households. Population has increased over the past five years. There is no seasonal migration. • ***Safety:*** the centre of the settlement is 1.25km from the pipeline, although the nearest household is 700m. • ***Project attitude:*** according to the Muhtar, local residents would welcome a construction camp. Local residents are generally aware of the pipeline and there was high female participation in meetings. 36% of households have no concerns, 36% think that there will be health and safety risks and 27% mentioned a range of 'other concerns'. In terms of benefits, 64% of households have expectations of direct employment, and 18% feel that there will be no benefits. • ***Main landowners:*** 35% of land is owned by local residents and 50% is communal. There is no seasonal grazing. The majority of landowners have title deeds. Grain, wine, grapes, and cotton are grown. In some cases multi-cropping takes place. Households have on average 1-2 cattle per household and a small number of sheep. There is no cattle breeding for commercial purposes. Temporary irrigation is used. • ***Settlement livelihood:*** agriculture, manufacturing, transport, trade, bee keeping and tailoring. 30% of respondents are farmers and 35% family labourers, although 30% have been unemployed for more than one year. Bee keeping is carried out by two households and is one of a number of sources of income. Local residents have had no previous pipeline experience, but 100% of households would accept	***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 55 (Map 55C) (KPs 1016.8 – 1032.9): West of Karatepe Aslantas National Park, Osmaniye Province

a temporary job. • ***Accessibility:*** the settlement is accessible throughout the year and is 14km from Kadirli district centre. • ***Information provision:*** according to the Muhtar, Turkish is spoken by all local residents. 90% of inhabitants are literate, although female literacy rates are low. TV, family, friends, and the Muhtar are the best local information sources and TV, radio, the Press, and the Muhtar for local information. • ***Services:*** there is a primary school. 50 students are transported to Kadirli for secondary schooling. There is a travelling health team and local residents also go to Yukaribozkuyu and Kadirli. • ***Infrastructure:*** piped, regular supply. Water is also transported to settlement via tankers. Pipeline intersects with drinking water mains. Electricity present, although 30-40 households use solar energy. There are no sewerage systems. Waste is burnt. • ***Settlement problems:*** unemployment, poor sewerage (potentially resulting in diseases), poor roads, inadequate access to water and insufficient irrigation.	***Sensitive crops (cotton/grapes)*** Dust may affect yields of crops essential for subsistence or commercial livelihoods ***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation. ***Accessibility of information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities etc. ***Construction hazards: animals***	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **See Overview of Land Acquisition Process in Appendix C9.** **Contractor will consult with authorities** to determine maximum acceptable time for disruption. **Communication** with settlement must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low. **Livestock crossings** will be established at locations	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **See Overview of Land Acquisition Process in Appendix C9.** If irrigation water is disrupted longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be **compensated**. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Potential for accidents involving livestock.**

Social Impact Table 55 (Map 55C) (KPs 1016.8 – 1032.9): West of Karatepe Aslantas National Park, Osmaniye Province

	Trench poses safety hazard for livestock.	agreed with the community. Stock proof fencing will be erected in areas of danger for livestock.	Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure.

Environmental Impact Table 56 (Maps 56A and 56B) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Thermic Sandy Orthic Quartzipsamments.	Main potential impacts include: • sediment yield (at channel crossings); • soil productivity (disruption of agricultural calendar, physical disruption of soil profile); • soil contamination; • channel alteration (channel crossings); • waterlogging.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation – see typical drawings. Co-ordinate construction with farmers. Avoid construction on freshly irrigated soils: allow them to drain. Use equipment mats as required.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
Landscapes in the northern part are expansive and mostly featureless - endless fields of cereals with occasional scattered trees or small copses interrupted sporadically by large or small irrigation canals. One notable exception is the castle sited on the top of Hamidiye Mountain, an isolated rocky outcrop just north of the settlement of Gokcedami, and visible from miles around. Just to the west of here, the route crosses the Ceyhan River, a wide, partly-braided river flowing in a wide floodplain of shingle islands and marshland. South of the river, smaller fields are more common and these are sown with row crops, mainly vegetables and melons, irrigated through a network of small, raised concrete irrigation aqueducts. Landscape values are low throughout.	Short-term construction modifications of landscape.	Apply 'Soils' reinstatement specifications above.	**MINOR IMPACT** Agricultural landscape is considered resilient to change. Therefore, only minor impacts are expected.
Surface Waters			
The pipeline route crosses Ceyhan River in this section. River channel is meandering, with a trapezoidal cross-section and mid-channel bars. Width	Direct disturbance to bank and bed morphology through	Apply standard mitigation measures in Section 6.4 and the	**MINOR IMPACT** Disturbance will be short-term

Environmental Impact Table 56 (Maps 56A and 56B) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
of river crossing is 130m, with a bank-full width of c.400m and a floodplain of >1,300m wide. Bed consists of sand and gravel and the flow is regulated, of a uniform and tranquil type. Low-flow channel may periodically migrate within the bank-full width of the flood-flow channel, although its movements at the crossing point will be constrained by width and bed controls, (ie boulders installed beneath the road bridge situated c. 250m upstream of crossing). Channel controls at the bridge may be expected to moderate channel expansion and flooding at the crossing point. Aslantas Reservoir may have limited capacity to moderate extreme flows at the pipeline crossing. Bank-side vegetation is comprised of shrubs and riparian vegetation is fragmented. Water quality samples taken 190m upstream of the crossing point indicate that this is a Class IV river. Ceyhan River flows into the Mediterranean Sea and is upstream of a number of irrigation districts and communities.	physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in already poor water quality. Potential for medium-term sedimentation and turbidity. Potential impacts on downstream ecology and water abstraction for human use.	RP, Appendix C2, for the protection of surface waters, Including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench. Assess need for alternative water supply for downstream communities, such as Orhaniye and Selimiye settlements, and provide where necessary if sedimentation and turbidity persist for more than 3 days at the community.	and limited to the immediate working area. Sedimentation of Ceyhan River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Groundwater			
The majority of the route continues to pass over the unconfined aquifer in the Cukurova (Adana-Ceyhan) Plain, with the remaining 2.5km passing over an area of confined aquifer (see Environmental Impact Table 55). The confined aquifer zone exists within the clay layer reaching a depth of 150m. Groundwater in this zone is of high enough quality for drinking purposes.	Potential for moderate and localised impacts to groundwater quality in the unconfined and confined aquifers from construction activities.	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including: • No groundwater abstraction within 50m of springs or wells. Groundwater will not be abstracted for use as hydrotest water. • No facilities (construction camps, pipe yards, fuel stores etc) will be located within 50m of springs or wells.	**MINOR IMPACTS** The confined aquifer zone is potentially a major drinking water resource, although its Class is not known at this stage. However, where mitigation measures described are applied, impacts are predicted to be minor at most and localised.
Ecology			
Important Ecological Factors			

Environmental Impact Table 56 (Maps 56A and 56B) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
The banks of Ceyhan River are an important ornithological area (KP 1037.0 to KP 1037.3). 1 Pied Kingfisher and 1 Common Kingfisher (both nationally-threatened) were recorded at the crossing. In addition, a very large colony of sand martins is present just downstream from the river crossing point. At KP 1048.1 1 Corncrake (globally-threatened, and most probably a migrant) and 1 Graceful Prinia (nationally-threatened) were recorded. The protection status for this species is given in Table 5.21, Section 5. Two fish species breeding in the Ceyhan river are on IUCN 2000 Red List – common carp, (*Cyprinus carpio*), (listed as Data Deficient), breeding between April and June, and loach sp. (*Orthrias tschaiyssuensis*), (listed as Vulnerable), breeding between May and July. Both the common carp and the sharptooth catfish, (*Clarias lazera*), which also breeds in this river between May and June, are of high commercial value. Additional seasonal sensitivities for fish species of medium commercial value are given in the EMMP (see Appendix C1).	Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods. The sand martin colony likely to be occupied from March to September. The corncrake was observed as a migrant and unlikely to be breeding in this area. Temporary disturbance to protected and commercially important fish species and aquatic plants providing breeding sites for fish during construction across the Ceyhan River.	Preconstruction survey to establish location of sand martin colony in relation to Ceyhan River crossing; if within 100m of the centre line of works, construction will be undertaken between October and March. The Sand Martin colony and areas of reeds and dense vegetation will be placed out of bounds for construction workers. In addition, the clearance of riverside vegetation in advance of the construction of watercourse crossing to be undertaken outside the April – July period for all other bird species breeding on the river banks. Shrubs and dense vegetation along the RoW will be cleared outside the breeding season for the Graceful Prinia (April to July). Construction activities at river crossings will not be permitted during the breeding season of fish species that are of high commercial value or that are designated has having conservation importance. For construction activity to be permitted during the breeding season of fish species with	**MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. This is critical for the sand martin where surveys identify the colony within 100m of the pipeline centreline. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April for all other bird species (except for the sand martin), and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACTS** at most for all fish species if construction takes place during August to February inclusive. At other times of year (varying by species), impacts will generally be **MINOR** on the basis of the rigid application of water crossing mitigation measures. Where construction is undertaken during the breeding season, impacts may be **MODERATE** for the IUCN listed species

Environmental Impact Table 56 (Maps 56A and 56B) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		medium commercial value, the Contractor will be required to submit specific mitigation measures to avoid impacting breeding fish to BOTAS for approval. Such measures will include, but not be limited to, the following: preconstruction survey results indicating that spawning grounds are avoided, the provision of fish passages, etc, in addition to the generic mitigation measures that are required at all river crossings.	common carp (April-June), loach species (May-July) and highly commercially valued sharptooth catfish (May to June).
Noise			
Gunluce settlement is located c. 203m from the centreline of the pipeline, and around 250m from a highway crossing.	Short-term noise impacts are expected to occur at Gunluce during soil stripping activities. Noise impacts will also occur during piling works associated with the nearby highway crossing.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised.	**MINOR IMPACT** Noise impacts are predicted to occur during piling activities associated with the highway crossing and soil stripping.

Environmental Impact Table 56 (Maps 56A and 56B) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	

Social Impact Table 56 (Map 56C) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

MAP 56: PROJECT INFORMATION
No pump stations, construction camps or block valve stations in the area.
MAP 56: MAP HIGHLIGHTS
• Key land use: irrigated agriculture. • Pipeline crosses two rivers (Ceyan and Altigoz). • Numerous irrigation channels and service roads cross the pipeline route. • An energy transmission line bisects the pipeline. • Unclassified roads link local settlements.
MAP 56: IMPACTED & SURVEYED SETTLEMENTS
• ***Impacted:*** 13 settlements will be directly impacted by the pipeline project (Orhaniye, Sakarcalik, Burnhali, Kaysu, Yenigun, Topraktepe, Kirmacili, Sadiye Karamezar, Haliciye, Sevkitiye, Yukari Ciyanli, Cigdemli, Hemite and Islamaglu). All of these settlements will have land intersected by the proposed pipeline (L). No settlements are within 5km of a pump station or construction camp, or within 2km of a block valve station (B). Two settlements (Sakarcalik, Sadiye Karamezar) are within 500m of the pipeline route (D). Settlements impacted by traffic have not yet been identified. One settlement (Catakli) is located upstream of the Altigoz river, crossed by the pipeline 1.6km south. • ***Surveyed:*** two settlements (Sakarcalik and Kayasu) were surveyed in the field (S) and nine settlements were interviewed by telephone (T). • ***Not surveyed:*** Gokcedam (200m from the pipeline), Gunluce (150m from the pipeline), Selmiye (1500m from the pipeline), Catakli (1.65km from the pipeline), Hamidiye (1.2km from the pipeline), Altigobekirli (2km from the pipeline), and Islamaglu (700m from the pipeline). • ***Not on the map:*** nine settlements (Kayasu, Yenigun, Sadiye Karamezar, Haliciye, Sevkitiye, Yukari Ciyanli, Cigdemli, Toprakepe, Hemite) with land intersected by the pipeline (L); and four other settlements; Islamaglu (700m from the pipeline); Altigobekirl (1771m from the pipeline); Hamidiye (893m from the pipeline) and Yukarici Yansu. • ***Disclosure Meeting Locations:*** Gunluce, Yenigun, Topraktepe

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Orhaniye (L) (T)			
• ***Demographics:*** 226 inhabitants. There is no seasonal migration. • ***Safety:*** 1.6km to the centre of the settlement. Possible earthquake area. • ***Project attitude:*** local residents are generally aware of the pipeline and according to the Muhtar, would welcome a construction camp. The Muhtar had no major concerns regarding the pipeline.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor **will consult** with authorities to determine maximum acceptable time for disruption.	If irrigation water is disrupted longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will

Social Impact Table 56 (Map 56C) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

• ***Landownership and use:*** 70% of land is owned by local residents. There is no seasonal grazing or fishing. Seasonal irrigation is used by local residents. • ***Settlement livelihood:*** 90% of respondents are family labourer, and only 1% are in regular paid jobs. Bee keeping is carried out by four households and is a main source of income. • ***Availability & skills:*** local residents have no previous pipeline experience. • ***Distance from settlement to district centre:*** the settlement is 23.15 km from Osmaniye district centre. The settlement is accessible throughout the year. • ***Information provision:*** All local residents are literate. The main local sources of information are TV, families, friends the Muhtar and national sources include TV, radio, newspapers and Muhtar. • ***Environmental & cultural sites:*** the Muhtar stated that there is a castle. • ***Infrastructure:*** there is piped water but the supply is not regular. An artesian well is used. • ***Settlement problems:*** possible earthquake area.		***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	be **compensated.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Sakarcalik (L) (D) (S)			
• ***Demographics:*** 1,000 inhabitants with 150 households. Increased birth rates have caused a rise in population over the past five years. There is no seasonal migration. • ***Safety:*** the centre of the settlement is 1km from the pipeline and the nearest household is 125m. • ***Health:*** poor sewerage and unhealthy drinking water contributing to ill health. Malaria is a problem in the summer. • ***Project attitude:*** according to the Muhtar, inhabitants would welcome the construction camp and there is no major hostility. 27% of households have no major concerns, 18% have a range of 'other' concerns (eg the impacts of dust on crops during harvest, impacts on	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.

Social Impact Table 56 (Map 56C) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

water ducts/ channels) and 36% of households are concerned with health and safety. 46% of inhabitants have expectations of direct employment, and 18% have expectations of indirect employment. • ***Settlement livelihood:*** agriculture, construction, transport, and trade are the main sources of livelihood. 87% of respondents are family labourers, and 5% have regular paid jobs. • ***Main landowners:*** 75% of land is owned privately by inhabitants, 20% is communal, and 5% state owned. Grain, vegetables, herb, fruit trees, and cotton are the main crops. Cattle, sheep, poultry and goats are the main livestock kept in the settlement. Irrigation is used, and irrigation channels are in the same place each year. • ***Availability & skills:*** no previous experience. Seven out of 24 skills construction skills are available including heavy vehicle operator, mechanic, welders, lathe operators, repairmen, security personnel, and skilled construction workers. 55% of inhabitants would potentially accept a temporary job. Sand and stones (from the river) were cited as a potential construction resource by the Muhtar. • ***Accessibility:*** the settlement is accessible throughout the year. It is 19km from Merkez district centre. • ***Information provision:*** 80% of inhabitants are literate. Family, friends and the Muhtar are the main sources of local information. • ***Services:*** telephone services and transport services are available. There is a market. There is a primary school although students also travel to Gokcedag settlement. There is a travelling health team that visits the settlement, otherwise local residents travel 5km to Kirmitli town for health facilities. • ***Infrastructure:*** there is piped water supply although it is irregular. Each house has its own well, but these are located too close to the toilets. Electricity systems are present, although there are frequent cuts. There is no sewerage system and either cesspits are used or sewerage is disposed of into the stream. Most waste is burnt. • ***Settlement problems:*** income, poor sewerage impacting upon health, unhealthy drinking water. Economic problems – in debt to Agricultural bank and Agricultural Credit Cooperatives.	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive crops (cotton)*** Dust may affect yields of	settlement is within 500m of construction work. Community liaison meetings held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be	**Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression

Social Impact Table 56 (Map 56C) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

	crops essential for subsistence or commercial livelihoods	monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	and monitoring measures are fully implemented.
		Groundwater During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided.	**If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project.
	Irrigation Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	**Contractor will consult with authorities** to determine maximum acceptable time for disruption.	If irrigation water is disrupted longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be **compensated.**
	Skills and resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials	Information is highlighted to contractor so that they can ensure that directly impacted settlements are given **preferential treatment** in recruitment and in sourcing	**Potential positive benefits to local settlements.**

Social Impact Table 56 (Map 56C) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

	Health Potential health impacts on construction workers.	of goods and supplies within project constraints Information is **highlighted to contractor** so that they can ensure that their workers are protected.	**No residual impact**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kayasu (L) **(S)**			
• ***Demographics:*** 1200 inhabitants with 250 households. There has been a recent increase in population. There is no seasonal migration. • ***Safety:*** the settlement centre is 713m from the pipeline. • ***Project attitude:*** a construction camp would generally be welcomed and there is no hostility towards the project. The key benefit perceived by 46% of inhabitants is direct employment. • ***Land ownership & use:*** 20% of land is owned by local residents and 50% is state owned. There is seasonal grazing (cattle, sheep, poultry, goats) all year round. There is no temporary irrigation. Key crops are grain, vegetables, fruit trees and cotton. There is no fishing or beekeeping. • ***Settlement livelihood:*** agriculture, trade, transport are the main settlement livelihoods. 30% of inhabitants are seasonal labourers and 55% are family labourers. • ***Availability & skills:*** no previous experience. Two out of 24 construction skills including tree felling. 46% of inhabitants are willing to accept a temporary job. • ***Accessibility:*** the settlement is accessible all year round and the distance to the district centre is 14km. • ***Information provision:*** Literacy rate is 90%. The local sources of information are the family and the Muhtar. • ***Services:*** phone, mobile networks. Market, transport and tourist activities. There is also a school but only a travelling health team. • ***Infrastructure:*** there is no piped source of water and household wells provide the water supply. Electricity is present. There are no	***Sensitive crops (cotton)*** Dust may affect yields of crops essential for subsistence or commercial livelihoods ***Land*** Potential complications in expropriation process. ***Drinking water*** Potential for disruption or contamination of drinking water during construction ***Construction hazards: animals*** Trench poses safety hazard	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **See Overview of Land Acquisition Process in Appendix C9.** The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project. **Livestock crossings** will be established at locations agreed with the community.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **See Overview of Land Acquisition Process in Appendix C9.** **No residual impact.** **Potential for accidents involving livestock.** Financial compensation will

Social Impact Table 56 (Map 56C) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

wells provide the water supply. Electricity is present. There are no sewerage systems, waste systems and waste is disposed of by burning. • ***Settlement problems:*** unemployment, income, and poor health facilities.	for livestock. ***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	**Stock proof fencing** will be erected in areas of danger for livestock. **Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. Community liaison meetings held during and immediately following construction will identify any additional land that has been affected.	be given. The level of compensation will be facilitated by the Projects complaints procedure. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Yenigun (L) **(T)**			
• ***Demographics:*** 880 inhabitants. There is no seasonal migration. • ***Safety:*** the settlement centre is 192m from the pipeline. • ***Project attitude:*** according to the Muhtar a construction camp would be welcome and there is awareness and general enthusiasm about the project. Inhabitants believe that the pipeline intersects with the water dynamo used for pumping water from the spring, and also intersect with the wells. They are concerned about pollution of the water sources from leakages and explosions. Other concerns relate to cultivation of the land after expropriation, cost of felling trees, the existing problem of erosion and the schedule/ duration of construction. The inhabitants do not perceive any benefits from the project.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation. ***Drinking water*** Potential for contamination of drinking water by sediment or accidental spills	Contractor **will consult** with authorities to determine maximum acceptable time for disruption. The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided	If irrigation water is disrupted longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be **compensated.** **No residual impact**

Social Impact Table 56 (Map 56C) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

• ***Land ownership & use:*** 90% of land is owned by local residents. There is bee keeping (5 households for subsistence). There is temporary irrigation. • ***Settlement Livelihood:*** agriculture, bee keeping, construction and education are the main settlement livelihoods. 70% of inhabitants are family labourers. • ***Availability & Skills:*** no previous experience. • ***Accessibility:*** the settlement is accessible all year round and is 11km from the district centre. • ***Information provision:*** Literacy rate is 99%. The main information source for local and national news is the TV. • ***Infrastructure:*** there is no piped water source, artesian wells are the only water source. • ***Settlement problems:*** inadequate access to water, poor roads and poor drinking water quality.	***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented.	by the project. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500 m of construction work. Community liaison meetings held during and immediately following construction will identify any additional land that has been affected.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.**

Social Impact Table 56 (Map 56C) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Topraktepe (L) **(T)**			
• ***Demographics:*** 1,510 inhabitants. There has been a decrease in population. 10% of inhabitants migrate on a seasonal basis. • ***Safety:*** the settlement centre is 2.9km from the pipeline. • ***Project attitude:*** according to the Muhtar a construction camp would be welcomed and there is awareness of the project. There are no major concerns or perceived benefits. • ***Land ownership & use:*** 88% of land is owned by local residents There is no seasonal grazing. Four households are involved in bee keeping for their own consumption. There is no temporary irrigation. • ***Settlement livelihood:*** agriculture, bee keeping, hunting, constructing and education are the main settlement livelihoods. 95% of inhabitants are family labourers and 5% have regular paid jobs. • ***Availability & skills:*** there is previous experience of drinking water projects. • ***Accessibility:*** the settlement is accessible all year round and the distance to the district centre is 8km. • ***Information provision:*** Literacy rate is 98%. Local and national sources of information are TV and radio. • ***Infrastructure:*** the only source of water is stored water.	***Drinking water*** Potential for contamination of drinking water by sediment or accidental spills ***Hunting*** Temporary reduction in game due to disturbance during construction	T The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the project. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**No residual impact** **Significance cannot be established at this time**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kirmacli (L) **(T)**			
• ***Demographics:*** 1900 inhabitants with a recent decrease in population. 30% of inhabitants migrate. • ***Safety:*** the settlement centre is 4.4km from the pipeline. • ***Project attitude:*** according to the Muhtar construction camp would be welcome. There is general awareness of the project although inhabitants would like more information about the pipeline. There are no perceived benefits.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contaminations of flow from spills or increase in sedimentation.	Contractor will consult with authorities to determine maximum acceptable time for disruption.	If irrigation water is disrupted longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.

Social Impact Table 56 (Map 56C) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

• ***Land ownership & use:*** 70% of land is owned by local residents there is no seasonal grazing. There is bee keeping and hunting. There is temporary irrigation. • ***Settlement livelihood:*** agriculture, bee keeping (by 25 households), are main sources of income and hunting, manufacturing, construction, trade and education are important sources of livelihood. 50% of inhabitants are family labourers and 15% have regular paid jobs. • ***Availability & skills:*** no previous experience. • ***Accessibility:*** the settlement is accessible all year round, the distance from the settlement to district centre is 19km. • ***Information provision:*** There is a 95% literacy rate. The local and national sources of information are TV and newspapers. • ***Environmental & cultural sites:*** castle. • ***Infrastructure:*** there is piped water although the supply is irregular, a common depot is the alternative water source. • ***Settlement problems:*** unemployment, inadequate access to drinking water and delays in payment from sales of agriculture products.	***Hunting*** Temporary reduction in game due to disturbance during construction. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**Significance cannot be established at this time.** **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 56 (Map 56C) (KPs 1032.9 – 1048.7): Cukurova Plain, Osmaniye Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Yukarici Yansu (T)			
• ***Demographics:*** 1,700 inhabitants. There is no seasonal migration. • ***Project attitude:*** according to the Muhtar a construction camp would be welcomed and there is general awareness of the pipeline project. There are no major perceived benefits or concerns. • ***Land ownership & use:*** 80% of land is owned by local residents. There is no seasonal grazing or temporary irrigation. There is bee keeping. • ***Settlement livelihood:*** agriculture, bee keeping (by three households for their own consumption), construction, transport, trade and education. 75% of inhabitants are family labourers, 1% have regular paid jobs. • ***Availability & skills:*** no previous experience. • ***Accessibility:*** the settlement is accessible all year. • ***Information provision:*** Literacy rate is 90%. Local sources of information are TV, newspapers and schools. National information sources are TVs and newspapers. • ***Environmental & cultural sites:*** museums. • ***Infrastructure:*** there is no piped water supply, the local spring is the only water source. • ***Settlement problems:*** inadequate access to water and poor roads.	***Drinking water*** Potential for disruption or contamination of drinking water during construction	The need for an **alternative source of water** will be evaluated prior to construction, and if necessary will be provided by the Project.	**No residual impact.**

Environmental Impact Table 57 (Maps 57A and 57B) (KP 1048.7 – 1050): Cukurova Plain, Adana/Osmaniye Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Soils types from the previous section continue in this section of the route: • Thermic Sandy Orthic Quartzipsamments.	Main potential impacts: • sedimentation at channel crossings; • soil productivity (disruption of agricultural calendar, physical disruption of soil profile); • channel alteration (channel crossings); • waterlogging.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation – see typical drawings. Co-ordinate construction with farmers. Avoid construction on freshly irrigated soils: allow them to drain. Use equipment mats as required.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed**.**
Landscape and Visual			
Small fields are common and these are sown with row crops, mainly vegetables and melons, irrigated through a network of small, raised concrete irrigation aqueducts. Landscape sensitivities are low throughout.	Short-term construction modifications of landscape.	Apply 'Soils' reinstatement specifications above.	**MINOR IMPACT** Agricultural landscape is considered resilient to change. Therefore only minor impacts are expected.
Groundwater			
The route continues to pass over the Cukurova (Adana-Ceyhan) Plain (see Environmental Impact Tables 55 and 56). Approximately 1km of the unconfined aquifer and c. 1.8km of the confined aquifer are crossed. Groundwater in the confined aquifer is of high enough quality for drinking purposes.	Potential for moderate and localised impacts to groundwater quality in the unconfined aquifer from construction activities.	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including • No groundwater abstraction within 50m of springs or wells. Groundwater will not be	**MINOR IMPACT** The confined aquifer zone is potentially a major drinking water resource, although its Class is not known at this stage. However, where mitigation measures described are applied,

Environmental Impact Table 57 (Maps 57A and 57B) (KP 1048.7 – 1050): Cukurova Plain, Adana/Osmaniye Province Border

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		abstracted for use as hydrotest water. • No facilities (construction camps, pipe yards, fuel stores etc) will be located within 50m of springs or wells.	impacts are predicted to be minor at most and localised.

Social Impact Table 57 (Map 57C) (KPs 1048.7 – 1050): Cukurova Plain, Adana/Osmaniye Province Border

MAP 57: PROJECT INFORMATION
There are no pump stations, construction camps or block valve stations in the area.
MAP 57: HIGHLIGHTS
• Land use is dominated by irrigated agriculture.
MAP 57: SURVEYED AND IMPACTED SETTLEMENTS
• No settlements are located on this map.

Environmental Impact Table 58 (Maps 58A and 58B) (KPs 1050 – 1064.2): Cukurova Plain, Adana Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
• Thermic Sandy Orthic Quartzipsamments. • Thermic Orthic Calcixerolls, which are often truncated on steep slopes.	Main potential impacts include: • sediment yield (channel crossings); • soil erosion; • soil productivity (disruption of agricultural calendar, physical disruption of soil profile); • channel alteration (channel crossings); • waterlogging.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration. • Channel stabilisation – see typical drawings. Co-ordinate construction with farmers. Avoid construction on freshly irrigated soils: allow them to drain. Use equipment mats as required.	**MINOR IMPACT** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor. Furthermore, soil productivity losses are predicted to last less than 3 months after construction is completed.
Landscape and Visual			
Predominantly landscapes of intensive, irrigated cereals, but smaller fields are common and these are sown with row crops, mainly vegetables and melons, irrigated through a network of small, raised concrete irrigation aqueducts. Further south, the route crosses the main Adana-Osmaniye motorway, the Karacay River, and another major highway in quick succession; the river a wide, deep, slow-flowing river with dense emergent vegetation along its banks in marked contrast to the fast-flowing mountain rivers seen earlier along the route. Landscape sensitivities are low throughout.	Short-term construction modifications of landscape.	Apply 'Soils' reinstatement specifications above.	**MINOR IMPACT** Agricultural landscape is considered resilient to change. Therefore, only minor impacts are expected to occur.
Surface Waters			
The pipeline route crosses Karacay River, which is canalised with a trapezoidal cross-section with mid-channel bars. Width of crossing is 23m	Direct disturbance to bank and bed morphology through	Apply standard mitigation measures in Section 6.4 and the	**MINOR IMPACT** Disturbance will be short-term

Environmental Impact Table 58 (Maps 58A and 58B) (KPs 1050 – 1064.2): Cukurova Plain, Adana Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
and the bank-full width is c.8m, with no floodplain. Levees have been constructed. Bed consists of sand and the flow is perennial, of a uniform and tranquil type. Bank-side vegetation is comprised of shrubs with no riparian vegetation. The D400 motorway crosses the river c. 0.4km upstream of the pipeline crossing point. Water quality samples taken 400m downstream of the crossing point indicate that this is a Class III river. Gunyazi Settlement is 0.5km downstream of the crossing point.	physical works, and indirectly, due to run-off containing suspended solids from working areas resulting in a reduction in water quality. Water quality indicates that Karacay River is polluted and further degradation in quality will be avoided. Potential for short to medium-term sedimentation and turbidity. Potential impacts on downstream ecology and water abstraction for human use.	RP, Appendix C2, for the protection of surface waters, including: • use of appropriate sediment filters or trapping devices; • techniques to divert/separate flow from open trench. Assess need for alternative water supply for downstream communities, eg Gunyazi Settlement, and provide where necessary if sedimentation and turbidity persist for more than 3 days at the community.	and limited to the immediate working area. Sedimentation of Karacay River will only be visible for less than 3 weeks after construction, with no obscuration of the river bed.
Groundwater			
The majority of the route continues to pass over the Cukurova (Adana-Ceyhan) Plain (unconfined aquifer). Groundwater samples were taken from wells located c. 2.4km east of the route near KP 105.3 (Well Site No.16) and c. 2km west of the route near KP 105.9 (Well Site No.17). Results indicate that groundwater quality is Class II. BVS-052 will be located at KP 1061.2 on the unconfined aquifer. Approximately 350m^2 of permanent landtake required. A new access road will be constructed to the site of c. 50m in length.	Potential for moderate and localised impacts to groundwater quality from construction of both the Pipeline and BVS-052.	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including: • No groundwater abstraction within 50m of springs or wells. Groundwater will not be abstracted for use as hydrotest water. • No facilities (construction camps, pipe yards, fuel stores etc) will be located within 50m of springs or wells.	**MINOR IMPACT** Where mitigation measures described are applied, impacts are predicted to be minor at most and localised.
Ecology			
Important Ecological Factors			**MODERATE IMPACTS**

Environmental Impact Table 58 (Maps 58A and 58B) (KPs 1050 – 1064.2): Cukurova Plain, Adana Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
ESA 49 is identified between KP 1060.6 and KP 1061.1 for the globally-threatened plant species (*Ophrys transhyrcana sp. amanensis*).The IUCN status for these species are given in Table 5.20, Section 5. A large slow-flowing, eutrophic, irrigation canal with well-developed marginal vegetation is located between KPs 1055.4 – 1056 and parallel to the route. The canal supports an interesting riparian bird community including three nationally-threatened species: 2 White-breasted Kingfisher, 2 Common Kingfisher, & 1 Graceful Prinia. Another White-breasted Kingfisher was present near the Karacay River but outside of the construction corridor. The protection status for these species are given in Table 5.21, Section 5. At KP 1054.9, near the Karacay River crossing, the European Pond Turtle (globally-threatened) was recorded. The protection status for this species is given in Table 5.21, Section 5. The common carp, (*Cyprinus carpio*) breeds in the Karacay river between April and June and is categorised in IUCN 2000 Red List as Data Deficient. This species is also of high commercial value, along with the sharptooth catfish (Clarias lazera), which breeds in this river between May and June. Additional seasonal sensitivities for fish species of medium commercial value are given in the EMMP (see Appendix C1).	Habitat destruction of areas peripheral to cultivated lands may result in the loss of individuals from populations of globally-threatened plants. Potential for direct disturbance to nationally-threatened birds during nesting, feeding or indirectly, through habitat loss if construction is undertaken during the breeding season (ie between April and July inclusive). July can remain sensitive for late and second broods. Temporary localised disturbance to globally-threatened reptile between May and September inclusive. The European Pond Turtle typically mates in May, with eggs (up to 10 per clutch) laid amongst the roots of waterside vegetation in June. Incubation period is dependent upon variable by temperature, but is generally in the order of 70 days. Hatchlings emerge August – September. Temporary disturbance to	Threatened plant species will be identified and located during pre-construction surveys, particularly within ESA 49. The feasibility of translocating species will be assessed prior to construction. Where only a few individuals occur, these will be translocated outside of the RoW if the same habitat exists and if this is possible. Otherwise one or a combination of the following techniques will be used, supervised throughout by a botanical specialist (appointed as described in the EMMP, see Appendix C1): • remove and keep top soil and sub-soil separate, protect top soil, and replace correctly; • take turfs containing the threatened plants and nurture until replacement during reinstatement of the RoW. Care will be taken in using fertiliser during re-instatement since it has an adverse effect on non-grass species. It will be used sparingly or not at all in ESA 49. Preconstruction survey to establish location of breeding birds along the irrigation canal; if within 100m of the centre line of works,	Short-term disturbance to internationally important flora. The Construction Contractor will ensure that construction planning achieves a 21-day period from the time when the ESA is entered to the completion of reinstatement (see the RP, Appendix C2). **MINOR IMPACTS** at most for breeding birds, where pipeline construction is scheduled to avoid seasonal sensitivities. Where the construction schedule dictates work during the breeding season, impacts will be **MINOR**, where the RoW is cleared prior to April, and **MODERATE**, where construction occurs during the breeding season without prior clearance of the RoW. **MINOR IMPACTS** only to a globally-threatened reptile, if the construction period avoids the seasonal sensitivity. **MINOR IMPACTS** at most for all fish species if construction takes place during July to February inclusive. At other times of year (varying by

Environmental Impact Table 58 (Maps 58A and 58B) (KPs 1050 – 1064.2): Cukurova Plain, Adana Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
	protected and commercially important fish species and aquatic plants providing breeding sites for fish during construction across the Karacay River.	construction will be undertaken between August and March. In advance of construction works associated with the Karacay River crossing, riverside vegetation will be cleared between beginning of October and end of April, ie outside of the breeding season for the European Pond Turtle. Construction activities at river crossings will not be permitted during the breeding season of fish species that are of high commercial value or that are designated has having conservation importance. For construction activity to be permitted during the breeding season of fish species with medium commercial value, the Contractor will be required to submit specific mitigation measures to avoid impacting breeding fish to BOTAS for approval. Such measures will include, but not be limited to, the following: preconstruction survey results indicating that spawning grounds are avoided, the provision of fish passages, etc, in addition to the generic mitigation measures that are required at all river	species), impacts will generally be **MINOR** on the basis of the rigid application of water crossing mitigation measures. Where construction is undertaken during the breeding season, impacts may be **MODERATE** for the IUCN listed species common carp (April-June) and highly commercially valued sharptooth catfish (May to June).

Environmental Impact Table 58 (Maps 58A and 58B) (KPs 1050 – 1064.2): Cukurova Plain, Adana Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		crossings.	
Noise			
Islamoglu settlement is located c. 428m from both the pipeline centreline and a highway crossing. Gunyazi is located c. 203m from the Pipeline and c. 450m from a highway crossing.	Noise impacts associated with piling activities required during highway crossings will occur at Islamoglu and at Gunyazi. Short-term noise impacts will also occur at Gunyazi during soil stripping.	The following mitigation measures will be applied: • use of silenced/low noise construction plant and machinery; • provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels; • all hours of work will be agreed with the relevant authorities prior to the commencement of works; • plant and machinery will be sited away from inhabited buildings; • existing screening, including that arising from the stockpiling of materials and spoil will be utilised. The Construction Contractor will develop site-specific noise mitigation measures, such as the use of mobile noise barriers to screen dwellings for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP (see Appendix C4).	**MINOR IMPACT** Noise impacts are expected to occur at Gunyazi during soil stripping activities. During soil stripping it may not be possible to utilise spoil to screen dwellings from the works, and hence, noise impacts are likely to occur. However, this will be short-term in nature, lasting only for a few days. **MINOR IMPACT** Assuming that the mitigation measures described are implemented during construction, noise impacts are predicted to be minor and occur only during the short-term at Islamoglu and Gunyazi during piling activities.
Archaeology and Cultural Heritage			

Environmental Impact Table 58 (Maps 58A and 58B) (KPs 1050 – 1064.2): Cukurova Plain, Adana Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Kırteke Mound is a settlement mound located on the edge of the 100m Corridor. Part of this site has been registered by the MoC as a 1st Degree Site, with the remaining registered as a 3rd Degree Site. However, the full extent of this site is unknown.	Potential for direct impacts, such as ground disturbance, at these sites during pipeline construction. Indirect impacts may arise from construction activities that will affect the visual/historical setting of these sites.	The extent Kırteke Mound will be investigated during further field surveys prior to construction. This will determine whether the site extends into the construction corridor and whether there will be a need for detailed surface research and/or rescue excavations at this site. Further investigation will delineate this site and identify a safe route through. Specific mitigation to be developed following site investigations. The MoC classification for the site will be determined from investigations. Construction will be carried out under the supervision of an archaeologist authorised by BOTAŞ.	**MODERATE TO MINOR IMPACTS** Residual impacts cannot be determined precisely for this site at this stage since the extent is unknown. Archaeological investigations prior to construction will establish the full extent of the site. However as investigations are expected to find a safe route through these sites, the ultimate scale of impact is likely to be minor and short-term in duration.

Adana Socio-Economic Overview

Demographics:
Adana is the largest surveyed province in terms of population. It has 1.7 million inhabitants, 8% of whom live within the pipeline corridor. It is also the most densely populated province (112 inhabitants per km^2). It has experienced significant in-migration and seasonal migration of agricultural workers particularly from south-east Anatolia. 70% of the province population live in urban areas, the highest levels of urbanisation encountered along the pipeline. The average household size is lower than the survey average and indicative of more urbanised, nuclear households. All individuals surveyed speak Turkish and the majority of inhabitants are Sunni Muslims, although Alevi and Shiite Muslims are present.

Land:
There is a high degree of land inequality and polarisation compared with other provinces, together with high crop production and high diversification of output (including vegetables and fruit). According to the SIS, 45% of land in Adana is irrigated (exceeding the national average of 21%). Villagers (owner cultivators) and the State, are the primary and secondary landowners respectively. The average landholding is 46ha.

Livelihoods:
Adana is one of the most developed and industrialized provinces in Turkey (particularly around Ceyhan district). However, industrial activities are non-existent within the pipeline corridor (with the exception of the existing BOTAŞ Marine Terminal and the Toros Gübre Fertiliser facilities in Kurtpinari). Adana is ranked top of the surveyed provinces in terms of wealth (assets and income). However, living standards have decreased over the past five years due to the increasing cost of agricultural production and the Turkish economic crisis. In the seven settlements surveyed, abundance of fertile land and irrigation possibilities makes agriculture (accompanied by small-scale livestock breeding) the most widespread way of maintaining a livelihood. A significant number of people owe considerable amounts of money to agricultural loans co-operations.

Infrastructure & Services:
Formal sewerage systems and solid waste disposal systems are very rare. A high proportion of settlements have a mosque, primary school and health centre. Literacy rates are relatively high and 74% of respondents have primary or secondary education. Electricity, water and telephone networks are available although supply, particularly of the former, is irregular.

Key Problems:
The main problems for local residents are the lack of services, particularly the inadequacy of water networks and the increasing difficulties experienced in meeting livelihood needs.

Project Attitude:
Previous experience of industrial developments and underemployment of local people, means that the surveyed respondents have high expectations for permanent employment and request timely payment of compensation for land expropriation for the BTC Project.

Source: Household and Settlement Survey (2001) (Note: Only pipeline baseline data used, not marine terminal data)

Social Impact Table 58 (Map 58C) (KPs 1050.0 – 1064.2): Cukurova Plain, Adana Province

MAP 58: PROJECT INFORMATION			
There are no pump stations or construction camps in the area. There is one block valve station.			
MAP 58: MAP HIGHLIGHTS			
• Major land use is irrigated agriculture, with some non-agricultural land and rain-fed agriculture. • The pipeline crosses the Mercin River, two motorways, a railway and numerous unclassified roads. • The Islamoglu mound lies within the corridor to the east of the route. • An energy transmission line bisects the pipeline.			
MAP 58: IMPACTED & SURVEYED SETTLEMENTS			
• ***Impacted:*** four settlements on this map will be directly impacted by the pipeline project. Three of these (Imran, Hamdilli, Selimiye) have land intersected by the proposed pipeline (L); and three settlements (Gunyazi, Imran and Sogukpinar) are within 500m of the pipeline route (D). No settlements are within 5km of a pump station or construction camp. One settlement (Erenler) is within 2km of the block valve station (B). Settlements impacted by traffic have not yet been identified. One settlement (Gunyazi) is downstream of the pipeline crossing on the Mercin River. • ***Surveyed:*** four settlements (Gunyazi, Erenler, Imran, Hamdilli) were surveyed in the field (S) and three settlements (Dagistan, Selimiye and Hamdilli) were surveyed by telephone (T). • ***Not surveyed:*** Islamoglu Mah (500m from the pipeline); Kuzucak (1.8km from the pipeline); Sogukpinar (400m from the pipeline); and Degirmendere (2km from the pipeline).			
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Dagistan (T)			
• ***Demographics:*** 235 inhabitants with 90 households. 2% of inhabitants migrate seasonally. • ***Safety:*** the nearest household is 900m from the pipeline and the settlement centre is 1.2km away. • ***Project attitude:*** inhabitants would welcome a construction camp, there is no awareness of the pipeline project, and no major concerns or expected benefits seen. • ***Land ownership & use:*** 60% of land is owned by local residents. There is seasonal grazing and bee keeping, but no fishing or hunting. Seasonal irrigation is undertaken.	***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Irrigation***	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. Contractor will **consult** with	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **If irrigation water is**

Social Impact Table 58 (Map 58C) (KPs 1050.0 – 1064.2): Cukurova Plain, Adana Province

Seasonal irrigation is undertaken. • ***Settlement livelihood:*** agriculture, bee keeping, transport, trade and education are the main areas of employment. 100% of the local residents are farmers. • ***Availability & skills:*** previous experience, on the NGP. • ***Accessibility:*** the settlement is accessible throughout the year; it is 21km from the district centre. • ***Information provision:*** 90% of the local residents are literate. Local and national information is obtained through TV, radio and paper. • ***Infrastructure:*** piped water is provided although irregular, stored water is used as an alternative water source. • ***Settlement problems:*** no major problems.	Potential loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation.	authorities to determine maximum acceptable time for disruption. .	**disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Gunyazi (D) (R) (S)			
• ***Demographics:*** 613 inhabitants with 100 households and no recent change in population. Villagers retired from their jobs in other provinces have returned. • ***Safety:*** the settlement centre is 700m from the pipeline, and the nearest house is 300m from the pipeline. • ***Health:*** there are insufficient health facilities, therefore facilities in neighbouring Handilli town are used. • ***Disputes:*** 'other' disputes, ie individual and family problems. • ***Project attitude:*** inhabitants would welcome a construction camp. The local people are aware of the pipeline, but they are concerned about leakages and sabotage. They will be positive as long as there are no damages, and there are no adverse impacts to the environment and agriculture. 73% of respondents have expectations of direct employment and 9% perceive no benefits. 55% of respondents had no major concerns, and the remaining respondents had a range of concerns eg regarding health and safety risks. • ***Land ownership & use:*** 28% of land is owned by local residents, 19% is communal. There are problems related to inheritance and	***Construction hazards: human*** Working areas pose safety hazard to residents, particularly small children. Land beyond that compensated for may be affected if mitigation measures are not fully	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Protective barrier fencing** will be erected where a settlement is within 500m of construction work. **Community liaison meetings** held during and immediately following construction will identify any	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. Any **additional damage will be compensated for.**

Social Impact Table 58 (Map 58C) (KPs 1050.0 – 1064.2): Cukurova Plain, Adana Province

land deeds. Key crops cultivated are grain, cotton, corn, and soya beans. Land allocated for cotton has decreased recently as diseases that affect corn plants have occurred in the present year and some cotton fields could not be harvested. Beekeeping is carried out, but there is no fishing or hunting. A grazing area of 2700 acres is used for cattle (700-750 in number), poultry and sheep (60-70 in number). There is all year grazing. Permanent irrigation channels are used. • ***Settlement livelihood:*** agriculture, animal husbandry, bee keeping and trade are the main settlement activities. Agriculture and animal breeding are unprofitable. 7% of inhabitants have been unemployed (for less than one year), 4% unemployed (for more than one year), 2% have regular paid jobs, 1% are seasonal labourers and 40% are family labourers. • ***Availability & skills:*** some people have previous experience. Five to six local residents have worked as welders in various pipeline projects in Russia and Saudi Arabia. Transmission lines and filter installation cities were constructed in the vicinity of the settlement. Eight out of 24 construction skills are available in the settlement including heavy vehicles drivers, heavy machinery operators, and administrative skills. 55% of inhabitants are available for temporary jobs. • ***Accessibility:*** the settlement is accessible throughout the year. The settlement is 15 km to the district centre. • ***Information provision:*** The literacy rate is 95%. Local sources of information are: the family, Muhtar and national sources are TV, and newspapers. • ***Environmental & cultural sites:*** none • ***Services:*** telephone services, coffee houses, a market, and transport services. There are no health facilities and local residents use the services in Hamdilli town, which is difficult in emergencies. • ***Infrastructure:*** there is piped, irregular supply of water, from Tartali settlement, which is affected by electricity cuts. There is no alternative water source. There is an electricity system in place although there are frequent power cuts. There are no sewerage	implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	additional land that has been affected. **Livestock crossings** will be established at locations as agreed with the community. Consider erecting stock proof fencing. Stock proof fencing will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable bee foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 58 (Map 58C) (KPs 1050.0 – 1064.2): Cukurova Plain, Adana Province

systems, and sewage is discharged via the drainage ducts. Pumping machines are also sometimes used for this purpose. There is no waste system. • ***Settlement problems:*** insufficient health facilities. Inhabitants suggest that the political and economic problems of the country have also affected the settlement.		construction.	
	Land Potential complications in expropriation process.	**See Overview of the Land Acquisition Process in Appendix C9**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Sensitive crops (cotton) Dust may affect yields of crops essential for subsistence or commercial livelihoods.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Irrigation Loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated
	Skills and Resources Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Information is highlighted to Contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**Potential positive benefits** to local settlements.

Social Impact Table 58 (Map 58C) (KPs 1050.0 – 1064.2): Cukurova Plain, Adana Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Imran (L) (D) (S)			
• ***Demographics:*** 680 inhabitants with 80 households, no recent change in population. 1% of the population migrate seasonally. • ***Safety:*** the settlement centre is 770m from the pipeline, the nearest house in the settlement is 600m from the pipeline. There has been an increase in animal thefts. • ***Health:*** there has been a spread of typhoid due to water contamination. • ***Disputes:*** no conflicts. • ***Project attitude:*** a construction camp would be welcome. Inhabitants are aware of the project, and are generally positive, they want to learn about potential underground water resources from studies done for the pipeline. 91% have no major concerns with the project. 82% of respondents have expectations of direct employment. • ***Land ownership & use:*** 30% of land is owned by local residents, 30% is used but not owned by local residents and 14% is state owned. There are problems with title deeds. The key crops are grain, vegetables, cotton, fruit trees and corn. Some land is irrigated and channels are permanent. Seasonal grazing occurs all year. • ***Settlement livelihood:*** agriculture although the soil is not very fertile. There is also animal breeding and milk production. Other livelihoods are bee keeping, trade, construction, transport and education. 45% of inhabitants are family labourers, 4% have been unemployed (for less than one year), 2% are unemployed (for more than one year) and 1% have regular paid jobs. • ***Availability & skills:*** some people have previous pipeline experience. The Iran-Ceyhan-Kirikkale pipeline constructed 15-20 years ago passes near the settlement but had hardly any impacts on settlement life. Six out of 24 construction skills are present including, construction engineers, heavy vehicle drivers, heavy machinery operators and other construction workers. 55% of inhabitants are	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children. Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Bees*** Disturbance of any stationary hives located within 300m of the route.	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee

Social Impact Table 58 (Map 58C) (KPs 1050.0 – 1064.2): Cukurova Plain, Adana Province

willing to take on temporary jobs. • ***Accessibility:*** the settlement is accessible the entire year and is 15 km from the outskirts of the district centre. • ***Information provision:*** The literacy rate is 90%. Sources of local information are TV, family, friends, Muhtar and sources of national sources are the TV, radio, newspapers, and Muhtar. • ***Environmental & cultural sites:*** historical protected areas/ graves, lake and thermal springs. • ***Services:*** coffee houses, market and transport. Traditional methods and health facilities of Hamdilli and Kuzucak settlements are used. There are no schools and 65 are students transported to Kuzucak settlement. • ***Infrastructure:*** piped, regular supply of water with no alternative water source. Electricity infrastructure is present. No sewerage systems or waste system. Waste disposal is burning. • ***Settlement problems:*** poverty, unemployment, debt to the Agricultural Credit Cooperation, lack of health clinic, electricity cuts and lack of education facilities.		moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location.	location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure.
	Sensitive vegetation used by bees Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Sensitive crops (cotton) Dust may affect yields of crops essential for subsistence or commercial livelihoods.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.
	Land Potential complications in expropriation process	**See Overview of the Land Acquisition Process in Appendix C9.**	**See Overview of the Land Acquisition Process in Appendix C9.**
	Irrigation	Contractor will **consult** with	**If irrigation water is**

Social Impact Table 58 (Map 58C) (KPs 1050.0 – 1064.2): Cukurova Plain, Adana Province

	Potential loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation. ***Skills and Resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	authorities to determine maximum acceptable time for disruption. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated **Potential positive benefits** to local settlements.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Hamdilli town (L) (S)			
• ***Demographics:*** 1,650 inhabitants with 325 households, there has been a recent decrease in population, due to emigration to Adana and other metropolitan areas for employment and to pursue university education. 20 households have settled in Germany and Austria. There is no seasonal migration. • ***Safety:*** the settlement centre is 1.8km from the pipeline. • ***Health:*** unhealthy drinking water with potential for causing health problems. • ***Disputes:*** there are serious conflicts between local political parties. • ***Project attitude:*** the inhabitants want a construction site to be established near the town. Although there seems to be awareness of the project, the general attitude is one of indifference. The inhabitants have no concerns and will give their support provided no damage occurs. The key perceived benefit is direct employment (72%).	***Sensitive crops (cotton)*** Dust may affect yields of crops essential for subsistence or commercial livelihoods. ***Construction hazards: animals*** Trench poses safety hazard	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **Livestock crossings** will be established at locations agreed with the community.	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **Potential for accidents involving livestock.** Financial compensation will

Social Impact Table 58 (Map 58C) (KPs 1050.0 – 1064.2): Cukurova Plain, Adana Province

• ***Land ownership & use:*** local residents own 50% of land and 25% is used by the settlement. There are problems regarding inheritance and land deeds. Livestock is grazed all year round. Some land is irrigated and channels are kept in the same place between years. The key crops are grain, cotton, soya beans and peanuts. There is no fishing or bee keeping. • ***Settlement livelihood:*** agriculture and breeding animals for milk. Other livelihoods are trade, manufacturing, construction, tourism and education. 33% of inhabitants are family labourer, 5% are unemployed (for less than a year), 2% are unemployed (for more than a year), 3% have regular paid jobs and 1% are seasonal labourers. • ***Availability & skills:*** no previous experience although the Nato pipeline passes close by. 8 out of 24 construction skills, including heavy vehicles drivers, welders and heavy machinery operators. 64% of inhabitants are willing to take on temporary jobs. • ***Accessibility:*** the settlement is accessible through the year, although transport is a key settlement problem. The distance from settlement to district centre is 12km. • ***Information provision:*** The literacy rate is 99%. The local sources of information are TV, family, friends, Muhtar and the national sources of information are TV, radio, newspapers and the Muhtar. • ***Services:*** coffee houses, market, transport, post office, police, and sports facilities. There is a school, and local health facilities including a midwife, a health centre and a doctor. • ***Infrastructure:*** piped, regular supply of water. In addition, each house has a well and a pump. There is electricity although there are frequent cuts. Sewerage and waste systems are present. Waste is disposed of in the settlement dump. • ***Settlement problems:*** transport, unemployment, poor roads, insufficient infrastructure and sewerage systems and unhealthy drinking water.	for livestock. ***Land*** Potential complications in expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Contamination of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on	Stock proof barriers will be erected in areas of danger for livestock. **See Overview of the Land Acquisition Process in Appendix C9.** ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information	be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 58 (Map 58C) (KPs 1050.0 – 1064.2): Cukurova Plain, Adana Province

	employment opportunities, potential disruption to utilities, etc. ***Skills and Resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	for all residents. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**Potential positive benefits** to local settlements.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Erenler (S)			
• ***Demographics:*** 300 inhabitants with 55 households. There has been a recent decrease in population, due to emigration of young people for education. • ***Safety:*** the settlement centre is 934m from the pipeline. • ***Project attitude:*** a construction camp would be welcome. The general attitude towards the project is very positive. 64% of inhabitants had no concerns and direct employment was the key perceived benefit by 64% of the inhabitants. • ***Land ownership & use:*** 60% of land is owned by local residents and 25% is communal. There are problems with land deeds. There is no irrigation. Key crops are grain, vegetables, cotton, fruit trees. There is grazing throughout the year. • ***Settlement livelihood:*** agriculture is the main livelihood, there is no animal husbandry (except for 1 household). 40% of inhabitants are family labourers, 6% are unemployed (<year), and 3% are unemployed (>year). • ***Availability & skills:*** no previous experience. There are 8 out of 24 construction skills. 64% of inhabitants are willing to take on temporary	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards:***	**Road safety training** will be held in schools prior to construction commencing. **Community liaison meetings** held prior to and during construction will include safety briefings. **Community liaison meetings** held during and immediately following construction will identify any additional land that has been affected. **Livestock crossings** will be	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising. **Any additional damage will be compensated for.** **Potential for accidents**

Social Impact Table 58 (Map 58C) (KPs 1050.0 – 1064.2): Cukurova Plain, Adana Province

jobs. There is a coalmine in operation. • ***Accessibility:*** the settlement is accessible but transportation is difficult in winter. The distance from the settlement to the district centre is 9km. • ***Information provision:*** There is a 100% literacy rate. Local information sources are TV, family, friends, and the Muhtar, national sources of information are TV, radio, newspapers, and the Muhtar. • ***Environmental & cultural sites:*** civilian architecture, forest • ***Services:*** coffee houses, market, transport and sports facilities. There are no schools. Health facilities are traditional, the facilities of Hamdilli town (4km) and Ceyhan (10km) are used. • ***Infrastructure:*** piped, although irregular water supply. There is no alternative water source. Electricity systems are present. There are no sewerage or waste systems, and waste is disposed of in the settlement dump. • ***Settlement problems:*** unemployment is the main problem and inhabitants do not think unemployment can be prevented. Other problems are lack of education and insufficient health conditions, frequent electricity cuts affecting water availability.	***animals*** Trench poses safety hazard for livestock. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc. ***Skills and resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials. ***Land*** Potential complications in expropriation process.	established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. Asking residents or workers to translate as necessary. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints. **See Overview of the Land Acquisition Process in Appendix C9.**	**involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum. **Potential positive benefits** to local settlements. **See Overview of the Land Acquisition Process in Appendix C9.**

Social Impact Table 58 (Map 58C) (KPs 1050.0 – 1064.2): Cukurova Plain, Adana Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Selimiye (L) **(T)**			
• ***Demographics:*** 260 inhabitants. 15% of inhabitants migrate seasonally. • ***Safety:*** settlement centre is 1.75km from the pipeline • ***Project attitude:*** a construction camp would be welcome. There is general awareness about the pipeline project and there are no major concerns. • ***Land ownership & use:*** 50% of land is owned by local residents and 50% is communal. There is no seasonal grazing. There are no fisheries or bee keeping. There is no irrigation. • ***Settlement livelihood:*** agriculture, mining, construction, trade and education. 85% of inhabitants are farmers, 5% are unemployed (<year) and 10% have regular paid job. • ***Availability & skills:*** previous experience eg the Tefken project. • Accessibility: settlement is accessible except in January and February. The settlement is 16.5 km to the nearest district centre. • ***Information provision:*** Literacy rate is 100%. Local sources of information are TV, family, friends, Muhtar, and national sources are TV, radio, paper, and the Muhtar. • ***Environmental & cultural sites:*** mausoleum. • ***Infrastructure:*** there is no piped water available, the settlement uses the settlement fountain. • ***Settlement problems:*** inadequate access to water, low income, unemployment.	***Land*** Potential complications in expropriation process. ***Accessibility of recruitment*** Decreased access to recruitment process.	**See Overview of the Land Acquisition Process in Appendix C9.** ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy	**See Overview of the Land Acquisition Process in Appendix C9.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **No residual impact expected.**

Environmental Impact Table 59 (Maps 59A and 59B) (KP 1064.2 - 1076, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
Soils			
Thermic Orthic Calcixerolls, which are often truncated on steep slopes.	Main potential impacts include: • soil erosion; • sediment; • soil productivity.	• Topsoil removal and storage; subsoil removal and storage; and reinstatement of soils. • Permanent erosion control devices. • Sediment interception and sediment settling ponds where required by the landowner/occupier. • Bio-restoration.	**MINOR IMPACTS** Soil erosion will be short-term and is predicted to occur at approximately the same rate as soil formation. There will be no change in erosion class, or the change will be limited to less than a 100m section of the corridor.
Landscape and Visual			
The final reach of the Pipeline rises over a series of low rounded hills running more or less parallel to the coast (130m asl), the tops and valleys of which are cultivated with cereals and whose steep sides remain covered with maquis. The route then descends into the existing BOTAŞ Marine Terminal.	Some loss of trees and bushes particularly from areas of maquis. Short-term construction modifications of landscape.	Apply 'Soils' reinstatement specifications above.	**MINOR IMPACT** Small loss of bushes in denser areas of maquis leaving narrow straight gaps. Otherwise the agricultural landscape is considered resilient to change.
Groundwater			
Approximately 1.5km of the Cukurova (Adana-Ceyhan) Plain (unconfined aquifer) lies within the 500m Corridor but is not crossed by the pipeline route. Groundwater samples were taken from this aquifer at two wells sites, c. 1.6km east of route (Well Site No. 18 - Akpinar Settlement) and c. 1.5km east of route (Well Site No. 19 - Kurtpinar Settlement). Results indicate that groundwater quality is Class II.	Potential for minor and localised impacts to groundwater quality where activities such as re-fuelling, vehicle washing or maintenance occur in, over or adjacent to a drain or watercourse, (ie Kalebogazi Creek).	Apply standard mitigation measures in Section 6.5 to avoid reducing groundwater quality and conflicting with other users, including: • Fuelling, washing or maintenance of plant or machinery will not occur in, over or adjacent to a drain or watercourse. • No groundwater abstraction within 50m of springs or wells.	**MINOR IMPACT** With the application of the specified mitigation measures described, only minor impacts are expected to occur, which will be short-term in nature.

Environmental Impact Table 59 (Maps 59A and 59B) (KP 1064.2 - 1076, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
		Groundwater will not be abstracted for use as hydrotest water.	
Ecology			
Important Ecological Factors At KP 1072 (near a provincial highway crossing), the Mehely's Horseshoe Bat (a globally-threatened species) was recorded. The protection status for this species is given in Table 5.21, Section 5.	Minor temporary disturbances are expected to globally-threatened mammals during seasonal sensitivities (see EMMP, Appendix C1): • the Mehely's Horseshoe Bat gives birth in late spring and hibernates in hollow trees, ruins, tunnels, garrets or caves from September/October to spring (May).	Preconstruction surveys during the summer months for the Mehely's Horseshoe Bat will establish the presence and abundance of the species and seek to identify summer colonies and potential winter hibernation roosts. Hollow trees within the RoW of the Pipeline will be removed during the late summer months to prevent their use as winter roosting sites and to allow construction to continue during the autumn, winter and early spring periods. Caves, ruins or underground cavities, which have been identified as hibernation roosts (particularly those close to camps and works sites), will be secured, and placed out of bounds, to avoid their disturbance by workers.	**MINOR IMPACT** at most to a globally-threatened mammal during the construction period where the specified mitigation measures are applied for the seasonal sensitivities identified.
Archaeology and Cultural Heritage			
There are three archaeological sites lying within the 100m Corridor that may be potentially impacted during pipeline construction: • Gokdere (3rd Degree Site*) – ancient settlement. There are traces of buildings at this site, dating back to the Roman period. • Maltepe South – 'Classical Site'. There are traces of buildings at this site, dating back to the Roman period.	Potential for direct impacts, such as ground disturbance, at these sites during pipeline construction. Indirect impacts may arise	The re-routing of the Pipeline around the site at Gokdere will be further investigated during field surveys prior to construction. Further investigation will delineate this site and identify whether a re-	**MODERATE TO MINOR IMPACTS** Residual impacts cannot be determined precisely for Gokdere at this stage since the re-route will be subject to

Environmental Impact Table 59 (Maps 59A and 59B) (KP 1064.2 - 1076, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

BASELINE	POTENTIAL IMPACTS	MITIGATION	RESIDUAL IMPACTS
site, dating back to the Roman period. • Kurtkulagi Pasture (1st Degree Site*) – this is a megalithic monument. This type of monument is documented for the first time in this region. * These sites have not yet been registered by the MoC and are provisionally assigned these classifications. Gokdere and Kurtkulagi have been proposed for registration by the regional preservation council	from construction activities that will affect the visual/historical setting of these sites.	route is possible. Specific mitigation to be developed following site investigations. The pipeline has been re-routed to avoid Kurtkulagi Pasture. Potential impacts will therefore be avoided. Maltepe South will be fenced throughout the construction period to avoid accidental damage Construction will be carried out under the supervision of an archaeologist authorised BOTAŞ.	further investigation prior to construction. As further field investigations are expected to find a re-route to avoid this site, the ultimate scale of impact is likely to be minor and short-term in duration. **MINOR IMPACT** Assuming Maltepe South is fenced, impacts will be limited to the temporary disturbance of the site setting and peripheral features. **MINOR IMPACT** Impacts will be limited to the temporary disturbance of the site setting of Kurtkulagi Pasture and peripheral features.

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

MAP 59: PROJECT INFORMATION

There are no pump stations, construction camps or block valve stations in the area.

MAP 59: MAP HIGHLIGHTS

- Major land use is rain-fed agriculture, some pasture and irrigated agriculture.
- The pipeline crosses two unclassified roads and the Kalebogazi river.
- The Yuceoren Quarter lies within the corridor to the west of the route.
- Two Energy Transmission lines bisect the pipeline.
-

MAP 59: IMPACTED & SURVEYED SETTLEMENTS

- ***Impacted:*** seven settlements (Akpinar/ Kurtpinar, Kurkulagi, Tatarli, Sevkiye, Veysiye, Abdiye, Sarimazi) will be directly impacted by the pipeline project; all of these have land intersected by the proposed pipeline (L); no settlements are within 5km of a pump station and one settlement (Vesiye) is within 500m of the pipeline route (D). Settlements impacted by traffic have not yet been identified. There are no settlements downstream of a river/ creek crossing.

Surveyed: three settlements (Akpinar/ Kurtpinar, Kurkulagi, Catakli) were surveyed in the field (S) and six settlements (Tatarli, Sevkiye, Veysiye, Abdiye, Sarimazi, Burhanli) were surveyed by telephone (T).

- ***Not surveyed:*** Sagirlar (850m from the pipeline) and Barikecli.
- ***Not on map:*** Tatarli, Sevkiye, Veysiye (550m from the pipeline), Abdiye (1.25km from the pipeline), Catakli (2km from the pipeline) and Burhanli (1.2km from the pipeline).
- ***Disclosure Meeting Location:*** Akpinar

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Akpinar (Kurtpinar) (L) (S)			
• ***Demographics:*** 2,000 inhabitants with 550 households. Increase in population due to BOTAŞ and Toros Fertiliser facilities. The Settlement includes two neighbourhoods (both surveyed as part of the marine terminal baseline. These include the Karatepe neighbourhood (500 population, 80 households), Incirli neighbourhood (500 population, 100 households). • ***Safety:*** the settlement centre is 1.7km from the pipeline and the nearest house is 1km. Karatepe is within a few meters of oil storage tanks, and inhabitants are concerned about odour and fire outbreak. • ***Health:*** contagious diseases occur occasionally. • ***Project attitude:*** a construction camp would be welcome, there is	***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction	**No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

general awareness about the project although the attitude is predominantly negative, especially in Karatepe and Incirli where they have lost most of their livelihood including fishing, agriculture and pasture land due to previous projects. However, they do have expectations of jobs. • ***Land ownership & use:*** 17% of land is owned by local residents and 60% of land is communal. Karatepe and Incirli neighbourhoods lost all land in previous project expropriations. The key crops are grain, vegetables, cotton and watermelon. There is seasonal grazing in the summer and October. There is no irrigation. • ***Settlement livelihood:*** animal breeding is the main source of income. Other livelihoods include agriculture (soil is fertile), animal husbandry (cattle, sheep, goats, poultry), fishing, construction, trade and tourism. 7% of inhabitants are unemployed (for less than one year), 4% are unemployed (for more than one year), 3% have regular paid jobs, 1% are seasonal labourers and 25% are family labourers. Incirli has lost fishery as an income due to prevention of fishing in the BOTAŞ area. Both neighbourhoods need jobs. • ***Availability & skills:*** previous experience (Iraq-Ceyhan-Kirikkale pipeline). 10 out of 24 construction skills including a machine technician. There are a high number of experienced workers. 55% of inhabitants are willing to take on temporary jobs. There is also an inoperative stone quarry. • ***Accessibility:*** the settlement is accessible all year round and the distance from the settlement to the district centre is 18 km. • ***Information provision:*** Literacy rate is 85%. Local sources of information are TV, family, friends, Muhtar and the national sources are TV, radio, paper and the Muhtar. • ***Environmental & cultural sites:*** civilian architecture. • ***Services:*** phone and mobile networks, coffee houses, market and transport. There is a school, but there are no health facilities, except for traditional methods. Health facilities of Kurtkulagi town (4-5km) are used. • ***Infrastructure:*** there is piped water, although the supply is irregular. There is no alternative water source. Electricity is present. There are	***Construction hazards animals:*** Trench poses safety hazard for livestock. ***Land*** Potential complications in expropriation process. ***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2km downstream of a river crossing. ***Skills and Resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Livestock crossings** will be established at locations agreed with the community. Stock proof fencing will be erected in areas of danger for livestock. **See Overview of the Land Acquisition Process in Appendix C9.** **Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure. **Information is highlighted to Contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within project constraints.	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in Appendix C9.** **No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full. **Potential positive benefits** to local settlements.

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

There is no alternative water source. Electricity is present. There are no sewerage systems. Waste systems are present eg waste is collected by trucks. • ***Settlement problems:*** poor water quality, unemployment, water shortage, lack of sewer system, lack of health facilities.	***Health*** Potential health impacts on construction workers	**Information is highlighted to Contractor** so that they can ensure that their workers are protected.	**No residual impact.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Kurtkulagi town (L) **(S)**			
• ***Demographics:*** 3000 inhabitants with 450 households, there has been no change in population. 25% of inhabitants migrate to the Iskenderun-Payas region for employment and to the province and district centre for education. Seasonal workers also come to work in the town. • ***Safety:*** the settlement centre is 2km from the pipeline, and the nearest house is 1.6km. Occasional fires take place and are put out by fire extinguishers. • ***Disputes:*** minor land conflicts. • ***Project attitude:*** there is a general awareness of the project but the inhabitants want more information. The overall attitude is neither positive nor negative. Key benefits perceived are direct employment by 80% of the inhabitants, land compensation by 10% and indirect employment by 10%. There are some safety concerns. • ***Land ownership & use:*** 30% of land is owned by local residents and 40% of land is state owned. There are problems with title deeds and inheritance issues. There is temporary irrigation, and the key crops are grain, vegetables, cotton, fruit trees and grapes. • ***Settlement livelihood:*** agriculture, animal breeding (goats), beekeeping, transport, trade, education and tourism. 10% of the inhabitants are unemployed (for less than one year), 6% are unemployed (for more than one year), 2% have regular paid jobs and 27% are family labourers. • ***Availability & skills:*** there is previous experience, the Iraq-Ceyhan-Kirikkale pipeline passes 1km at the south of the town. 9 out of 24	***Conflicts over land boundaries*** Exacerbation of existing conflicts. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production. ***Construction hazards animals*** Trench poses safety hazard for livestock. ***Land*** Potential complications in	**Land boundaries to remain clearly demarcated** at all times. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be discussed at meetings before and during construction. **Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger to livestock. **See Overview of the Land Acquisition Process in**	**No significant residual impacts.** **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented. **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **See Overview of the Land Acquisition Process in**

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

construction skills including engineers, heavy vehicle drivers, heavy machinery operators, and qualified workers in the construction of utility infrastructure. 73% of inhabitants will accept a temporary job. There is also an inoperative stone quarry. • ***Accessibility:*** the settlement is accessible all year and the distance from the settlement to the district centre is 14km. • ***Information provision:*** Literacy rate is 99%. Local sources of information are TV, family, friends, Muhtar and the national sources of information are; TV, radio, newspapers and the Muhtar. • ***Environmental & cultural sites:*** Kazankeys site, civilian architecture, religious buildings, grave and a nursery. • ***Services:*** post office, transportation and agricultural credit cooperative. There is a primary school with 12 teachers and 207 students. In addition, 100 students are transported 14km to Ceyhan for high school education. There are health facilities including a midwife, health centre, doctor, and a nurse. • ***Infrastructure:*** there is a piped regular supply of water. There is no problem with drinking water due to recent construction of new wells. Electricity, sewerage systems and waste systems are present. • ***Settlement problems:*** unemployment, poverty, sewerage system not sufficient.	expropriation process. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Potential contamination of flow from spills or increase in sedimentation. ***Accessibility to recruitment*** Decreased access to recruitment process. ***Skills and Resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	**Appendix C9.** ***Groundwater*** During land acquisition, any ground water within 50m of the working width and 100m down slope of the working width to be identified. **In event of a spill** settlement to be immediately warned and alternative sources of water to be provided. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy **Information is highlighted to Contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and	**Appendix C9.** **If there is any long term impact on water sources**, appropriate alternatives to be provided by the Project. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **No residual impact expected.** **Potential positive benefits** to local settlements

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

		supplies within project constraints.	
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Tatarli (L) **(T)**			
• ***Demographics:*** 938 inhabitants with 195 households. There is no seasonal migration. • ***Safety:*** the settlement centre is 6.8km from the pipeline. • ***Project attitude:*** a construction camp would be welcome. There is general awareness of the project and no major concerns were raised. • ***Land ownership & use:*** 90% of land is owned by local residents. There is no seasonal grazing, fisheries or bee keeping. There is temporary irrigation. • ***Settlement livelihood:*** agriculture, construction, transport. 70% of inhabitants are family labourers and 10% have regular paid jobs. • ***Availability & skills:*** there is previous experience in constructing a drinking water system. • ***Accessibility:*** the settlement is accessible, throughout the year. 27 km to the district centre. • ***Information provision:*** Literacy rate is 90%. Main local sources of information are TV, family, friends, the Muhtar and national information sources are TV, radio, paper, Muhtar. • ***Environmental & cultural sites:*** there are lots of water resources. • ***Infrastructure:*** there is a piped, regular supply of water. There is no alternative water source. • ***Settlement problems:*** inadequate energy supply, infrastructure problems and poor roads.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Potential contamination of flow from spills or increase in sedimentation.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Veysiye (L) (D) **(T)**			
• ***Demographics:*** 570 inhabitants. There is no seasonal migration. • ***Safety:*** the settlement centre is 550m from the pipeline.	***Construction hazards: humans***	**Road safety training will be**	**Continued attention** to

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

• ***Project attitude:***: a construction camp would be welcome. There is general awareness of the pipeline project and there are no major concerns. • ***Land ownership & use:*** 50% of land is owned by local residents There is no seasonal grazing. There is bee keeping (by one household, for their own consumption). There is no temporary irrigation. • ***Settlement livelihood:*** agriculture, bee keeping, hunting, construction, trade and education are the main settlement livelihoods. 70% of the inhabitants are family labourers. 10% have regular paid jobs. • ***Availability & skills:*** there is no previous experience. • ***Accessibility:*** there is accessibility to the settlement throughout the year. The settlement is 16km from Ceyhan district centre. • ***Information provision:*** Literacy rate is 70%. Main sources of local information are TV, family, friends, Muhtar and national sources are TV, radio, newspapers and the Muhtar. • ***Environmental & cultural sites:*** Uzun Ahmet's traces. • ***Infrastructure:*** there is a piped regular supply of water, and nearby settlements provide alternative water sources. • ***Settlement problems:*** inadequate energy supply, inadequate access to water, telecommunications.	Working areas pose safety hazard to residents, particularly small children Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Bees*** Disturbance of any stationary hives located within 300m of the route. ***Sensitive vegetation used by bees*** Dust may affect yields of vegetation (eg grey clover) essential for nectar production.	**held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings. **Community liaison meetings held** during and immediately following construction to identify any additional land that has been affected. **Beekeeping: stationary hives.** Inform owner of need to move hives to a position at least 300m from the route. If moved during the productive season, stationary hives must be temporarily moved at least 7km from their original position for 15-20 days prior to moving back close to their original location. **Effectiveness of dust suppression** methods to be monitored daily and increased if necessary. **Community liaison meetings:** issue to be	mitigation measures will be critical to prevent injury. Compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **Benefits** from health and safety awareness raising. **Any additional damage to land will be compensated for.** **No significant impacts expected.** If settlements believe that more than 10% of suitable foraging vegetation will be affected, a location specific bee assessment is to be carried out to assess the need for compensation. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** predicted if dust suppression and monitoring measures are fully implemented.

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

		discussed at meetings before and during construction.	
	Hunting Temporary reduction in game due to disturbance during construction.	Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**Significance cannot be established at this time.**
	Accessibility to information Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	**Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should emphasise oral communication where literacy is low.	**Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Abidiye (L) **(T)**			
• ***Demographics:*** 675 inhabitants. There is no seasonal migration. • ***Safety:*** the settlement centre is 1.25km from the pipeline. • ***Project attitude:*** a construction camp would be welcome and there is a general awareness about the pipeline project.	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Potential	Contractor will **consult** with authorities to determine maximum acceptable time	**If irrigation water is disrupted** longer than time considered acceptable by

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

a general awareness about the pipeline project. • ***Land ownership & use:*** 100% of land is owned by local residents. There is no seasonal grazing. There is no bee keeping or hunting. There is temporary irrigation. • ***Settlement livelihood:*** agriculture and forestry. 60% of the inhabitants are family labourers. • ***Availability & skills:*** there is previous experience of the Tefken project. • ***Accessibility:*** the settlement is accessible. It is 12km from Ceyhan district centre. • ***Information provision:*** Literacy rate is 50%. The local sources of information are TV, family, friends, the Muhtar and the national sources are TV, radio, newspaper, and the Muhtar. • ***Infrastructure:*** there is piped, regular water supply, but there is no alternative water source. • ***Settlement problems:*** unemployment.	contamination of flow from spills or increase in sedimentation. ***Accessibility to information*** Sectors of the population may not have access to project related information on employment opportunities, potential disruption to utilities, etc.	for disruption. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information for all residents. This should include emphasising oral communication where literacy is low.	authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITONAL MITIGATION**	**RESIDUAL IMPACTS**
Sarimazi (L) **(T)**			
• ***Demographics:*** 4,970 inhabitants. 100% of the inhabitants migrate. • ***Safety:*** settlement centre is 3km from the pipeline, the nearest house from the pipeline is 2.2km. • ***Project attitude***: a construction camp would be welcome, there is general awareness of the project, and there are no major concerns. • ***Land ownership & use:*** 45% of land is state owned. There is seasonal grazing and temporary irrigation. Bee keeping (by five households, forming one of many sources of income) and hunting are other land uses. • ***Settlement livelihood:*** agriculture, bee keeping, hunting, fishing, manufacturing, construction, transport, trade, education are the main settlement livelihoods. 20% of the inhabitants have regular paid jobs and 75% are farmers.	***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2km	**Livestock crossings** will be established at locations agreed with the community. **Stock proof fencing** will be erected in areas of danger for livestock. **Fisheries mitigation measures** including: verification of fisheries, fish characterisation,	**Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

• ***Availability & skills:*** there is previous experience of the Tefken project. • ***Accessibility:*** the settlement is not accessible and the distance from settlement to district centre is 15km. • ***Information provision:*** Literacy rate is 60%. The local sources of information are TV, family, friends, Muhtar and the national sources of information are TV, radio, newspapers and the Muhtar. • ***Environmental & cultural sites:*** historical protected area, forest. • ***Infrastructure:*** there is piped, regular water supply and there is no alternative water source. • ***Settlement problems:*** unemployment and poor roads.	downstream of a river crossing. ***Irrigation*** Potential loss of flow from planned/ accidental disruption. Potential contamination of flow from spills or an increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance during construction. ***Accessibility to information*** Sectors of the population may not have access to project related information on	implementation of habitat restoration measures and compensation where necessary. The level of compensation will be facilitated by the Projects complaints procedure. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure. **Communication with settlement** must take into account settlement characteristics to ensure equal access to information	are implemented in full. **If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Significance cannot be established at this time.** **Any change can highlight and exacerbate existing divisions** in communities. Mitigation measures will keep this to a minimum.

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

	employment opportunities, potential disruption to utilities, etc. ***Accessibility to recruitment*** Decreased access to recruitment process.	for all residents. This should include emphasising oral communication where literacy is low. Winter road closures, seasonal migration and poor transport will be **taken into account** in the recruitment strategy.	**No residual impact expected.**
SITE SPECIFIC CHARACTERISTICS	**ADDITIONAL IMPACTS**	**ADDITIONAL MITIGATION**	**RESIDUAL IMPACTS**
Catakli (S)			
• ***Demographics:*** 708 inhabitants with 135 households. There has been a decrease in population, due to emigration to Adana and other metropolitan areas for employment and for education. There is no seasonal migration. • ***Safety:*** the settlement centre is 2km from the pipeline, and the nearest house in the settlement is 1.65km from the pipeline. • ***Disputes:*** there are no conflicts, but relations with neighbouring settlements appear unsettled. • ***Project attitude:*** a construction camp would be welcome, there is a general awareness of the project, and the attitude of the settlement is positive although indifferent. There are job expectations (100%) and concern about land inheritance issues. • ***Land ownership & use:*** 60% of land is owned by local residents and 24% of land is share cropped. There are problems related to land inheritance issues and the title deed registrations. Seasonal irrigation, with channels in the same place, is undertaken. The key crops are grain, cotton, corn and soybeans. There is no bee keeping. Seasonal grazing occurs throughout the year. • ***Settlement livelihood:*** agriculture, cattle and poultry breeding for household consumption are the main livelihoods. There has been a	***Irrigation*** Potential loss of flow from planned/ accidental disruption. Potential contamination of flow from spills or an increase in sedimentation. ***Skills and resources*** Increased opportunity to provide skilled or semi-skilled labour or to source goods or materials.	Contractor will **consult** with authorities to determine maximum acceptable time for disruption. **Information is highlighted to contractor** so that they can ensure that directly impacted settlements are given preferential treatment in recruitment and in sourcing of goods and supplies within Project constraints.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. **Potential positive benefits** to local settlements.

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

decrease in cotton production recently due to a plant disease. Citrus fruits have been recently cultivated. Other settlement livelihoods are construction, transport and education. 7% of inhabitants are unemployed (<year), 4% are unemployed (>year), 1% have regular paid jobs, 1% are seasonal labourers and 30% are family labourers. • ***Availability & skills:*** there is no previous experience, although a few inhabitants have experienced infrastructure projects. 7 out of 24 construction skills including heavy vehicle drivers, heavy machinery operators and construction workers, the inhabitants seem to be very qualified in each area. 100% of the inhabitants are willing to take on temporary jobs. In addition there are abundant local sources of sand and pebbles. • ***Accessibility:*** the settlement is accessible all year. The settlement is 6km from the district centre. • ***Information provision:*** Literacy rate is 99%. Local information sources are TV, family, friends, Muhtar and the national sources are TV, radio, paper, and the Muhtar. • ***Services:*** there are no schools and facilities of neighbouring Tatarli settlement are used. There are no settlement health facilities, the inhabitants use the Mustafeybeyli town health facilities. • ***Infrastructure:*** there is piped water although the supply is affected by electricity cuts. There is no alternative water source. Water is sourced from this settlement and Tatarli settlement and is used by 30 other settlements in the neighbourhood. There are no sewerage systems present. There is a waste system, but source of waste disposal is not known. • ***Settlement problems:*** unemployment, low income, poverty. Inhabitants are unable to pay debt to Agricultural Credit Cooperative. Lack of sewerage, education, lack of health facilities and frequent electricity cuts.			

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

SITE SPECIFIC CHARACTERISTICS	ADDITIONAL IMPACTS	ADDITIONAL MITIGATION	RESIDUAL IMPACTS
Burhanli (T)			
• ***Demographics:*** 890 inhabitants. There is no seasonal migration • ***Safety:*** settlement centre is 1.2km from the pipeline, the nearest house is 650m from the pipeline. • ***Disputes:*** problems rarely occur and are resolved with the help of the settlement headman and elders. The settlement headman is very influential. • ***Project attitude:*** a construction camp would be welcome. There is awareness about the pipeline, the general attitude is positive and there are no major concerns.	***Construction hazards: humans*** Working areas pose safety hazard to residents, particularly small children	**Road safety training will be held** in schools prior to construction commencing. **Community liaison meetings held** prior to and during construction will include safety briefings.	**Continued attention** to mitigation measures will be critical to prevent injury. **Benefits** from health and safety awareness raising.
• ***Land ownership & use:*** 70% of land is privately owned, although 15 households do not have title deeds which are issued in the names of their heirs. There is no seasonal grazing. There is temporary irrigation and the key crops are wheat, soybeans, corn and cotton. • ***Settlement livelihood:*** agriculture is the main source of income, animal breeding is for subsistence and sheep breeding by some families is for commercial purposes (sacrificial sheep). Transport, trade, education are other livelihoods sources for the settlement. 25% of inhabitants have regular paid jobs and 65% are family labourers. There is fishing (three households, one of many sources of income), bee keeping (one household, one of many sources of income) and also hunting. • ***Availability & skills:*** there is no previous experience of a pipeline project. • ***Accessibility:*** the settlement is accessible throughout the year. • ***Information provision:*** literacy rate is 99%. Main local sources of information are TV, family, friends, Muhtar and the main sources of national information are; TV, radio, newspapers and the Muhtar • ***Environmental & cultural sites:*** Uzun Ahmets's traces, caves. • ***Services:*** there is a school but with only one teacher, which is insufficient, 60 students use the facilities at Tartali settlement. There are four groceries. There is also a settlement clinic, a doctor, a health	Land beyond that compensated for may be affected if mitigation measures not fully implemented. ***Construction hazards: animals*** Trench poses safety hazard for livestock. ***Fishing*** Potential reduction in fisheries yield or damage to fisheries habitats within 2km downstream of a river crossing.	**Community liaison meetings will be held** during and immediately following construction to identify any additional land that has been affected. **Livestock crossings** to be established at locations agreed with the community. **Stock proof fencing** to be erected in areas of danger for livestock. **Fisheries mitigation measures** including: verification of fisheries, fish characterisation, implementation of habitat restoration measures and compensation where	**Any additional damage to be compensated for** **Potential for accidents involving livestock.** Financial compensation will be given. The level of compensation will be facilitated by the Projects complaints procedure. **No significant impacts** if there is compensation for any reduction in yields, and if habitat restoration measures are implemented in full.

Social Impact Table 59 (Map 59C) (KP 1064.2 – 1076.2, end of pipeline route): North-East of Sagirlar Settlement to the End of the Pipeline Route, Adana Province

employee and a midwife. • ***Infrastructure:*** there is piped water, sourced from Tatarli, although power cuts affects the water supply. There is no alternative water source. Electricity is present, although there are frequent power cuts. There is no sewerage system, and the sewage accumulates in pits and is transported to larger pits, 8-10 new pits have been open for this purpose. • ***Settlement problems:*** unemployment	**Irrigation** Potential loss of flow from planned/ accidental disruption. Potential contamination of flow from spills or an increase in sedimentation. ***Hunting*** Temporary reduction in game due to disturbance during construction	necessary. The level of compensation will be facilitated by the Projects complaints procedure. Contractor will **consult** with authorities to determine maximum acceptable time for disruption. Project to **establish level of hunting** in settlements prior to construction. Where hunting is a source of subsistence (rather than recreation), appropriate mitigation measures and compensation needs to be agreed. The level of compensation will be facilitated by the Projects complaints procedure.	**If irrigation water is disrupted** longer than time considered acceptable by authorities, or if there is unexpected loss of flow, affected land-users will be compensated. Significance cannot be established at this time.

12 MARINE TERMINAL - ONSHORE IMPACTS AND MITIGATION

12.1 INTRODUCTION

12.1.1 Basis for the assessment

This section identifies the terrestrial impacts associated with the construction, commissioning and operation of the onshore BTC Marine Terminal (including tank farm and jetty facilities). It assesses their significance in light of mitigation measures incorporated into its design and management. Where appropriate, specific control measures are described in greater detail.

The potential impacts have been derived through scoping and consultation activities and also through applied professional judgement. Assessment criteria on which professional judgement is based are detailed in Section 3 of this report.

12.1.2 Scoping

Preliminary details concerning the existing environmental baseline were established during initial scoping activities undertaken between September 2000 and January 2001. This overview highlighted potential areas of concern and established the need for areas of further investigation. Potential areas of concern included the following ecologically important areas.

- Coast near Golovasi (approximately 1.5km west of the proposed jetty location). The globally threatened Loggerhead Turtle (*Caretta caretta*), classified by IUCN as endangered, is known to nest on this stretch of coastline.

- Yumurtalik Lagoons Nature Reserve (approximately 20km southwest of the proposed terminal location). This reserve represents the only known wintering area in the Mediterranean of the globally threatened Green Turtle (*Chelonia mydas*) classified by the IUCN. This site is also important for internationally important populations of breeding birds.

No other areas of significant environmental concern associated with the marine terminal were identified through this initial scoping exercise. However, during the consultation, commencing in August 2001, a number of additional perceived benefits and concerns were raised. These issues varied between stakeholders (from local residents to NGOs and local authorities), but generally included the following:

Perceived benefits of the BTC Marine Terminal:

- generation of employment;
- contribution to regional development;
- improvement of infrastructure;
- improvement of regional security services.

Perceived negative impacts of the BTC Marine Terminal:

- decreased access to fishing grounds;
- increased traffic congestion during construction;
- increased pollution;

- generation of health and safety issues;
- potential for future expansion onto adjacent agricultural land;
- potential for future in-migration leading to pressure on local resources and infrastructure and services.

12.1.3 Potential impacts

While the possible interactions between the proposed terminal and terrestrial receptors are numerous, mitigations inherent in the design, combined with the relatively low number of sensitive receptors means that the potential impacts associated with the development of the proposed marine terminal facilities are limited in scope. The potential impacts identified in scoping, consultation and the EIA process in general are summarised in Table 12.1.

Table 12.1 Potential Impacts

MAIN ACTIVITIES	POTENTIAL IMPACTS
Construction	
• Land clearance • Construction traffic • Construction activity • Alteration to drainage regime • Establishment and enforcement of Security Exclusion Zone and Manoeuvring Area	• Temporary and permanent habitat loss • Habitat disturbance • Impacts to traffic and transport • Noise and light impacts to humans • Noise and light impacts to ecology • Landscape and visual impacts • Impacts to surface and groundwater quality • Impacts to air quality from dust and vehicle emissions • Soil compaction • Impacts to cultural heritage through construction disturbance • In-migration • Impacts from construction workers • Safety risks to neighbouring settlements • Employment, sourcing of local goods and skills training • Secondary impacts to livelihoods due to decreased access to fishing grounds • Decreased suitability for tourism activities • Disruption to infrastructure and services
Operation	
• Physical presence of marine terminal facilities • Operation of terminal facilities • Vehicle movements associated with terminal operation • Flaring • Alteration to drainage regime • Ongoing enforcement of Security Exclusion Zone and Manoeuvring Area	• Displacement of flora and fauna • Impacts to traffic and transport • Noise and light impacts to humans • Noise and light impacts to ecology • Landscape and visual impacts • Impacts to water quality • Impacts to hydrology • Impacts to air quality from flaring • Impacts to cultural heritage • Employment, sourcing of local goods and skills training • Secondary impacts to livelihoods due to decreased access to fishing grounds • Potential risk to environmental and social resources from oil spill (addressed in Section 14)

12.1.4 Structure of this section

The remainder of this section is organised as follows:

- soils;
- landscape and visual;
- surface and ground waters;
- geological environment;
- air quality;
- noise;
- traffic and transport;
- cultural heritage;
- demographics and migration;
- resource ownership and use;
- employment, livelihoods and skills;
- infrastructure and services.

12.2 SOILS

12.2.1 Introduction

This section identifies the potential for impacts to soils as a result of the construction and operation of BTC Marine Terminal. Impacts to soils have been identified when an activity results in a change to the existing soil conditions. Potential impacts to soils broadly fall into the following categories:

- soil compaction;
- loss of soil resource;
- soil contamination and solid waste handling and disposal.

Secondary impacts, which result from changes in soil conditions, have also been identified (eg changes to local hydrology). The significance of impacts has been determined using a suite of impact significance criteria, which are set out in Section 3 of this report. Mitigation measures have been identified and are also presented in this section.

The generation, storage, handling and disposal of solid wastes can have implications to several environmental aspects other than soil but is dealt with in this section since the primary receptor to impact is usually land.

12.2.2 Construction impacts and mitigation

12.2.2.1 Storage tanks, general facilities and accommodation

The terminal will be constructed on prepared ground. The underlying geology comprises igneous basalt rock.

Terminal site preparation will involve site levelling, which will result in the disturbance and compaction of soils in the vicinity of the proposed facilities. A number of best practice soil management measures will be used to ensure that compaction impacts are minimised. These measures are described in the Reinstatement Plan (Appendix C2).

Soil compaction, as well as progressive changes in the areas of hardstanding as the various facilities are built, will result in localised changes to the local drainage regime. This will alter

runoff and infiltration patterns, but given the very low rainfall, secondary impacts are considered to be minor.

Impacts to soils during construction will be minimised by the mitigation measures listed below.

- Compaction will be minimised during soil stripping use of appropriate machinery.
- Top and subsoils will be stripped, stored and replaced separately and any parent material removed.
- Topsoil that is removed from locations that are to become hardstanding and/or covered by a permanent structure will be removed and stored for later use in landscaping of the site.
- Soil stockpile heights will be restricted to a maximum of 2m to prevent compaction under the weight of the soil.
- Measures to reduce the mobilisation of silt from soil stockpiles will be taken, such as covering stockpiles.
- Any compaction in the construction areas or in other areas that might affect agricultural restoration will be relieved (for example by subsoil ripping).
- The beach profile will be restored to its pre-construction status.
- Arrangements will be made for the aftercare of the construction area.
- Purpose designed drainage procedures will be used.

Other measures will include the avoidance, wherever practicable, of areas of sensitive soils for use as storage facilities etc.

12.2.2.2 Loading lines to the jetty

The loading lines from the tank farm to the BTC Jetty cross some small areas of agricultural land. The loading lines pass through areas of Class III and Class VII Soil Capability (described in Section 10). As these soil types are not especially sensitive in terms of their potential for agricultural development, and the impacts from the installation of the loading lines are localised, impacts are anticipated to be minor. Any standing crops present will be cut, baled and removed from the construction areas and up to 1m outside the construction area. Should the owner/occupier not require the crop, the material would then be disposed of in accordance with Turkish legislative requirements. The siting of construction areas will take into account the nature of any crop and proximity to orchards will be avoided.

Topsoil stripping and storage for the loading line corridor will be undertaken in line with best practice methods described in the Reinstatement Plan (Appendix C2).

The loading line trench will be backfilled with the previously excavated spoil, which has been stored for that purpose. This will most likely be done with the help of backhoes/dozers. After clearing and removal of all material and waste, the topsoil, which has been stockpiled separately, will be replaced over the working corridor.

The causeway footing will be constructed on rock therefore anticipated impacts to the beach sediments and the beach profile will be minor at most.

12.2.2.3 Managing spills

Spills of fuel and lubricant oils will be prevented by ensuring that all fuel storage areas are located in secure bunded areas. Wherever possible, fuel handling will also take place in secure bunded areas. Adequate supplies of skimmers, dispersants and absorbent material will be available at all fuel storage and handling areas to cope with terrestrial spills as part of the Pollution Prevention Plan. Similar conditions will apply to lubricant oils, chemicals and liquid wastes. Should a spillage occur, contaminated soils would either be cleaned up or removed for appropriate disposal in accordance with Turkish legislation and World Bank standards. Guidance for the cleanup of contaminated soils is included in the Environmental Management and Monitoring Plan (Appendix C1) and the Waste Management Plan (Appendix C3).

12.2.3 Operational impacts and mitigation

12.2.3.1 Storage tanks, general facilities and accommodation

During normal operation, long term changes in soil function will be caused by the presence of new areas of hardstanding and the operational activities associated with them. The tanks will be located on soils with non-sensitive soil capability classes (Class III and Class VII). Soil retained from the hardstanding and the construction of these areas will be used in landscaping (see the Reinstatement Plan - Appendix C2).

During operation, general wastes (that is all other non process unit derived waste) will be produced from the offices, battery rooms, fire stations/garage, workshops, as well as from general maintenance generating material such as scrap wood and metal. Inadequate disposal of such wastes has the potential to cause contamination to soils.

There are currently several options for the disposal of solid wastes. The scope for incineration of combustible wastes will be investigated during the construction phase. Wastes that cannot be incinerated will be disposed of off-site by a licensed waste contractor. Potentially hazardous materials (eg paints, batteries etc) will be disposed of by a specialist contractor to a licensed site. Landfill disposal could be in existing (third party) landfill facilities constructed along the pipeline route specifically for the waste for the construction project. Impacts due to potential contamination from solid waste will therefore be minor at most.

12.2.3.2 Loading lines

Once reinstatement of the loading lines has been completed, recovery of the affected area is expected to be rapid. Long term impacts to soils are anticipated to be minor.

Nevertheless, especially in slopes, particular attention will be paid to implementing measures for land drainage and erosion control. Land drainage and erosion control issues are addressed in detail in Appendix C2.

12.3 LANDSCAPE AND VISUAL

12.3.1 Introduction

This Section identifies the landscape and visual impacts associated with construction and operation of the BTC Marine Terminal.

The methodology and criteria for assessing and determining the potential landscape and visual impacts is set out in Section 3. A discussion of the landscape and visual impacts and their

significance is presented in Sections 12.3.2 and 12.3.3 respectively. Mitigation measures are also included as appropriate.

12.3.2 Magnitude of landscape impacts

Operational impacts to landscape will arise predominantly through a combination of landscape features lost during construction and from the introduction of the facilities associated with the proposed marine terminal (tank farm, accommodation etc). It should be noted, however that many of the components of the proposed marine terminal will not be alien to the landscape due to the presence of the existing marine terminal facility, which acts as an industrial backdrop from many key viewpoints (eg the settlement of Kurtkulagi).

Some elements of the proposed terminal facilities, notably the loading lines, have no operational landscape impacts as they are subterranean.

A summary of the impacts on landscape for the operational phase is presented in Table 12.2.

Table 12.2 Landscape Impacts and Evaluation of Significance

FACILITY	RECEPTOR	RECEPTOR SENSITIVITY	MAGNITUDE OF IMPACT	SIGNIFICANCE (RESIDUAL IMPACT)
Tank farm	Elevated scrubland	Low	Moderate	Minor
Tank farm	Pine woodland – one tank would lead to the loss of some trees, which are in the possession of BOTAŞ	Moderate	Moderate	Moderate
General facilities and accommodation	Low lying scrubland	Low	Moderate	Minor
Jetty	Foreshore and beach area	Moderate	Moderate	Moderate

Landscaping, bunding and planting for areas of the site will mitigate impacts to some extent but will not address the jetty affect on the coastal landscape. It will, however, offset the moderate impacts resulting from the loss of some pine woodland, which is in the possession of BOTAŞ.

12.3.3 Visual impacts

12.3.1.1 Construction impacts

The impacts during construction are similar in nature to those identified during operation (see Section 12.3.1.2). The main receptors include local residents, BOTAŞ personnel, potential tourists, users of the main coastal roads and fishermen.

Some receptors are likely to be more susceptible than others during the construction phase, in particular, people that live along the sides of the access roads to the site and residents with a view of the site who will be subject to visual disturbance. Some areas in close proximity to the existing facilities may be screened by the existing facilities. Furthermore, construction impacts are temporary and thus potentially less severe.

Impacts during construction will be primarily mitigated through the limitation of the construction area to the minimum required for construction purposes in response to identified local sensitivities.

12.3.1.2 Operational impacts

Receptors that may be disturbed during operation include:

- local residents at settlements with both short-distance views (eg, Sahil Sitesi) and those with longer distance views (Kurtkulagi, Hamzali, Golovasi);
- BOTAŞ personnel at the existing facilities (both those living/working at the terminal and those using the leisure facilities which BOTAŞ operates for its nationwide staff);
- potential tourists and holiday home owners (eg Sahil Sitesi, Incirli, Golovasi and the BOTAŞ tourist facilities);
- users of the main coastal roads to Yumurtalik etc;
- fishermen.

Various receptors are likely to be more susceptible than others, depending on the visual aspect and scale of visual intrusion. Even in a given settlement, some households may have unobstructed views of the new facilities while others may have no view at all. Furthermore, some areas in close proximity to the existing facilities (eg the settlement of Karatepe) will effectively have no views of the new facilities due to screening by the existing tank farm (see Plate 12.1).

Views of the terminal will be partially screened by mitigation planting and the growth of existing intervening vegetation. In addition the removal of matured trees will be minimised.

Plate 12.1 Existing BOTAŞ Tank Farm and Karatepe Settlement

12.3.1.3 Zone of Visual Influence

The Zone of Visual Influence (ZVI) for the proposed marine terminal site at Ceyhan identifies the extent to which the facilities will be visible to surrounding receptors (see Figure 12.1).

The ZVI extends away from the coast and inland, although the landward spread is limited by the hilly landscape west of both Kurtkulagi and Hamzali.

Many of the surrounding settlements will be within viewing distance of the new tank farm, accommodation block, general facility area and jetty. These settlements include much of Kurtkulagi, the southern and eastern borders of Hamzali, the southern outskirts of Golovasi and the northern borders of Incirli. The southern outskirts of Karatepe settlement may be within view of the proposed facilities, although much of this will be screened by the existing tank farm. However, the ZVI for the proposed terminal lies within the footprint of the visual influence of the existing BOTAŞ site and therefore these settlements will already experience views of the area.

The existing Incirli and BOTAŞ beach tourist facilities are located within an existing industrial context, with tourism continuing regardless. As a result, the development of the marine terminal is not expected to impact tourism in these two sites. Sahil Sitesi is characterised by a sense of peacefulness, seclusion and natural beauty, in spite of the view of the jetty, less than 3km away, which attracts the high number of secondary homeowners (approximately 150) and other tourists. In terms of visual impacts, this is the only settlement that is likely to experience major visual intrusion from the marine terminal development. The potential impacts to tourism are discussed in Section 12.10.3.

During operation of the new terminal, the Enclosed Ground Flare (EGF) will be visible from parts of Sahil Sitesi. It is predicted that the visual impact to the receptors identified will be minor (see Figure 12.1).

Various different visual receptors will be affected by the longer term existence and operation of the onshore facilities (including jetty and EGF). The overall significance of visual impacts is summarised in Table 12.3.

Table 12.3 Visual Impacts and Evaluation of Significance – Operation

RECEPTOR	RECEPTOR SENSITIVITY	MAGNITUDE OF IMPACT	MITIGATING FEATURES	SIGNIFICANCE (RESIDUAL IMPACT)
Workers at existing BOTAŞ facilities	Low	Moderate	Existing industrial context	Minor
Recreational users at existing BOTAŞ facilities	Moderate	Moderate	Existing industrial context	Moderate
Residents at Golovasi	High	Low	Screening by terrain and vegetation	Moderate
Residents at Hamzali	High	Low	Screening by terrain and vegetation and backdrop of existing facilities	Moderate
Residents at Kurtkulagi	High	Low	Backdrop of existing facilities	Moderate
Residents at Incirli	High	Low	Backdrop of existing facilities	Moderate
Residents at Karatepe	High	Low	Screened by existing facilities	Moderate

RECEPTOR	RECEPTOR SENSITIVITY	MAGNITUDE OF IMPACT	MITIGATING FEATURES	SIGNIFICANCE (RESIDUAL IMPACT)
Residents at Sahil Sitesi	High	High	Screening by terrain and vegetation (main facilities). Backdrop of existing facilities (jetty)	Major
Road users	Low	Moderate	Transient view	Minor
Fishermen	Low	Moderate	Transient view and backdrop of existing facilities	Minor

Indicative photomontages of the BTC Marine Terminal from three different view points are presented in Plate 12.2 – Plate 2.4.

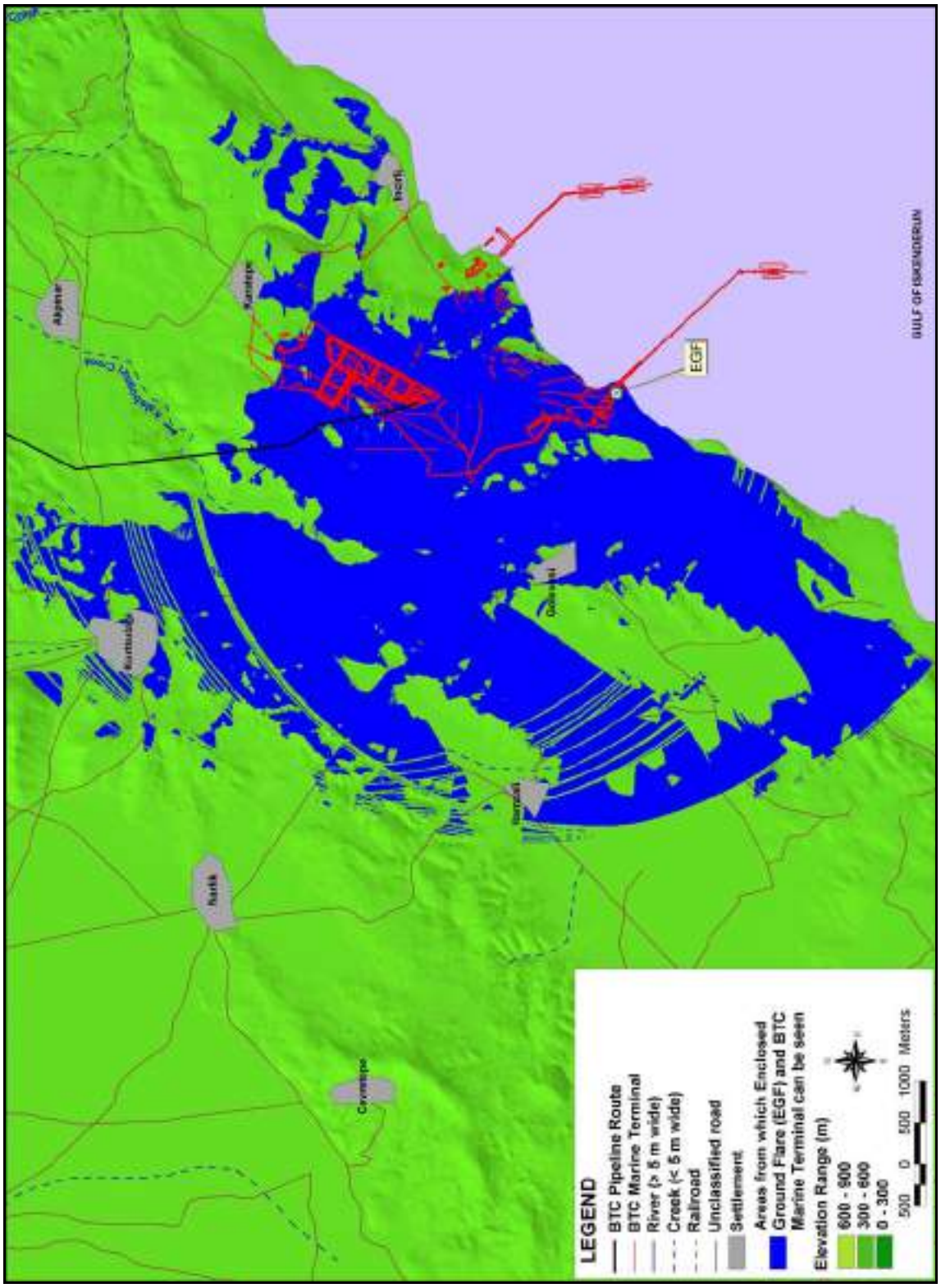


Figure 12.1 Zone of Visual Influence of BTC Marine Terminal and EGF

Plate 12.2 General View of the BTC Marine Terminal from Sahil Sitesi (Observation Point 1)

Plate 12.3 General View of the BTC Marine Terminal from Golovasi (Observation Point 2)

Plate 12.4 General View of the BTC Marine Terminal from Sahil Sitesi (Observation Point 3)

12.3.4 Mitigation

The mitigation strategy that will be employed to limit the extent of landscape and visual impact of the terminal will need to accommodate the varying characteristics of its component elements and the nature of the impacts associated with each.

The new tank farm will be particularly visible, especially at viewpoints to the north and west. Any opportunities to screen these structures risks accentuating their prominence by drawing attention to them. As skyline features, opportunities to provide comprehensive screening will be limited. Mitigation measures will focus instead on de-emphasising their apparent bulk. For example, sparse tree cover on the slopes below the existing tanks to the north and west helps to disrupt views of them. In the same way, clumped naturalistic tree planting will be introduced on the slopes at the base of the new tanks to the same effect. Any opportunities to employ landform screening (eg bunds) will be taken, so long as it can be integrated with existing landform features. This will ensure that any recognisable features at ground level, such as huts or vehicles, which might otherwise confirm the scale of these structures, are obscured. Planting schemes will utilise native species present on site in associations and densities similar to those of existing stands. This will ensure that the planting scheme blends harmoniously with the existing landscape and provides continuity of habitat. Furthermore, secondary ecological impacts associated with the introduction of alien species are thus avoided.

It is proposed that a mixture of shrubs and trees be planted at a spacing of approximately 1.5m for shrubs (eg hibiscus, oleander, myrtle) and 3.0m for trees (eg pine, olive or citrus). Trees and shrubs will be planted in irregular lines to provide a natural appearance in keeping with the surrounding landscape.

From the south, the new tanks will present a shortened profile. In addition, plantation woodland on intervening slopes helps to visually tie the tanks into the landscape. Some extension of this woodland may be needed to extend this effect so that it accommodates the new tanks. Other mitigation of the tank farm will concern the alignment and finish of the tanks. If feasible the tanks should be aligned to reduce the distance between them so that they appear as far as possible as a unified structure rather than (as it is) several different structures. In addition, the tanks' surfaces will be finished to emulate both the greys of the native soil and the colour of the existing tanks, again to help tie them visually into the landscape.

The other land-based facilities (housing compound and office compound), being much smaller, will employ more traditional mitigation, particularly using tree and shrub planting both at perimeter and, more importantly, within the compound. This will create a more pleasant environment for their users as well as landscape mitigation for the sites as a whole. Planting schemes will be devised to reflect existing planting in the locality and will avoid linear tree screens.

The new jetty presents limited opportunities for visual mitigation. Its structural appearance will be governed by practical needs although low-bulk designs, where feasible, would be favoured. Principal visual impacts from this structure will affect the residents and other occupants at the site-facing edge of Golovasi and Sahil Sitesi. If pertinent and appropriate, off-site screening will be provided at affected properties.

12.4 SURFACE AND GROUND WATERS

12.4.1 Introduction

This section identifies the potential for impacts to surface and groundwater resources as a result of construction, commissioning and operation of BTC Marine Terminal. Impacts to water resources have been identified when an activity is predicted to result in a change to the baseline situation. The significance of the impacts has been determined using the impact significance criteria set out in Section 3 of this report. The significance of any potential impact on surface water quality will ultimately depend on the use of the resource (eg for fishing, bathing, drinking supply) or its importance to ecology or amenity and the magnitude of the change caused by the project. The significance criteria are largely based on World Bank and Turkish standards (see Appendix D) for each category of impact. Where no standards are available, professional judgement has been used.

Mitigation measures have been identified and details are presented in this section.

12.4.2 Construction and commissioning impacts

12.4.2.1 Scope of impact

The BTC Marine Terminal is located on basalt rock. An unconfined aquifer is located approximately 1.4km to the south. Surface water features comprise ephemeral watercourses appearing only during periods of high rainfall. The principal impacts of construction and commissioning relate to groundwater and marine receiving waters. The potential for impacts to surface waters is low.

Impacts to groundwater may arise from changes in infiltration and runoff patterns due to compaction or increased hardstanding during construction. In addition, potentially contaminated drainage streams may pollute groundwater if not properly treated and disposed of. Construction mitigation measures described in Section 12.4.2.2 have been designed to minimise impacts to surface and groundwater resources. As a result, impacts are predicted to be minor at the most.

Releases to the marine environment are confined to the possible discharge of loading line hydrotest solution during commissioning. As these impacts relate to the marine environment, this is discussed in Section 13.

12.4.2.2 Mitigation

All necessary precautions to prevent the pollution of inland surface and groundwater resources will be taken. In order to achieve this, specific method statements/procedures for the control of relevant construction activities will be developed by the Contractor, and approved by BOTAŞ, the Ministry of Environment and the Department of State Hydraulic Works as appropriate.

Key environmental requirements include the following:

- measures for the control of refuelling and vehicle washing activities;
- measures for the control of vehicle movement in the vicinity of irrigation channels, field drains and ephemeral watercourses;
- measures for the control of runoff from the construction area and other areas;
- measures for the safe disposal of waste waters and other liquid effluents;

- measures for emergency response in the event of a pollution incident.

The above measures are addressed in detail in the Environmental Management and Monitoring Plan (EMMP) (Appendix C1), together with the Waste Management Plan (WMP), Pollution Prevention Plan (PPP), and Traffic Management Plan (TMP) (Appendices C3, C4 and C5). These management plans represent the technical basis for the development and maintenance of key environmental management systems and procedures during the implementation of the scheme and will evolve and adapt as the implementation of the BTC Marine Terminal progresses.

The measures for the safe storage and handling of all fuels, lubricant oils, chemicals and liquid wastes will also apply to the protection of groundwater resources.

During loading and line construction, every precaution will be taken to prevent silting, erosion and pollution of ephemeral watercourses, irrigation channels and drainage ditches. If, notwithstanding the following precautions, such as silting, erosion or pollution does take place during the construction phase, emergency procedures in accordance with the PPP will be put in place and immediate action taken to minimise the effect on the watercourse and to prevent any reoccurrence of the event.

All construction wastewaters arising (eg run-off from potentially contaminated areas, from vehicle wash areas, canteens, sanitary facilities) will be treated to the standards described in Appendix D. Approvals for any discharge from the sites will be obtained from the Authorities. Provisions, such as pre-discharge monitoring, settlement lagoons, grass plots or sediment filter systems will be used to ensure that pollution does not occur. Since final discharge locations have not yet been identified, further investigations will be carried out to assess the most appropriate option or options for treated discharges, including reuse for irrigating land on the BOTAŞ site and discharge to soakaway.

12.4.3 Operational impacts and mitigation

12.4.3.1 Surface water

Aqueous discharge from the operational marine terminal are summarised in Table 12.4. These apply to normal operations; ie they do not include storm events when run-off volume flows will clearly increase and be highly variable.

Table 12.4 Approximate Operational Discharges from the BTC Marine Terminal

Discharges	Primary holding pond	Treated wastewater	Irrigation and/or soakaway	24 m^3 per day
	General facilities	Treated wastewater	Irrigation and/or soakaway	24 m^3 per day
	Housing compound	Treated wastewater	Irrigation and/or soakaway	38 m^3 per day
	Jetty	Treated wastewater	Irrigation and/or soakaway	1.5 m^3 per day
	Guardhouse	Treated wastewater	Irrigation and/or soakaway	1.5 m^3 per day
	Tank farm	Treated wastewater	Irrigation and/or soakaway	2 m^3 per day

A central wastewater treatment plant will be provided to process all wastewater from the terminal facilities as described in Section 9. The wastewater treatment plant will comprise a primary holding pond, biological wastewater treatment plant and storm water pond. Following treatment, effluent that meets the standards required by Turkish legislation and the World Bank (see Appendix D) will be discharged at a controlled flow rate to the environment.

Drainage from contaminated areas (vehicle washing, machinery etc) will be connected to the oily water system. This will gather potentially contaminated water streams that will be then routed via an oil separation unit to the primary withholding pond and then to the stormwater pond. Oily water sources at the marine terminal will include the following:

- storage tank bunds (tank roof runoff, tank drain, storm water in the bund area etc);
- process area bunds at the receiving station and the relief tank bund;
- fiscal metering station bund.

All marine terminal waste streams will therefore discharge to the environment via the stormwater pond, at a controlled flow rate. At present the preferred option is to use the treated wastewater for irrigation on the terminal site. The water will be treated to a quality that allows this. However, should this prove infeasible then discharge will be to soakaway (see below). There will be no discharge to surface waters and therefore no impact to them.

12.4.3.2 Groundwater

The presence of the proposed BTC terminal facilities will result in an increase in hardstanding. This will result in greater runoff from the hardstanding to the surrounding areas altering the drainage regime locally. In addition, the tanks will be bunded with an impermeable bentonite clay, also resulting in similar impacts to those described above. These alterations to local hydrology could cause impacts to groundwater, however as there are no significant groundwater resources at the site, predicted impacts to groundwater are minor at most.

Operational discharges have the potential to cause impacts to groundwater quality. There are two options for the disposal of treated wastewater as follows:

- irrigation of orchards on the terminal site;
- soakaway.

The preferred disposal option is the re-use of treated wastewater as irrigation water, however provision is also being made for soak away. The discharge location would be situated approximately 1.5km from the unconfined aquifer to the west and south west and approximately 500m from the nearest on-site accommodation.

The feasibility of discharge to soakaway at the terminal site is still to be examined. Ensuring the discharge has no more than a minor impact to water resources will require a two-phased investigation:

- In the first instance the capacity of the ground to physically accommodate the water flows will be investigated. Trial pits will be excavated and percolation tests will be undertaken of the surface strata at the site to establish their characteristics (porous versus fissured) in terms of capacity to accommodate the waste flows.

- Secondly, simple dispersion modelling (using analytical solutions similar to those recommended for the RBCA of contaminated sites) and risk assessment will be undertaken to establish potential impacts to the nearest groundwater resource. This

may feed back into further ground investigations, in the event for example that a decision to opt for fissured flow then raises an unacceptable level of risk.

In the event that the discharge is to either soakaway or irrigation, impacts to groundwater will be minor on the basis that (a) the wastewater is treated to the standards required by Turkish legislation and World Bank (described in Appendix D) and (b) there is no valuable groundwater resource put at risk.

12.4.4 Abstraction of water

Means of supplying the construction camp and operational terminal are being investigated since current supplies used in the BOTAŞ Marine Terminal will need to be supplemented. A one-off large volume supply of water (approximately 150,000m^3) will also be required to test the tanks. The tanks will be tested in series, reducing the volumetric requirement.

The main option under investigation is abstraction of groundwater from a location 15km east of the terminal, near to Burnaz Springs. Pumping tests and sampling will be undertaken to establish:

- whether the water is of acceptable quality;
- whether the water can be sustainably abstracted at the rate required without impacts to other users.

On the basis that feasibility is established according to the above criteria then approval from DSI will be required.

The loading lines will be tested using seawater; resource use impacts for this operation will therefore be minor.

12.5 BIOLOGICAL ENVIRONMENT

12.5.1 Introduction

This section identifies potential impacts to the biological environment as a result of construction and operation of the proposed BTC Marine Terminal. Impacts to ecology have been identified when an activity is predicted to result in a change to the baseline situation. The significance of an impact has been determined using the impact significance criteria set out in Section 3 of this report. The significance of any potential impact on ecology will ultimately depend on the status of the habitat or species and the predicted change as a result of an activity. The scale of an impact is generally subjective and often difficult to quantify. Mitigation measures have been identified and details are presented in this section.

Impacts to coastal and marine habitats and species are dealt with in Section 13.6.

12.5.2 Construction impacts and mitigation

The construction of the BTC terminal facilities will result in disturbance to the following areas of habitat, which are in the possession of BOTAŞ:

- approximately 32ha of maquis scrubland associated with the construction of the tank farm;
- approximately 0.6ha of maquis scrubland associated with the construction of the loading lines;

- approximately 2.4ha of agricultural land associated with the construction of the loading lines;
- approximately 3.0ha of woodland associated with the construction of the loading lines;
- approximately 1.2ha of gardens and orchards associated with the construction of the loading lines.

Only the landtake associated with the tank farm will be permanent, long term impacts associated with habitat loss are discussed in the Section 12.5.3. Once the loading lines have been installed, the habitats will be reinstated, thus disturbance impacts will be short term in nature.

Approximately 83% of the disturbed area is associated with Anatolian maquis scrubland, whose faunal assemblage includes eight Turkish Red Data Book species (see Section 10.7.2). Although these species have not been assigned categories by the IUCN, they have been identified as meeting the criteria for the IUCN 2000 Red List and as such could be assigned categories in the future (Yusuf Gemici, *pers. comm.*). Pre-construction botanical surveys will be undertaken and if species of conservation value are found, strategies to minimise their loss or disturbance will be developed. This will include, as appropriate:

- transplanting;
- fencing off;
- avoiding use of such areas for construction laydown, temporary soil storage etc.

Impacts to maquis habitat within the overall BOTAŞ boundary are predicted to be moderate, however given that maquis is a widespread habitat in the wider area, overall impacts are considered to be locally minor. Some pine trees may be lost due to the positioning of one of the tanks. This is not ecologically significant and has been addressed above in a landscape value context.

Bird surveys carried out during spring/summer 2001 and Autumn 2001 identified a number of internationally and nationally protected bird species at or near the site. The birds observed are known not to be breeding in the area. The majority of the birds observed were raptors and were observed to be wide ranging, feeding both in the Study Area and on the surrounding agricultural land. Several dove species probably range between the terminal site and surrounding woodland. Disturbance to birds is unlikely to cause significant effects due to the fact that the birds are not breeding in the area and are observed to be wide ranging and highly mobile. Impacts to birds during construction are therefore predicted to be minor.

Reptile surveys were also carried out at the terminal site; these identified a number of internationally and nationally important species. Disturbance to these species will depend on the relative mobility of the species. As the mobility of some reptile species is limited, impacts are likely to range between minor and moderate, but are not considered significant in the long term (ie once the tank farm and loading lines have been installed).

Mammals of note were recorded during the Phase II habitat survey. As well as large numbers of small rodents, the Brown Hare (*Lepus capensis*) and bats were also observed. The scope for impacts to mammals is low due to the following:

- the habitats with which these species are associated (maquis and woodland) are widespread in the wider area;
- these species are relatively mobile and wide ranging.

Since a number of protected bat species are present in Turkey, specialist pre-construction surveys will be undertaken to ensure that bat roosts, if present on the site can be either protected or removed without harm to the bats themselves (see also Annex A of the Environmental Management and Monitoring Plan in Appendix C1).

The goitred gazelle (*Gazella subgutturosa*) has recently been reintroduced at the existing BOTAŞ terminal site. As this species is confined in pens on the existing BOTAŞ facilities in an area that will not be required for temporary construction, no impacts are anticipated.

As well as traversing maquis habitat, the loading lines will also traverse agricultural land, woodland and gardens/orchards as mentioned above. It should be noted that the site avoids the more sensitive and valuable dune habitants between the proposed and existing jetty alignments. The EIA scoping exercise did not identify the need for detailed ecological surveys of the loading line route to be undertaken. However, bird and reptile species are known to be similar to those identified during the tank farm surveys, as the species are wide ranging and have been observed to use a range of habitats in the area. The key potential impacts are disturbance or loss of rare or otherwise noteworthy species during trenching activities.

Pre-installation surveys by appropriate specialists will be carried out prior to trenching, and any sensitive species noted. Where appropriate, mitigating measures will be taken, including the following:

- working areas (eg loading line laydown areas etc) will be sited to avoid ecological sensitivities;
- reinstatement and/or transplantation plans will be developed for any notable species identified in the loading line working width;
- any seasonal sensitivities (eg breeding birds) will be noted, and works scheduled appropriately;
- waste will be disposed of according to guidance outlined in the Waste Management Plan (Appendix C3);
- dust will be controlled using dust suppression methods outlined in the Pollution Prevention Plan (Appendix C4);
- mitigation measures outlined in the Pollution Prevention Plan will be adopted to minimise impacts to aquatic habitats.

By carrying out the surveys and applying the mitigation measures outlined above, impacts are anticipated to be minor to moderate.

12.5.3 Operational impacts and mitigation

Operation of the BTC Marine Terminal will result in long term habitat loss wherever there are permanent structures and hardstanding surfaces and the generation of operational noise and light, which have the potential to cause impacts to terrestrial ecology.

Approximately 32ha of maquis scrubland will be permanently lost as a result of the presence of the tank farm. This habitat is widely distributed in the vicinity of the proposed terminal and impacts to faunal communities are predicted to be minor. The bird, reptile and mammal species observed during ecological surveys of the site already co-exist with the existing BOTAŞ terminal facility. The pre-existing conditions greatly reduce the scope for impact.

Observations at the existing facilities show that the terrestrial ecology of the site is not significantly adversely impacted by terminal operations. For example, birds and bats, which may be considered sensitive to disturbance, are numerous and frequently observed. Clearly these species must be fairly acclimatised to the levels of existing human activity, movement noise and night lighting. Impacts are therefore anticipated to be minor during operation.

No permanent habitat loss is associated with the loading lines as the trenches will be reinstated following installation. Best practice reinstatement methods will be followed (Appendix C2).

Some planting is planned for landscaping purposes. This will utilise only species that are native to the area and, based on observations of existing conditions, are thriving in the local climatic and soil conditions.

The long term impacts are considered to be minor.

12.6 AIR QUALITY

12.6.1 Introduction

This section identifies the potential impacts to air quality as a result of construction and operation of the BTC Marine Terminal. Impacts to air quality fall into two categories, fugitive emissions and point source emissions. An impact has been identified when an activity is predicted to result in a change to the baseline situation. The significance of an impact has been determined using the impact significance criteria set out in Section 3 of this report. The significance criteria are largely based on World Bank and Turkish standards, however EU standards and World Health organisation standards have also been referred to for each category of impact. Where no standards are available, professional judgement has been used.

Mitigation measures have been identified and details are presented in this section.

12.6.2 Construction impacts

12.6.2.1 Dust emissions

Dust generated during construction can be significant locally. The following activities have the potential to result in the generation of dust during construction:

- earthmoving operations on site (excavation and removal of surface soils);
- earthworks engineering;
- site stripping;
- wind blow;
- movements of vehicles and trucks for the import of construction materials, for the export of excavated soil, for the transport of the workers and the delivery of site equipment.

Dust impacts, even without mitigation, would not be experienced at the nearest community, which is in excess of 500m from the site boundary. Some agricultural landuses in closer proximity could potentially be exposed to minor or moderate short term impacts depending how close they are to working areas. Standard dust mitigation measures (outlined below and described in the EMMP) will be employed when working within 250m of sensitive land uses, subject to soil moisture and weather conditions.

12.6.2.2 Other emissions

The movements of vehicles will also result in the emission of airborne pollutants, from their exhausts. The quantity of such emissions will depend on the number of the vehicles concerned, vehicle type, their state of maintenance and the volume of traffic. The main pollutants of concern from road traffic are PM_x and NO_x. EC Air quality standards for these pollutants can be exceeded when traffic flows are in the order of those experienced during an urban rush hour. Traffic to and from the marine terminal will be a small fraction of such levels and impacts to air quality will therefore be minor.

12.6.2.3 Mitigation measures during construction

A series of measures will be used as required to control dust and other emissions to air including, but not be limited to, the following:

- measures for the storage and handling of spoil, sub-soils and top-soils;
- measures for the control of vehicle movements on site;
- measures for the control of site operations (including trash burning);
- measures for the avoidance of nuisance from exhaust emissions.

These are described in more detail in the EMMP and PPP.

12.6.3 Operational impacts

12.6.3.1 Introduction

Operational emissions to atmosphere are important both in the context of:

- the impacts and mitigation for the BTC Marine Terminal itself;
- the impacts it will have in combination with other existing and planned industries on the northern coast of the Gulf of Iskendurun.

The latter issues are also addressed in Section 16 (Cumulative Impacts). The complete operational air quality assessment and dispersion modelling results are presented in Appendix B2 and are summarised in the following sections.

The underlying approach to the air quality assessment was:

- to identify and quantify all emission sources, including existing ones, the BTC Marine Terminal and proposed future industry;
- to use atmospheric dispersion modelling to predict ground level concentrations of atmospheric pollutants of concern for all sources combined:
- to establish the BTC Marine Terminal contributions to ground level concentrations;
- to compare predicted concentrations with applicable air quality standards and evaluate the significance of the BTC Marine Terminal's impacts on air quality.

Mitigation measures are not addressed discretely, but where mitigation and design considerations have been made in an air quality context these are highlighted below.

12.6.3.2 Pollutant sources

The main pollutant sources considered in the assessment are summarised in Box 12.1.

Box 12.1 Summary of BTC Marine Terminal and Other Main Pollutant Sources

BTC Marine Terminal

- Storage emissions: will occur as fugitive releases from the seven external floating roof tanks. These were selected in favour of fixed roof tanks as having lower emissions but minor VOC releases will result comprising 25te per annum, approximately 12kg of which will be benzene.
- Tanker loading emissions: approximately 59,000te per annum VOCs will be generated during tanker loading and will be collected and piped to an enclosed ground flare (EGF) with a VOC combustion efficiency of approximately 99.5%. The EGF was selected as the optimum option in terms of local air quality impacts for the reasons explained in Section 2. Its operation will annually introduce approximately: 215te VOC; 295kg benzene; 36te No_x; 387te SO_2; and 152,450te CO_2.

Existing BOTAŞ Marine Terminal

- Tanker loading emissions: the existing terminal has no VOC emission controls and emits approximately 3,000te VOC, including 3te benzene, per annum, during loading operations at the end of the jetty.
- Storage emissions: these occur from the tank farms serving the Iraq and Kirikkale pipelines at an approximate rate of 74te per annum, including 115kg benzene.

Existing Industry

- The Toros Gubre Fertiliser Facility (5km to the northeast) emits approximately 643te NO_x per annum.

Proposed Industry

- The Sugozu coal-fired Power Plant, due to commence operation in 2003, will emit approximately 10,600te NO_x and 6,500te SO_2 per annum.

Other Sources

- Other sources include local road traffic and shipping. These cannot be reliably quantified and were not included in the assessment, but can be regarded as having minor influences in comparison with the major industrial sources.

12.6.3.3 Assessment methodology

VOC fugitive emission rates from the storage tanks were characterised using the Tanks-4 emission software developed by the US Environmental Protection Agency (USEPA). Emissions from the flare were estimated using mass balance and engineering calculations. Emissions from the other sources (existing BOTAŞ Jetty, Toros Gubre Fertiliser Facility and Sugozu Power Plant) were estimated using USEPA emission factors.

Ground level pollutant concentrations were predicted using the USEPA's ISCST3 air quality dispersion model, with meteorological input data from the nearby Yumurtalik meteorological stations.

Full details of the approach are given in Appendix B2, along with the results. The scenarios modelled are summarised in Box 12.2.

Box 12.2 Pollutants and Emission Scenarios Modelled

- Annual Average VOC concentrations due to combined emissions;
- Percent concentration of BTC emissions to annual average VOC concentrations;
- Predicted 95th percentile VOC concentrations due to combined emissions;
- Contribution of BTC emissions to 99th percentile VOC emissions;
- Predicted annual average benzene concentrations due to combined emissions;
- Predicted annual average NO_x concentrations due to combined emissions;
- Predicted 95th percentile NO_x concentrations due to combined emissions;
- Predicted 99th percentile NO_x concentrations due to combined emissions;
- Contribution of BTC emissions to 99th percentile NO_x concentrations;
- Predicted annual average SO_2 concentrations due to combined emissions;
- Predicted 95th percentile SO_2 concentrations due to combined emissions;
- Predicted 99th percentile SO_2 concentrations due to combined emissions

Of the scenarios identified in Box 12.2, the results of the predicted annual average NO_x and SO_2 concentrations due to combined emissions are presented as Figure 12.2 and Figure 12.3 respectively. Graphic outputs of the other scenarios modelled are presented in Appendix B2.

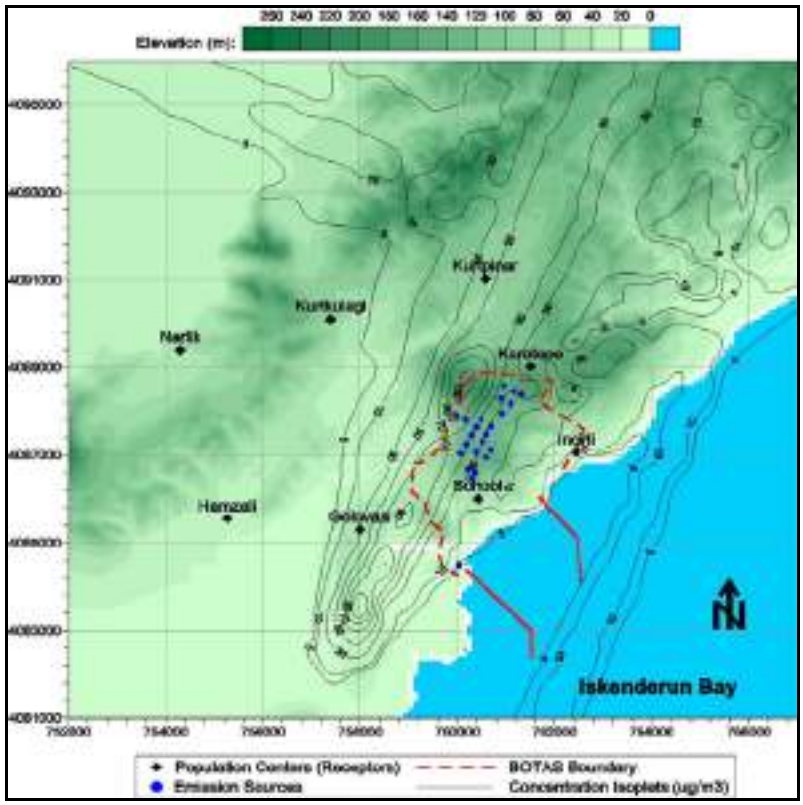


Figure 12.2 Predicted Annual Average NO_x Concentrations Due to Combined Emissions

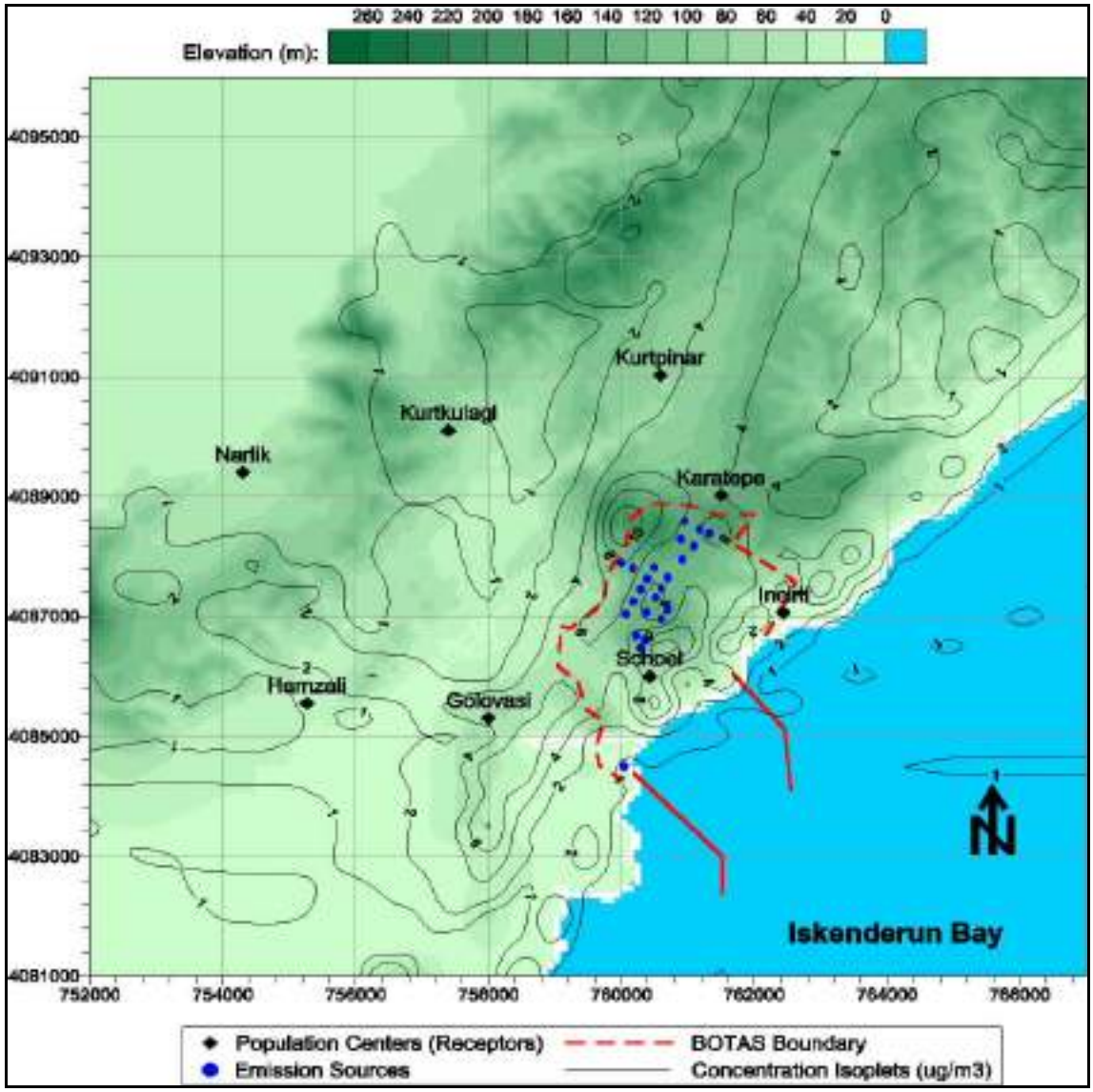


Figure 12.3 Predicted Annual Average SO_2 Concentrations Due to Combined Emissions

12.6.3.4 Summary and evaluations of air quality impacts

The findings of the air quality modelling study can be summarized as follows:

- The proposed BTC emissions will constitute approximately 7% of the total VOC emissions in the project area. The existing BOTAŞ crude oil loading facility is the largest VOC emitter comprising 88% of the total emissions.

- There are occasional existing short-term (hourly) VOC-related air pollution episodes due to the existing BOTAŞ facilities. Turkish hourly and 95th percentile VOC standards are exceeded during certain meteorological events (eg low wind speed and stable atmospheric conditions) in a strip of land west of the BOTAŞ facilities and on the BOTAŞ facility shoreline. The main cause of these exceedances is the existing BOTAŞ crude oil loading (jetty) operations which have uncontrolled emissions released under poor dispersion conditions (ie low release elevation).

- The contribution of the BTC emissions to the short-term VOC atmospheric pollution episodes will be minimal, if not zero. The contribution of the BTC Marine Terminal to hourly maximum concentrations will be less than 1μg/m^3. During the predicted episodes, most of the BTC sources will be located downwind from the areas experiencing the air pollution, and therefore, will not have any influence on them.

- The predicted annual average benzene concentrations are at safe levels, which are approximately three orders of magnitude lower than the EU standard and the WHO guideline.

- The proposed BTC emissions will constitute 0.5% of the total NO_x emissions in the project area. The Sugozu Power Plant, which is currently under construction, will be the largest NO_x emitter (93.8%) in the project area.

- The predicted annual and 95th percentile NO_x concentrations are in compliance with the ambient air quality standards. However, EU hourly standards are exceeded occasionally on the hills immediately north of the existing BOTAŞ facility due to the existing industries. The contribution of the BTC emission to these hourly pollution episodes will be less than 0.5μg/m^3.

- The proposed BTC emissions will constitute 10% of the total SO_2 emissions in the project area. The predicted annual and short-term SO_2 concentrations are in compliance with the ambient air quality standards.

Based on the findings of the air quality modelling study, it can be stated that the impacts of the proposed BTC complex on the local air quality will be minor, localised and within established national and international standards/guidelines. Cumulative impacts and impact interactions are discussed in Section 16.

12.7 NOISE

12.7.1 Introduction

The construction and operation of the proposed onshore facilities will generate noise levels that could potentially impact nearby noise sensitive receivers. This section assesses the potential for such impacts by considering the proximity and nature of the surrounding land uses and the likely levels of noise emitted during construction and operation of the onshore facilities. The significance of any impact has been assessed using the significance criteria outlined in Section 3.

Mitigation measures have also been identified and are presented in the following sections.

12.7.2 Construction impacts and mitigation

12.7.2.1 Sources of noise

Construction of the BTC Marine Terminal will encompass a variety of activities that will potentially generate noise as follows:

- General civil works involved in constructing the tanks, general facilities and accommodation blocks will include the requirement for earth moving machinery, diesel generators, air compressors etc. In addition, blasting and piling may be required.

- Trenching and laying the loading line will involve specialist heavy equipment, including side boom cranes, as well as generators for welding equipment.

All construction activities will have associated noise from traffic relating to the delivery of materials and workforce.

12.7.2.2 Mitigation

The mitigation measures described in the following sections will be employed during construction in the vicinity of noise-sensitive receptors, eg residential dwellings to ensure that adverse noise impacts are avoided.

Hours of Work

Construction working hours will be agreed with the relevant authorities and BOTAŞ prior to mobilisation, with a view to minimising the disturbance to local residents, both in the existing BOTAŞ facilities and offsite, where impacts might be experienced.

Limited construction activities may have to continue on a 24-hour basis. Approval of the relevant authorities and BOTAŞ will be obtained prior to commencement of any night-time works. Night-time working will be kept to a minimum and will be discussed and agreed in advance with BOTAŞ and the relevant authorities, including Muhtars as part of the Community Relations Strategy, discussed in Section 12.10.2.

Construction Plant

- Noise levels expected from the agreed method of working and chosen plant and equipment will be identified and specific measures appropriate to the selected plant will be implemented to minimise the impact of noise.

- All plant will be adequately maintained to minimise noise emissions and only inherently quiet plant will be selected for use on site. Where plant has been designed to operate with engine covers to reduce noise, these will be used and remain closed at all times whilst the plant is in operation. All items of plant operating on the site in intermittent use will be shut down in the intervening periods between uses. Routine checks will be undertaken to identify equipment that is emitting unacceptably high noise levels or particular tonal characteristics, which, through appropriate repair or general servicing, could be reduced. All equipment on site will be properly maintained to prevent unnecessary noise emissions.

- For types of plant and equipment whose noise emissions are governed by the Turkish Regulation on Noise Control or World Bank standards, only plants bearing an appropriate conformity mark will be brought to and used on the site.

- Any item of plant or equipment found to be emitting excessive noise levels due to a faulty silencer, broken or ill-fitting engine covers or other reasons, will immediately be taken out of service for repair or replacement as required to ensure it operates within its designed noise envelope.

- Noisy plants will be located as far from inhabited buildings as possible. Advantage will be taken of natural screening (eg trees etc) where practical to further attenuate noise. Where practical, the stockpiling of site materials, soil or spoil will be located where it can provide some additional screening provided that any plant associated

with this does not in itself generate nuisance. Noise barriers will additionally be used where significant noise impacts are anticipated. Plants known to emit directional noise will be orientated so that the noise is directed away from sensitive receptors.

- Site personnel will be trained in the proper use and maintenance of tools and equipment, and the positioning of machinery on site to reduce noise emissions to neighbouring settlements.

Piling and Blasting

- Piling activities will be subject to rigid safety, noise and vibration control procedures including procedures to ensure adequate warning is given to anyone who may potentially be affected.

- Blasting activities (if any are required at the BTC Marine Terminal site) will be subject to rigid safety and noise and vibration control procedures including procedures to ensure adequate warning is given to anyone who may potentially be affected.

It is considered that the above measures provide adequate protection from noise and vibration, as piling and blasting activities will only take place during the daytime.

Noise limits from the Turkish Noise Control Regulations (NCR) for noise levels to be achieved at receptors during construction are presented in Appendix D. The distances at which the noise criteria are met for each category of construction activity is also provided, in Section 6.

The closest noise sensitive receptors to the BTC Marine Terminal site are as follows:

- fishermen's settlement (south) 700m;
- housing compounds 900m;
- BOTAŞ lodges 1000m.

As the critical distances for all categories of construction activity are well within the distances for the nearest noise sensitive receptors, impacts to these receptors during construction are anticipated to be minor.

The potential impacts may be greater at some specific locations due to factors such as the proximity of works or the necessity of night-time activities and specific noise controls may be necessary at these locations. Specific mitigation measures, such as the use of noise barriers will be identified and implemented at the required locations prior to the commencement of noisy activities.

Traffic Noise

Construction traffic, especially heavy vehicles, has no potential to cause noise impacts, since in accessing the site it will use roads that pass through or close to residential areas. There will be existing traffic and noise but the marine terminal construction may substantially add to it. In the absence of fixed routes for construction traffic into and out of the site, it is not possible to state which roads and settlements will be most vulnerable. However, impacts will be mitigated to the maximum extent through implementation of the Traffic Management Plan (see Appendix C5), including such measures as:

- Sensitive routing of heavy loads;

- Observation of vehicle speed limits;
- Vehicle maintenance;
- Avoidance of passage through and near to settled areas during night time hours.

These are other measures will ensure that traffic noise impacts are predominantly minor, or at most moderate as locations where traffic flows are greatest.

12.7.3 Operational impacts and mitigation

12.7.3.1 Main noise sources

The main noise source from the operational BTC Marine Terminal will be the transfer pumps to be located in the tank farm and flare system (flare and blower) to be installed onshore near to the jetty.

Because of the distance of receptors such as housing compounds of the new terminal and nearby settlements from the noise source, it is anticipated that operational noise impacts from the pumps will be minor. This is a reasonable prediction since loading operations at the present facility do not result in noticeable noise impacts to the aforementioned receptors. Accordingly, the assessment of operational noise is focused on the flare system.

12.7.3.2 The flare system

Flares are generally categorized in two ways:

- by the height of the flare tip (ie ground or elevated);
- by the method of enhancing mixing at the flare tip (ie steam-assisted, air-assisted, pressure-assisted, or non-assisted).

An enclosed flare's burner heads are inside a shell that is internally insulated. The shell reduces noise, luminosity, and heat radiation and provides wind protection. Enclosed, or ground-based flares are generally used instead of elevated flares for aesthetic or safety reasons (EPA, Air Pollution Technology Fact Sheet). Enclosed flare and elevated flare options were compared in order to determine the one to be proposed for the BTC Marine Terminal in terms of both noise and air pollution. As a result, the proposed BTC Marine Terminal flare is an enclosed ground flare. Its enclosure will have a height of about 25m. In addition, the diameter is planned as 10m.

Combustion noise is created by the conversion of some of the thermal energy available in the fuel gas to acoustic power. As illustrated in Figure 12.4, the frequency of this energy is typically in the audible range, from 32 Hz to 10000Hz, exhibiting a peak between 250 and 500 Hz) (www.natcogroup.com).

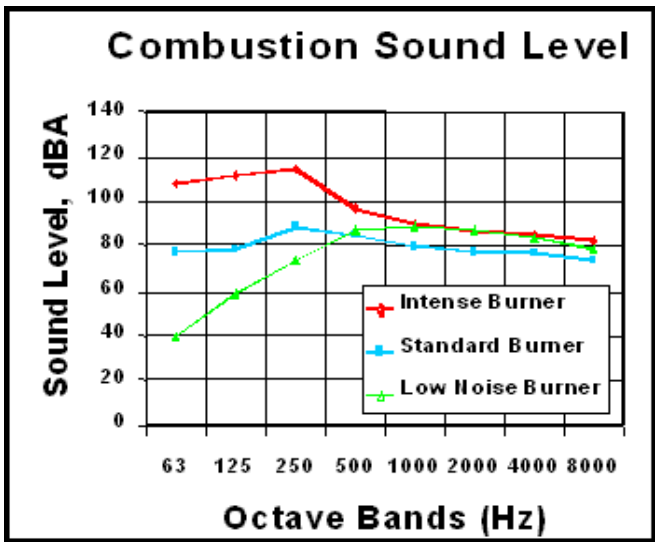


Figure 12.4 Combustion Sound Level and Octave Bands

The flare system proposed for the BTC Marine Terminal will be equipped with a silencer to reduce noise.

According to manufacturers information, a sound power level (PWL) of approximately 110dB(A) is expected to be generated by a large EGF as mentioned above at a waste gas flow rate of 20,000 m³/h.

Figure 12.5 provides information on the location of the noise sensitive receptors in the vicinity of the proposed BTC Marine Terminal and presents the results of the noise modelling study. This study considered actual site-specific conditions at the BTC Marine Terminal such as topography, meteorology and vegetation cover, all of which provide a level of noise attenuation. Noise contours predicted from this study indicate that noise levels at the receptors are much lower than the limit values stipulated in the World Bank guidelines (ie 55 dB(A) daytime and 45 dB(A) night-time, the latter being the most critical). According to the significance criteria in Section 3, this is a minor impact.

12.7.3.3 Air Blower

When blowers are enclosed with a sound attenuating enclosure, the generated noise decreases to less than 70 dB(A) at 21 feet (ie 6.5m) (www.polarpowerinc.com). Using the equation below, it is calculated that at 100-150 m away from the source, the noise level will be less than the World Bank limit values of 55 dB(A) daytime and 45 dB(A) night time. Impacts at all residential receptors are therefore predicted to be minor.

$$SPL_2 = SPL_1 - 20 \times \log \frac{D_2}{D_1}$$

where,
SPL_1: Sound pressure level (reference value used for calculation) at distance D_1 (reference distance)
SPL_2: Sound pressure level (calculated value) at distance D_2

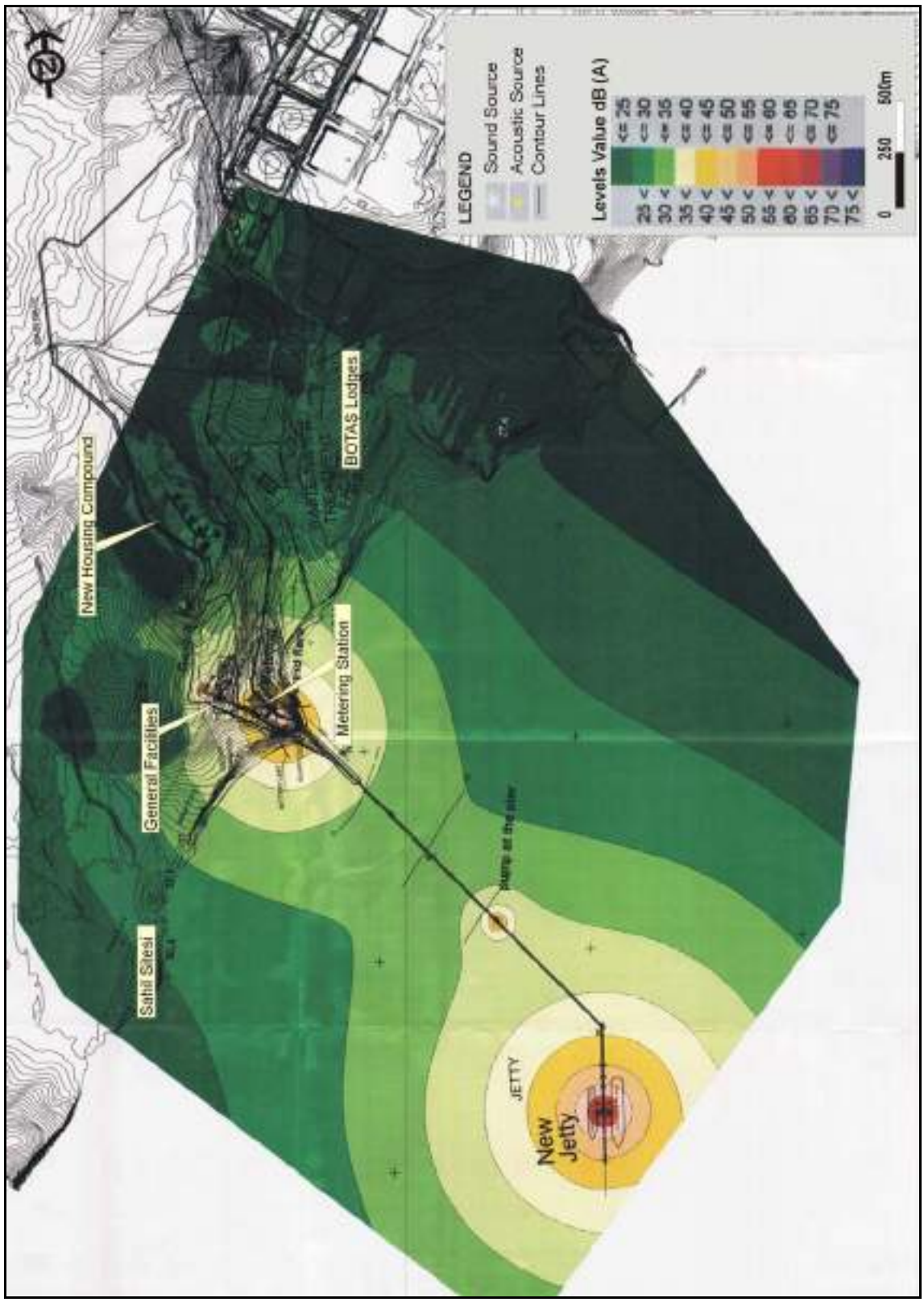


Figure 12.5 Noise Sensitive Receptors in the Vicinity of the BTC Marine Terminal

Loading lines

Pigging and scraping operations will create noise along the loading lines at different times of the year. However, this noise source will be transient and temporary. Low levels of noise are expected to occur during launching PIGs and scrapers. Furthermore, as the loading lines will be buried until they reach the jetty, noise impacts to nearby noise receivers are anticipated to be minor at most.

12.7.3.4 Mitigation

Additional mitigation has been developed to minimise operational noise impacts, including the following:

- equipment will be furnished with noise reduction devices to meet regulations where required;
- connecting pipes will be acoustically lagged where necessary;
- air intakes at furnace burners will be equipped with silencers where necessary;
- large motors will be specified to comply with noise regulations;
- control valves and piping will be designed to comply with noise regulations, with or without insulation.

12.8 TRAFFIC AND TRANSPORT

12.8.1 Introduction

The construction and operation of the BTC Marine Terminal and associated infrastructure may lead to impacts on existing road users and other sensitive receptors. This section discusses the assessment of such impacts and identifies measures to mitigate them.

The assessment was undertaken with reference to the requirements of the World Bank's Environmental Assessment Sourcebook [Ref 1] and UK guidance on Transport Assessments and according to the criteria in Section 3.

The main potential impacts associated with the terminal may include:

- increases in traffic flows on the road network and their potential for delays and congestion;
- conflicts between motorised and non-motorised forms of transport (eg delays to pedestrians and cyclists);
- visual intrusion, increased roadside litter and traffic-related noise and emissions;
- the loss of vegetative cover brought about by the construction of new roads;
- water pollution from spills or accumulated contaminants on road surfaces and potential modifications to natural drainage patterns brought about by construction of new roads;
- traffic accidents, which may result in death, injury or environmental damage.

Traffic also leads potentially to noise and air quality impacts. These impacts are addressed in Sections 12.7 and 12.6 respectively.

12.8.2 Potential construction impacts

Equipment, material and waste will have to be transported to/from the site. Personnel movements will also contribute to increased traffic volumes during the construction phase. Until the Construction Contractor develops a detailed programme, the exact volumes of traffic and how they will vary through the construction phase cannot be quantified.

Some of the items that need to be transported to the site will constitute abnormal loads, eg the steel piles for the jetty, the steel plate for tanks, turbines, compressors for firewater pumps and the oil loading arms for the jetty. These are likely to result in significant effects on local roads.

Other potential impacts include:

- increases in traffic flows on the road network and their potential for delays and congestion to local agricultural vehicles, especially during harvest time;
- impacts on the existing residents of the on-site BOTAŞ property.

Generic measures to mitigate these and other potential impacts are summarised below and discussed in detail in the Traffic Management Plan in Appendix C5.

12.8.3 Generic mitigation measures

A number of mitigation measures will be incorporated to reduce the temporary traffic-related impacts of constructing the terminal. These are discussed below.

12.8.3.1 Consultation/liaison

The relevant authorities will be consulted to agree on specific routes for use by construction traffic to avoid to the maximum extent possible any sensitive residential areas and unsuitable parts of the road network. In addition, advance warning will be given of construction works, including details of any proposed diversions and road closures. These details will be communicated to the authorities (including the emergency services) and affected residents in advance, via the pre-construction community meeting, and will be properly signposted.

The police will be consulted regarding heavy plant movements.

For residents that are located immediately adjacent to the BTC Marine Terminal, within BOTAŞ property, or those that are likely to experience a substantial increase in heavy vehicle traffic, additional efforts in consultation will involve the following.

- Meetings will be held with settlement Muhtars and residents; these will be organised at a location accessible by all sectors of the community prior to construction. The local residents will then be informed of the nature and length of activities in the area and provide other site specific information, for example: the construction schedule; the line list of sensitivities within the BOTAŞ property; road diversions and disruption to other services; construction staff code of conduct; dates of future community meetings; the Complaints Procedure.

- A notice board will be established in each settlement and all relevant project information will be posted and kept up to date.

- A safety briefing will be provided at settlements adjacent to the marine terminal development, residents within the BOTAŞ property and residents that will experience a substantial increase in heavy traffic. This will cover safety aspects of the construction, including road safety. All sectors, or representatives thereof, of the community will be invited to the briefing.

- Monthly meetings will be held with community leaders and members to provide information on progress and to provide a channel for issues and queries regarding construction to be raised.

- As part of the dispute resolution procedure, a key contact point for resolution of specific disputes with local residents if/when they arise, will be notified to the local residents.

- A fortnightly community impacts report will be submitted to the Employer's Community Relations Supervisors.

- As part of the implementation of the Traffic Management Plan, a monthly report on traffic related issues will be prepared and distributed.

12.8.3.2 Access roads

Existing access roads will be used to transport personnel, material and equipment wherever practicable. This will reduce the need to construct new projects roads, and will help reduce possible impacts of the removal of vegetation on the environment. However, the new facilities will need to be constructed without undue traffic-related conflict with the existing terminal. As a result, both temporary and permanent access roads will be constructed, operated and where necessary, reinstated in accordance with the provisions of the Traffic Management Plan. Where the requirement for temporary access routes proves necessary, they will be set up to maintain appropriate access for pedestrians, cyclists, motorists and livestock. Access to commercial and residential properties will be maintained.

12.8.3.3 Personnel movements

Construction workers will be drawn from the local workforce to the maximum extent practicable in order to minimise impacts from personnel movements. An employment strategy is outlined in Section 12.10, which identifies that the settlements most likely to be affected by the project will be employed first, including those living in the Ceyhan and Yumurtalik districts and the Adana province.

12.8.3.4 Oversized loads

All transport activities requiring 'Long and Heavy Vehicle Transport' will be in accordance with the requirements of General Directorate of Highways and Turkish Highways Traffic Regulation.

12.8.3.5 Other issues

- Traffic flows will be timed to avoid periods of heavy traffic flow along main roads.
- Statutory vehicle limits will be complied with (eg width, height, loading, gross weight and speed).
- Clear signs and signals will be set up where necessary.
- Any road damage will be repaired.

- The spread of dust will be minimised by measures including the sheeting, surfacing of temporary roads and wetting of such areas.

12.8.3.6 Traffic Management Plan

The project's Traffic Management Plan (TMP) identifies the generic measures to be adopted throughout the project to mitigate impacts associated with the project (see Appendix C5). The TMP identifies:

- relevant traffic management policies and standards;
- the potential traffic impacts of the project;
- appropriate measures and procedures for mitigating the impacts.

The TMP addresses the following broad areas:

- access to construction areas;
- routing of construction traffic;
- temporary traffic control and management;
- road crossings;
- parking facilities;
- keeping highways clean of mud and dust;
- reducing the probability of traffic accidents.

The Construction Contractor will be required to use the TMP as the basis for undertaking a detailed Traffic Assessment (TA) and preparing an updated TMP identifying specific measures to mitigate any predicted impacts. The ultimate TMP produced will include detailed procedures that demonstrate how the impacts of traffic on local residents have been taken into consideration.

The TMP will be reviewed and regularly updated as the construction programme is developed and vehicle movement requirements are identified in detail and then on an ongoing basis through the construction phase.

12.8.4 Operational impacts

The existing on-site traffic flows resulting from operation of the existing BOTAŞ Marine Terminal are low. The BTC Marine Terminal interface will comprise approximately 100 persons and the majority of this workforce will be resident on site. Currently, approximately 780 employees travel to and from the BOTAŞ Marine Terminal each day. The BTC Marine Terminal operation will add a very small increment to this number; hence, traffic impacts during operation of the expanded terminal will therefore be minor.

12.9 CULTURAL HERITAGE

12.9.1 Introduction

Dedicated archaeological studies carried out for the BTC Project have identified no significant sites at or adjacent to the proposed BTC Marine Terminal. As such, the potential for impacts to cultural heritage is considered to be low.

However, it is widely acknowledged that the potential exists for unknown sites or features to be revealed during ground disturbances, even in areas where desktop research and non-

intrusive field surveys have identified no evidence of the presence of buried archaeological resources. As a consequence this section outlines mitigation designed to minimise impacts to cultural heritage in the event of an unexpected find.

12.9.2 Construction impacts and mitigation

Although it is not currently anticipated that archaeological remains will be encountered during construction of the terminal, the chance find procedures contained within the Cultural Heritage Management Plan (CHMP) (see Appendix C7) will be applied, as necessary. In addition, the CHMP makes provision for further archaeological surveys (intrusive, geophysical etc), which will be undertaken prior to construction to minimise the potential for unknown finds, to conduct the salvage excavations of identified archaeological sites and significant archaeological features possibly encountered during construction.

Key features of the CHMP include the following measures:

- Archaeological advisors will monitor all topsoil stripping and a 'watching brief' will be kept. Appropriately qualified and experienced archaeological specialists will fulfil this role. In addition, BOTAŞ will appoint archaeological supervisors who will oversee and monitor the implementation of the CHMP.

- Should archaeological remains be encountered, work will be stopped and the finds will be reported immediately to the relevant Museum Directorate and to BOTAŞ' archaeological supervisor, who will advise on the necessary course of action.

- Where archaeological discoveries are made, and by instruction of the relevant Museum Directorate representative, parts of the construction area may be demarcated to allow safe working for archaeological recording. This will normally be undertaken within the normal construction programme. In some areas, this may involve restriction of the construction area.

- If significant remains are discovered that cannot be recorded within the normal programme, it may become necessary, by instruction of the relevant Museum Directorate representative, for the Contractor to provide protection of deposits by provision of 'bog mats' or stone tracks.

- The use of metal detectors will only be allowed with the written permission of BOTAŞ. No unauthorised use of metal detectors will be tolerated.

- Archaeological briefings will be given for all construction personnel working in archeologically sensitive areas.

12.9.3 Operational impacts and mitigation

There is no scope for impact to archaeological resources during operation of the terminal. This is due both to the absence of identified receptors, as well as the nature of terminal operations, which are non-intrusive.

12.10 WASTE MANAGEMENT

During construction and operation of the BTC Marine Terminal, a variety of solid wastes will be generated and will require appropriate management.

An inventory of wastes classified by source, type and hazard is given in the Waste Management Plan (WMP) (see Appendix C3). At this stage the likely volumes of wastes arising have not been quantified. Improper waste management can lead to a number of potential impacts, including:

- soil contamination;
- surface and groundwater contamination;
- visual and aesthetic impacts due to trash and litter;
- health and safety hazards to humans, livestock and wildlife;
- air quality impacts through inappropriate combustion;
- pressures on existing waste management capacity.

The WMP (see Appendix C3) has been developed for marine terminal construction and operation and aims at avoiding the above impacts or reducing them to an acceptable (minor level).In the first instance the WMP is based on a management hierarchy whereby the priority will be to:

1. avoid generating the waste in the first place;
2. minimise the amount that is produced;
3. recover wastes through recycling and reuse;
4. treat and process the waste, without causing secondary impacts to soils, water resources and air quality;
5. dispose of the waste in a controlled way (ie to a licensed facility), without compromising existing waste management capacity.

Solid waste management is controlled in Turkey through several legal instruments:

- Solid Waste Regulation;
- Regulations Regarding the Control of Hazardous Waste;
- Regulations on the Control of Medical Waste.

Implementation of the WMP will be fully in accordance with the requirements of Turkish Legislation.

Full implementation of the WMP will ensure that potential impacts will be minor. However, there are uncertainties to be resolved mainly associated with the volumes of wastes that will arise and current capacity of existing waste management facilities to accept them. To address this, in advance of construction commencing the Marine Terminal Construction Contractor will finalise the WMP, especially taking into consideration the following matters:

- The Construction Contractor will quantify waste volumes by type and the rate at which they will arise.

- The Construction Contractor will demonstrate that to the maximum practical extent avoidance, recycling and reuse will be fully applied.

The Construction Contractor will determine that use of off-site waste disposal facilities is sustainable and will not compromise capacity and conflict with other users.

12.11 DEMOGRAPHICS AND MIGRATION

12.11.1 Community relations

12.11.1.1 Impacts

Good relations with neighbouring residents is increasingly recognised as essential to the overall success and smooth functioning of a project, during both construction and operation. Efforts to establish good relations is consistent with the philosophy that the Project (including workers) are guests in the project area and the local residents their hosts.

The feedback from the surveyed settlements was largely positive towards the Project, although expectations of employment and other project benefits are high. Although mechanisms for managing expectations will be adopted, the key to establishing and maintaining good relations with local residents lies in minimising the negative impacts of the Project through the implementation of the mitigation measures identified in this report. However, on a construction project of this scale, unexpected events will always occur. Establishing and maintaining good relations with local residents, within a framework of on-going communication, will enable these events to be rapidly identified and resolved. Plate 12. to Plate 12.8 illustrate the proximity of neighbouring settlements and the existing BOTAŞ Marine Terminal and Box 12.3 describes the nature of relations.

Box 12.3 Relationship between the Existing BOTAŞ Marine Terminal and Neighbouring Settlements

The existing BOTAŞ Marine Terminal is largely self-contained and the extensive grounds include housing for staff and their families, recreation facilities, a shop and a primary school. However, there is interaction with the neighbouring settlements, namely:

- local residents are able to send their children to the primary school;
- a BOTAŞ bus transports children from neighbouring settlements (along with BOTAŞ Marine Terminal children) to secondary schools in Ceyhan and Adana;
- local residents are permitted to cut grass inside the fence of the BOTAS Marine Terminal to use as animal fodder;
- BOTAŞ management are in contact with local Muhtars and, when possible, assist with the provision of equipment for settlement projects.

However, during consultation local residents expressed concerns regarding the lack of employment of local people at the existing BOTAŞ Marine Terminal and limited opportunities to provide the terminal with goods and services. Very few locals are amongst the 940 people currently employed at the existing BOTAŞ Terminal and most services are contracted out, further limiting the opportunities for locals to secure employment at the facility. This is a growing frustration for the local people, many of who report having invested in their children's education in the hope that this will enable them to secure employment.

(Source: Consultation meetings and existing BOTAŞ Marine Terminal staff)

12.11.1.2 Mitigation objectives: during construction

The objective of the Community Relations Programme in the construction phase will be:

- To provide settlements affected by the Project with regular information on the progress of work and implications for local residents;
- To inform the Project/contractors of any settlement related issues that may impact on construction;
- To monitor implementation of mitigation measures and the impact of construction via direct monitoring and feedback from local residents;
- To identify any significant new issues that may arise during the construction period;
- To manage any disputes between the Project/contractors and local residents;
- To take advantage of opportunities for construction activities to deliver benefits to local residents.

Box 12.4 Settlements Directly Affected by BTC Marine Terminal Construction

Settlements directly affected by marine terminal construction are those that are:

- directly adjacent to the marine terminal development (this excludes residents within the BOTAŞ property);
- likely to experience a substantial increase in heavy traffic as a result of construction activities;
- within 5 km of a construction camp/s.

Those settlements that are directly adjacent to the marine terminal are Golovasi (and Sahil Sitesi), Incirli and Karatepe. Location of the construction camps and access roads will be finalised in negotiation with the Contractor. Affected settlements are therefore not currently known.

Plate 12.5 Karatepe Settlement and the BOTAŞ Tank Farm and Property Boundary

Plate 12.6 BOTAŞ Jetty Support Vessels and Incirli Settlement in the Background

Plate 12.7 BOTAŞ Main Gate and Incirli Settlement in the Background

Plate 12.8 View Towards Golovasi / Sahil Sitesi Port from BOTAŞ Property Boundary

12.11.1.3 Mitigation measures: during construction

To meet the mitigation objectives, a Community Relations Programme will be established for implementation by the Contractor, BOTAŞ and BTC Co. Aspects of the Programme for implementation by the Contractor will be developed in more detail in the Contractor's Community Relations Plan. Aspects of the Programme for implementation by the Project will be implemented on the basis of the Community Liaison Management Plan in Appendix C8.

Division of responsibilities

The responsibility for the community liaison programme and employment of community liaison staff will be divided between BOTAŞ, the BTC Co and the Contractor.

The Contractor will have day-to-day responsibility for community liaison and will be the principal point of contact with affected settlements. The Contractor shall appoint a full-time dedicated Community Liaison Officer(s) (CLO) for the co-ordination of project public relations and external liaison needs. The Contractor shall appoint additional CLO(s) as required in order to fulfil the Scope of Work detailed in the Social Management and Monitoring Plan (SMMP). (see Appendix C8). Furthermore, the CLO(s) will manage the good reputation of both BOTAŞ and the Contractor. This position shall report directly to the Contractor's Project Manager including regular, on-going liaison with the BOTAŞ Community Relations Manager. In addition, the CLO(s) shall liase with third parties who are or may be affected by the execution of the Works, as well as interface with landowners.

At the present time it is envisaged that there will be one contract for both the construction of the onshore facilities and the offshore facilities.

BOTAŞ and BTC Co will also appoint staff with responsibilities for Community Relations. (see Table 12.5) in accordance with the role of BOTAŞ as the Turnkey Contractor and the assurance role of the BTC Co, the team will consist of the following:

- **BOTAŞ:** One Community Relations Manager (CRM), supported by a Community Relations Supervisor(s) (CRS), responsible for overseeing all works carried out by the contractors during construction of the marine terminal. There will also be one CRS based in the BOTAŞ office full time in order to deal with free-phone inquiries related to the marine terminal, the pipeline and associated Above Ground Installations (AGIs)

- **The BTC Co:** A Community Relations Manager (CRM) who will oversee all community relations activities for the BTC Project (marine terminal and pipeline), supported by seven environmental and social inspectors

The Community Relations Team of the Project will be empowered to stop works if they are of the opinion and can demonstrate that the requirements of the SMMP have been deviated from.

In order to carry out the required pre-construction activities, the Community Relations Manager has been appointed. The Community Relations Supervisors will be appointed immediately following contract award. The CLOs will be appointed no later than one month prior to construction (ie during the construction mobilisation phase of the Project).

The CLOs will be Turkish speaking, preferably with an understanding of the project area. They will preferably be graduates with a degree or diploma that has a social focus, with proven field skills in communications and a minimum of two years relevant experience, preferably in community relations. A minimum of one in every three CLOs will be female. The Contractor shall assign CLOs of adequate competency.

Table 12.5 Roles and Responsibilities with regard to Community Relations

Contractor: Responsible for Adhering to Requirements of SMMP

- Provide primary interface between Project and affected settlements.
- Coordinate and implement required pre-construction activities, namely:
  - produce management plans for community relations, construction camps and transport;
  - train staff with community relations responsibilities;
  - implement induction training workshops for all construction staff.
- Assist in local recruitment process.
- Ensure on-going communication with affected settlements through the following activities:
  - Meet with settlement leaders and hold community meetings prior to arrival of construction teams in a given locality to inform local residents about construction activities, work schedule, construction staff Code of Conduct, Complaints Procedure, safety issues, dates of future meetings and contact details of Community Liaison staff.
  - Hold regular meetings with directly affected settlements during construction to provide information on progress and provide a channel for issues and queries to be raised.
- Liase with contract representatives on major issues arising and ensure that local residents are kept informed of any expected or unexpected disruption through leaders and by maintaining a community notice board.
- Provide a focus for negotiation and resolution of specific disputes with residents if/when they arise, using the Complaints Procedure.
- Submit fortnightly and monthly community impacts report to the Project.

BOTAŞ: Overall Accountability

- Assist the contractors to develop community relations procedures prior to construction start-up, including required management plans, recruitment procedures, contracting procedures, CLO recruitment and training.
- Agree dispute resolution process with the Project, Contractor and settlements.
- Monitor implementation of/adherence to all relevant management plans through liaison with the Contractor and meetings with affected settlements.
- Identify breaches of management plans and recommend corrective action. Stop the work in the event of breaches that may cause serious impacts on local settlements or on the reputation of the project.
- Track the social impact of the project against the BTC Objectives and Key Performance Indicators (KPIs) as stipulated in the SMMP and work with the contractors where amendments to the mitigation measures are required.
- Monitor processing and resolution of complaints and ensure alignment across the project with Complaints Procedure.
- Provide regular information to the BTC Co on performance.
- Represent the Project at community meetings.

BTC Co: Monitoring and Assurance

- Review all community relations procedures compiled by contractors.
- Monitor performance through review of information provided by BOTAŞ (including performance against KPIs and targets), field observations and community meetings and submit recommendations for amendments or additions to community relations procedures.
- Make information on the project available to the public, including performance against KPIs.
- Monitoring and assurance of the processing and resolution of complaints.
- Monitor working practice of project security team.
- Monitor recruitment and contracting processes.
- Provide regular information to BOTAŞ Site Managers on performance.
- Assist at community meetings where necessary.

Complaints procedure

The Contractor will aim to prevent formal complaints through the community liaison mechanisms outlined above. In addition, a formal complaints procedure will be set up to enable any complaints to be made directly to the Contractor's CLO. Details of the free-phone telephone number and complaints procedure will be distributed to all settlements, landowners and occupiers in the vicinity of the marine terminal site and construction camps and close to roads that will experience significant increases of traffic movements (see Appendix A1, the PCDP, for more detail on the Complaints Procedure).

The telephone shall be answered in person and details of the complaint, source, location and date/time of offending event recorded. The Contractor's CLO will investigate the complaint in the first instance. All complaints received by community members or local authorities will be processed and resolved within seven days.

To accommodate those that do not have access to a telephone, the Complaints Procedure addresses both written and verbal complaints (if delivered in person). Responses will be provided in writing or verbally, depending on what is more appropriate (eg if the complainant is illiterate, a verbal response will be provided).

Projected affected settlements will also be provided with contact numbers for BOTAŞ in the event that the Contractor does not satisfactorily handle a complaint within seven days. The complaints procedure will include the right to third party arbitration, funded by the Project.

12.11.1.4 Mitigation objectives: during operation

The objective of the community relations programme in the operational phase will be to:

- maintain constructive relationships between local residents and the marine terminal operators, to assist in the operation of the terminal;
- maintain awareness of safety issues among local residents neighbouring the marine terminal and those along the access roads likely to experience a substantial increase in traffic;
- monitor attitudes of local residents to the marine terminal and operating company.

12.11.1.5 Mitigation measures: during operation

Community liaison activities undertaken during operation will be developed during the construction phase based on experience during this time. However, it is likely that they will consist of the following:

Ongoing community liaison

An employee at the marine terminal will be responsible for community liaison activities. Their responsibilities will include holding regular meetings with settlements to identify any issues and concerns. They will also be responsible for identifying appropriate ways for the terminal to be a good neighbour. This could include, for example, working with the local settlements to maximize local sourcing of goods and materials, having open days to explain how the terminal functions, providing briefings in schools or using available equipment to carry out small tasks as part of wider settlement projects.

Community relations hotline

A free-phone number will be displayed in all settlements neighbouring the marine terminal to report any grievances, concerns or suggestions for improvement. It will also be provided to the Jandarma (local security forces) and emergency services. Telephone calls will be answered by a person who will take the details of the caller and of the issue. The caller will be informed of the actions taken.

To accommodate those that do not have access to a telephone, the dedicated community relations employee will be available to receive both written and verbal complaints. Responses will be provided in writing or verbally, depending on what is more appropriate.

Reporting and availability of information

The operating company will develop short annual briefings that identify any issues associated with the marine terminal and its operation.

Prior to decommissioning

The operating company will carry out a study prior to de-commissioning to identify and mitigate any negative impacts resulting from de-commissioning.

12.11.1.6 Residual impacts

Maintaining good relations offers the following key benefits for both the Project and neighbouring settlements:

- Increased cooperation from local residents;
- Early warning of potential problems, with the Project more likely to be given the benefit of the doubt when problems arise;
- A cooperative approach to problem solving;
- Refinement of mitigation measures and resolution of complaints;
- Decreased cause for protest action from neighbouring settlements.

12.11.2 Construction workers and construction camps

12.11.2.1 Impacts

Overview

The preferred location for the construction camp is within the existing BOTAŞ property (see Box 12.5). Should alternative locations be investigated or additional camps proposed, it is the responsibility of the Construction Contractor to review key criteria guiding site selection prior to the finalisation of the construction campsite. The criteria will be included in the agreement of the Contractor.

Box 12.5 Size of Construction Camp

Only semi-skilled and skilled workers will be housed in the construction camp. Unskilled workers will be sourced from the local settlements and will therefore not require housing. The total number of workers housed in the camp will be 300 (225 workers for on shore construction and 75 workers for off shore construction). A total area of 700m x 250m of land within the BOTAŞ property will be required for the establishment of the construction camp.

(Source: BOTAŞ, Ankara office)

On the whole, the community consultation process indicated positive attitudes to a construction camp neighbouring local settlements, with residents expecting to secure project benefits as a result (eg preference for employment and provision of local goods to construction staff) (see Box 12.6). However, residents did raise concerns regarding the conduct of the workforce and the potential for this to conflict with the socio-cultural values of local residents.

Box 12.6 Attitudes of Local Residents to Location of Construction Camps[1]

The preliminary results of consultation indicated that, on average, 72% of surveyed households welcomed the location of a construction camp nearby, while 28% of the surveyed households indicated that they would not. Among the settlements directly adjacent to the existing BOTAŞ Marine Terminal, 50% of respondents in Golovasi were not in favour of a construction camp nearby, followed by Incirli (35% of respondents), Sahil Sitesi (13% of respondents) and Karatepe (11% of respondents). Among the indirectly impacted settlements, Sugozu recorded the highest percentage of respondents not in favour of a construction camp (44%). All respondents interviewed in Karayilan were in favour of neighbouring a construction camp.

(Source: Household Survey)

Settlements neighbouring the construction camp, namely Karatepe, Golovasi, Incirli and Sahil Sitesi will be targeted for preferential employment (and sourcing of goods and services, where possible), and will benefit from increased clientele for local retailers, including convenience stores, local markets and restaurants. However, in spite of these benefits, the possibility of tension and conflict developing between local residents and the workforce does exist. This tension could be caused by the following factors:

- Impacts of project activities on local infrastructure and services;
- Higher standards of living enjoyed by construction workers and resultant resentment from poorer neighbouring settlements;
- Incidence of prostitution in the vicinity of the construction camp;
- Spread of communicable diseases brought in by the outside workforce.

[1] Current findings on attitudes to the location of construction camps are considered preliminary, as this issue was not a specific focus of consultation. Additional consultation on this issue is therefore required once a potential site/s has been identified.

Box 12.7 Factors Mitigating Against Additional Tensions

The settlements neighbouring the proposed BTC Marine Terminal have already experienced the development of the existing BOTAŞ Marine Terminal and are located within an area subject to increasing levels of industrialisation. These settlements are no longer isolated from outside influences and are becoming increasingly familiar with large-scale development projects. As a result, disturbance due to socio-cultural differences (between the workforce and resident population) is not expected to be a common source of tension. Furthermore, settlements within the project area (eg Golovasi, Sahil Sitesi and Incirli) are currently engaged in tourist activities and are therefore accustomed to an influx of Turkish tourists and the differing socio-cultural values that this sometimes brings.

(Source: Settlement Level and Household Questionnaires)

The potential area of influence of the construction camp can be divided into three categories of settlements. These are:

- Settlements that fall within a 5km radius of the construction camps (including directly adjacent) and are therefore accessible on foot from the camp. Factors such as topography, road network and access to settlements from the construction camps will affect the likelihood of these settlements being reached. Settlements in this category include: Golovasi, Sahil Sitesi, Hamzali, Kurtkulagi, Kurtpinari, Karayilan, Karatepe and Incirli.

- Settlements located within driving distance (assumed to be within a one hour car journey) of the construction camps. This could be an issue during days off when construction staff have the opportunity to drive further distances. This is likely to apply only to larger towns/district centres which have the potential to attract construction staff for purchasing of supplies, entertainment etc. Settlements include: Ceyhan, Yumurtalik, Yakapinar, Imamoglu, Osmaniye, Yesilkent, Dortyol and Adana.

- Settlements located along the access roads (this applies to access roads that fall outside of the 5km radius specified above), which include Ceyhan, Adana, Osmaniye etc.

Infrastructure and resources

Impacts of Project activities on local infrastructure and resources are a possible source of tension between the workforce and the resident population, in particular, increased traffic congestion. The Project will, however, be largely self-sufficient, thus mitigating against any tensions developing in this regard.

Higher standards of living in the construction camp

The community consultation process highlighted resentment among local residents regarding the high standards of living enjoyed by residents (employees and their families) within the existing BOTAŞ Marine Terminal. This resentment needs to be understood within the following context:

- The low standards of living currently experienced in neighbouring settlements.

- Discontent regarding the low proportion of local residents employed during the construction and operation of the existing terminal. Dissatisfaction on this issue was

fuelled by the lifestyle changes experienced by BOTAŞ employees and witnessed by residents of neighbouring settlements.

Given the history, the relatively high standards of living in the construction camp has the potential to impact on relations between neighbouring residents and the construction workforce and/or the Project, and could affect relations during the operational phase.

Prostitution

The potential for increased prostitution as a result of the BTC Project is considered to be low, particularly in the vicinity of rural settlements where local residents are generally conservative and thus unlikely to tolerate such activities. In the district and provincial centre, brothels are controlled by the government and include the implementation of regular health checks for all sex-workers.
Communicable diseases

All personnel, including sub-contractors, will be required to undergo health screening. No-one suffering from a transmittable disease will be allowed to work on the project The Contractor will also be required to conduct regular health awareness training and personal health programmes (including check-ups and immunisations) in order to prevent illness occurring or spreading among the workforce. This will include awareness on HIV and STDs. These efforts will assist in ensuring that an increase in communicable diseases among neighbouring settlements, as a result of the construction workers, is kept to a minimum. It should also be noted that previous exposure to an outside workforce, as a result of existing developments in the project area, is expected to have increased the resistance of local residents to communicable diseases.

12.11.2.2 Significance criteria

Tension between construction staff and local residents will be considered significant if the conduct of the workforce is perceived by local residents to be offensive or giving cause for complaint. In addition, such tensions will be considered significant if they result in any one of the following:

- any legal action initiated by local residents against the Project and/or the construction company;
- disruptions to construction works by local residents;
- outbreaks of conflict and violence, including injury or damage to property.

Although unlikely, an increase in communicable diseases will be considered significant if local health services are not able to effectively treat or contain the outbreak of such diseases.

12.11.2.3 Mitigation objectives

In order to address the potential impacts that might be caused by construction workers, the following mitigation objectives have been agreed to by the Project:

- To ensure that construction crews behave in a way that is consistent with the recognition that the local population are their hosts and the contractors are guests in the project area.

- To prevent any negative impacts that could potentially accrue as a result of the presence of construction workers in the project area.

- To maintain effective dialogue between Construction Contractors and local residents such that potential issues can be rapidly identified and resolved (See Section 12.10.1, Community Relations).

12.11.2.4 Mitigation measures

The majority of the measures required to prevent impacts associated with construction workers are the responsibility of the Contractor and will be included in their contract for incorporation into their management plans. These requirements, plus additional mitigation measures that are the responsibility of the Project, are identified below.

Location of Construction Camps

The camp will be placed within the existing BOTAŞ property, therefore the impact on local infrastructure and utilities will be minimal. In the event of alternative locations being considered or additional camps proposed, they will be located at least 2km from any settlement, wherever possible. Settlements within 5km of the construction camp will be consulted to assess and/or verify their levels of acceptance regarding the nearby location of the camp during the public disclosure process. This consultation will be coordinated and facilitated by the Project. If settlements show strong resistance to the proximity of a construction camp, camps will not be located within 5km of these settlements, where practicable.

There will be on-going community liaison by the Contractor as part of their community liaison responsibilities (See Table 12.5).

Code of conduct

In order to minimise social disturbance from the behaviour of construction workers, a worker Code of Conduct will be drawn up. This will include:

- respect for local people and customs;
- zero tolerance of bribery or requests for gifts from local residents;
- no hunting, fishing or unauthorised gathering of products;
- zero tolerance of illegal activities by construction personnel, including illegal prostitution, illegal sale or purchase of alcohol, and sale, purchase or consumption of drugs, illegal gambling or fighting;
- no use of camp vehicles for non-work business and no use of personal vehicles for work business, unless authorised by the camp manager;
- limitations on hours of movement and use of security passes;
- no access to camps for non-authorised personnel;
- no purchase of goods or services at the camp gate;
- an alcohol and drugs policy (both in and out of work hours);
- rules on access to and use of camp entertainment facilities;
- country wide speed limits (10% lower than those legally imposed).

The Code of Conduct will include disciplinary measures for those that break the requirements. The Code will be publicised in settlements potentially affected by the construction workers to help ensure that local residents are aware of the behaviour expected of construction workers. A system for submitting complaints about the behaviour of workers is included in the Complaints Procedure.

Entertainment facilities

The Contractor will provide adequate recreation and entertainment facilities at all permanent camps in order to minimise the potential for 'unruly' behaviour amongst construction workers outside the camp. A limited volume and selection of alcoholic drinks may be available to workers in camps to discourage them seeking alcohol outside the camps. Decisions regarding the enforcement of alcohol free camps will be left, however, to the discretion of the Contractor, as this practice is common in Turkey.

Induction training

Training will be provided to all staff, both national and expatriate, on camp management rules, overall discipline and cultural awareness. Induction training will include:

- a briefing on Camp Rules;
- training on BP Health, Safety and Environment (HSE) policies and procedures;
- a community relations orientation. The objective of this orientation will be to increase awareness about the local area and about the Code of Conduct.

Workforce health strategy

The Project will develop and implement a Disease Awareness and Prevention Strategy in liaison with government health authorities and other expert health organisations in Turkey. This will include:

- health screening for all personnel;
- health awareness training for workers (including HIV/AIDS and other STDs) at induction and then periodically throughout their employment;
- a personal health programme for workers including check-ups and immunisations, if required;
- awareness-raising on health issues for settlements close to camps (via posters, leaflets, through health clinics, community meetings etc);
- condoms will be available, without charge, from the camp doctor [1] ;
- on-going liaison with local health authorities.

Use of camp facilities and services

Entry to construction camps will be strictly limited to the workforce. In the event of a medical emergency being brought to the camp, the medical staff will offer immediate emergency medical support and lend reasonable assistance in organising transport to health services.

Benefits to local settlements

By way of mitigation against possible resentment towards workers enjoying relatively higher standards of living in the construction camps, the Project will seek to bring benefits to local settlements. This will be done through:

1 The camp doctors recruited by the Construction Contractor will be recognised members of a Chamber of Medicine associated with the Turkish Medical Association.

- linking project infrastructure needs into existing infrastructure and service plans (eg road upgrades, sewerage treatment, waste management and water supply), thus resulting in long-term benefits for local settlements;

- the implementation of a Community Investment Programme by BTC Co, the objective of which is to have a positive impact on settlements most affected by construction activities by providing direct benefits, and by engaging with and adding value to local settlements in a sustainable way. This will be done via Sustainable Development Projects and Local Community Projects;

- the Employment Strategy, which will require the Contractor to maximise the use of local workforce on the project. Settlements directly affected by the marine terminal will have priority, followed by workers in Ceyhan and Yumurtalik districts and then Adana province.

12.11.2.5 Residual impacts

Even with full implementation of the mitigation measures, it is likely that there will be negative residual impacts arising from specific incidents or disputes between construction workers and local residents. However, the Project is committed to identifying and resolving incidents and disputes in order to maintain the confidence of the local settlements and the discipline of the workforce. This should ensure that any negative impacts are short-term.

With regard to health, the implementation of the identified migration measures will ensure that the residual risk of an increase in communicable diseases is very low. This low risk will also be offset by the training that the Project will deliver to approximately 400 workers in health and safety (including hygiene, HIV/AIDS awareness) as well as to settlements neighbouring the BTC Marine Terminal.

12.11.3 In-migration Impacts

Overview

Large-scale developments can directly or indirectly attract temporary or permanent in-migration into the area. The main drivers of in-migration will be the following:

- People travel to the project site in search of direct employment or to sell goods or services to the workforce.

- Non-local workers bring their families to nearby locations and remain after the end of the project.

The likelihood of in-migration as a result of the proposed BTC Marine Terminal should be assessed in light of the fact that the existing BOTAŞ Marine Terminal has been in operation for 26 years[1], employing approximately 1,000 people. In spite of this development and potential employment opportunities (perceived or actual), the project area shows very little sign of in-migration. Only Incirli has slightly higher male ratios, which could reflect previous in-migration. The absence of large-scale in-migration under the existing conditions indicates

[1] The Ceyhan Marine Terminal commenced operation in 1976, with the first tanker being loaded on the 25 May 1977 (http://www.BOTAŞ.gov.tr).

that a sudden influx of job seekers to the project area[1] is unlikely to occur as a result of the BTC Project.

What is expected, however, is a more gradual influx of job seekers to the Iskenderun Gulf area, including the project area, as a result of on-going industrialisation. With the identification of the Iskenderun Gulf area as an industrial zone, the way of life is expected to change from a predominantly subsistence based to an increasingly industrial and urban based one. There are already a number of developments (existing and proposed) in the immediate vicinity of the project (see Section 11).

Any in-migration and associated impacts are therefore likely to be caused by cumulative industrialisation, of which the BTC Project is a part, rather than as a result of the marine terminal development itself. However, as a precautionary principle, impacts associated with possible in-migration to the project area have been assessed and associated mitigation measures developed.

Impact description

The potential impacts of in-migration are directly related to the capacity of the existing services and resources to support an increased population, and the ability of the resident population to adapt to any changes to standards of living and sources of livelihood. An overview of conditions in the project area indicates that the existing services and resources are not sufficient to meet the needs of either the current or additional populations.

Conditions within the project area are summarised below:

- Services in the project area (piped water, sewerage, waste and health facilities) are insufficient for the existing residents and, based on their current capacity, will not be able to accommodate a substantial increase in population.

- The project area is also characterised by a low availability of sources of livelihood (income and subsistence based). In particular, there is limited availability of agricultural land (due to uneven distribution), and thus limited options for agriculture, and decreasing fish stock in the Iskenderun Gulf. Results from the settlement and household level surveys indicate that these conditions are already manifesting themselves in a deterioration in standards of living and high debt levels, with an associated increase in the incidence of depression and alcoholism among men.

The extent to which these conditions will be exacerbated by an in-migration of job seekers is dependent on three factors:

- Whether or not the migrants are able to secure formal employment.

- Whether or not the migrants, in the absence of formal employment, attempt to secure a subsistence livelihood, thus competing with local residents.

- Whether existing residents are able to secure formal employment, thus becoming less dependent on subsistence based livelihoods.

It is expected that the migrants, if failing to secure a wage income, will mostly return to their place of origin. For those that remain, the limited avenues for participation in

[1] For the purposes of this assessment, the project area refers to those settlements that neighbour the proposed marine terminal,ie Golovasi (and Sahil Sitesi), Karatepe and Incirli. Where the assessment goes beyond this geographical boundary, this will be highlighted.

subsistence-based livelihoods will limit the extent to which they impact local resources in the area. The most likely impact is therefore expected to be increased pressure on services in the project area[1] as a result of both unemployed migrants who remain in the hope of later employment, as well as employed migrants who choose to reside in the project area.

12.11.3.1 Impact summary

The likelihood of a large influx of job seekers to the project area as a direct result of the BTC Marine Terminal is *low*. However, the likelihood of a gradual influx of job seekers to the Iskenderun Gulf area, including the project area, is considered to be *high*. In-migration to the project area could potentially result in a loss of the following types of assets:

- **Natural capital**: if migrants undertake fisheries based activities this will put additional pressure on already over-stretched resources.

- **Physical capital:** additional people will increase the pressure on services that are already overstretched.

- **Financial capital:** increased competition for subsistence and wage-based livelihoods could impact on the amount of income generated from these activities.

- **Social capital:** competition for subsistence-based and income-based livelihoods could also result in tension and possible disputes between residents and newcomers, and/or between existing residents.

- **Human capital:** no change predicted.

In-migration may, however, result in improved financial capital due to increased clientele and expenditure in the project area. These benefits will mostly go to local retailers and farmers, and possibly to fishermen, although their benefits might be less as they reportedly have to sell the majority of their catch through local traders.

In the absence of mitigation, the ability of residents within the project area to absorb any potential loss of capital is likely to vary between individuals. Those dependent upon resource based livelihoods (eg fishing) are likely to have a *low* ability to cope with changes, whereas those involved in commercial and/or retail activities are expected to benefit from an increase in clientele. Their ability to adapt is therefore considered to be *high*. However, an ability to cope with a deterioration in service provision is considered *medium* for residents that can afford alternatives (eg purchase of alternative fuel sources, transportation to district centres for health care, sending children to more distant schools) and *low* for the poorer households, who cannot afford these alternatives.

12.11.3.2 Significance criteria

The occurrence of in-migration will be considered significant if:

- the ratio between number of people and capacity of local services exceeds levels considered acceptable by the relevant authorities;

[1] Although the potential for the development of informal settlements in the wider Iskenderun Gulf area does exist (as a result of in-migration), this is unlikely to take place in the project area due to the high security that would be in place for both the existing and proposed terminal.

- there is a recorded increase in levels of unemployment. (key indicators are decreased salary income and decreased numbers of hours worked within settlements neighbouring the proposed BTC Marine Terminal[1]);

- incidents of conflict over access to resources are reported to have occurred within settlements neighbouring the proposed BTC Marine Terminal.

12.11.3.3 Mitigation objectives

- In order to address the potential for in-migration to the project area, the Project has committed itself to discouraging in-migration in search of employment or other project benefits (eg provision of local goods).

12.11.3.4 Mitigation measures

Employment Strategy

The Project will actively discourage informal in-migration in search of employment opportunities. They will develop and publicise an employment strategy in appropriate media, and via direct notification of sub-governors and Muhtars within Adana Province and governors within Turkey. It will contain the following procedures:

- preference for local labour;

- no recruitment at the construction camp or work site. Locations for registration for unskilled work will be within a three-hour journey by public transport for all directly affected settlements (eg Ceyhan district centre or Yumurtalik district centre). Semi-skilled workers to be recruited from provincial centres (eg Adana) or more locally (eg Ceyhan or Yumurtalik district centre). Skilled workers to be recruited in Adana and other national centres.

Purchasing Strategy

The Project will publicise the fact that the contractors will not purchase goods at camp locations or work sites. (See Section 12.13 for more details on purchasing strategy).

Camp Rules

Illegal activities near to camps will not be tolerated. Authorities will be informed and any employees implicated will face disciplinary procedures.

Worker Training

The Project will develop a Disease Awareness and Prevention Strategy in liaison with government health authorities and other expert health organisations. This will include:

- health screening for all personnel, including sub-contractors;

- health awareness training for workers (including HIV/AIDS and other STDs) at induction and then periodically throughout their employment;

[1] State Institute of Statistics, 2002 (www.die.gov.tr)

- a personal health programme for workers including check-ups and immunisations, if required;

- awareness raising on health issues for settlements neighbouring the BTC Marine Terminal (via posters, leaflets, through health clinics, community meetings etc);

- condoms will be available, without charge, from the camp doctor;

- on-going liaison with local health authorities.

The Contractor will be prepared, at the request of the Project, to utilise the camp medical facilities and site medical personnel to provide training and support to local settlements.

12.11.3.5 Residual impacts

The successful implementation of the above mitigation measures will assist in minimising the potential for uncontrolled in-migration to the project area (ie in-migration in the absence of adequate resources, infrastructure and services). However, Turkish citizens are free to move within their own country. As a result, there is a *low* likelihood that there will be limited in-migration directly related to the project and a *high* likelihood that there will be higher levels of in-migration over time due to industrialisation of the Iskenderun Gulf area. In-migration associated with cumulative industrialisation is further discussed in Section 16.

The project will, however, benefit local settlements by raising the awareness of up to 400 workers in health and safety, including HIV and other STDs, many of whom will be from settlements within the project area, as well as residents in settlements neighbouring the marine terminal.

12.11.4 Safety of local residents and BTC workers

12.11.4.1 Impacts

The main safety hazard posed by the construction phase for local residents is the increased traffic on neighbouring roads. This is considered in Section 2.8.

Other safety hazards relate to the construction of the pipeline through BOTAŞ property. Within the property, there is a residential population of approximately 640 people, including facilities for guests. There are no livestock on the property, with the exception of a herd of deer that are kept in an enclosed area.

During construction, there will be an open trench of up to 2.5 meters deep crossing roads within the property. It is likely that the trenches will be left open for about one week at a time. Other hazards include heavy machinery and sharp or otherwise dangerous wastes.

The construction phase also poses safety risks for the BTC workers. However, these risks will be minimized through the compulsory adherence by both contractors and subcontractors to all BP HSE policies and procedures.

12.11.4.2 Significance criteria

Any injuries to local residents and BTC workers will be considered significant.

12.11.4.3 Mitigation objectives

Safety of the workforce and local residents is a priority for the Project. The Project has therefore committed to preventing injury to residents and BTC workers as a result of construction activities associated with the project:

12.11.4.4 Mitigation measures

The hazards posed by construction will be mitigated through a combination of communication with local residents and by implementing good working practices as summarised in the following sections.

Community liason meetings

In the weeks prior to construction, the community liason team will hold meetings with residents within BOTAŞ property and those affected by significantly increased transport loadings. A priority topic will be safety, including both road safety and also an explanation of the hazards posed by construction activities on the working width.

Women's meetings

Particular effort will be made to brief women on safety measures. As the primary caretakers, women are well positioned to pass on safety information to their children. Separate women's meetings will also assist in addressing the sometimes low attendance and participation of women at community meetings These meetings will be held in local schools or in other appropriate locations. In settlements identified as traditional or conservative, efforts will be made to ensure that a female CLO will run the meeting. Information will be provided orally with written material only used to back up key messages.

Roads used for access to schools

The Contractor will identify those roads that are used by children to reach schools. Where these roads are to be used by construction traffic, road safety awareness information and briefings will be provided in local schools. Vehicle traffic will be minimised during hours that children are travelling to and from school.

Securing the worksite

During construction, appropriate measures will be undertaken to ensure the safety of people and domestic animals from accidents caused by machinery or falling into the trench. Hazards will be dealt with on an individual basis. A risk assessment for all construction activities will be carried out prior to the start, especially where heavy equipment is involved. This will ensure that appropriate safety measures are taken to reduce the risks to acceptable levels. Mandatory security measures will include:

- demarcating open trenches with luminous temporary fencing that will act as a warning of the hazard;
- erecting protective barrier fencing on sections that come within 500m of residential areas and in areas where the trench is deeper than 2.5m;
- fencing all crossing points over open trenches;
- securing heavy machinery in an agreed location over night;

- properly store wastes overnight to avoid attracting animals.

BP HSE Training

As part of induction training, all staff (both national and expatriate) will be trained in BP HSE policies and procedures.

12.11.4.5 Residual impacts

The measures identified will minimise the likelihood of serious injury to local residents and the BTC workforce. There may be a residual, although very small, likelihood of injury. In the event of injury caused directly by the project, the Project will be responsible for necessary medical treatment and any compensation, if required.

12.12 LAND OWNERSHIP AND USE

Impacts on land ownership and use will occur if expropriation of land is required for alternative or additional construction camps (ie in addition to the proposed camp within the existing BOTAŞ property). Procedures for this will be dealt with separately as part of land acquisition process.

12.13 EMPLOYMENT, LIVELIHOODS AND SKILLS

12.13.1 Employment

12.13.1.1 Benefits during Construction

Direct employment

The project area is characterised by limited opportunities for wage income, high levels of underemployment and limited opportunities for agriculture. Employment is thus considered to be the most important source of potential benefits that the BTC Marine Terminal development can directly bring to local settlements.

One Contractor will be appointed, for construction of the on-shore facilities and off-shore facilities of the marine terminal. It is estimated that this Contractor will employ a total of between 700 – 1100 workers over a 2-2.5 year period (the peak of the construction phase). This will include those required for construction activities and those required to construct and run the construction camp/s and the overall operation. Each team will require skilled, semi-skilled and unskilled labour.

Table 12.6 provides further information on opportunities for employment during the construction phase. However, it should be noted that the number of workers and the division of skilled, semi-skilled and unskilled labour will depend on the exact construction methods used. These specifics will be determined by the Contractor. The figures provided should therefore only be taken as a guide.

Table 12.6 Estimates of Employment Opportunities during Construction

Task	Numbers of Workers	Skills Mix % (unskilled: semi-skilled and skilled)	Duration (peak employment for semi-skilled and skilled employees only)
BTC Marine Terminal – offshore			
Construction	120 workers	20:80	24 months
BTC Marine Terminal – onshore			
Construction	250 workers	40:60	30 months

Security of livelihoods

Those individuals that secure permanent or long-term employment on the marine terminal will experience increased security of livelihoods. This is particularly relevant for individuals dependent on the following: 1) availability of marine resources; 2) rain as a source of irrigation; 3) seasonal employment; and 4) other sources of livelihood that are vulnerable to climatic conditions and/or economic fluctuations (in terms of selling prices of products). However, these benefits will not be widespread, as employment opportunities associated with the project are relatively low.

Skills upgrade

Construction will require skilled, semi-skilled and unskilled labour. The skilled workers will include welders and machinery operators and workers who will typically require recognised qualifications and 10-15 years experience in pipeline/marine terminal construction in order to ensure the required quality of work. The semi-skilled workers will require more than 5 years experience. Unskilled workers will require no prior construction experience, but are likely to be required to be literate.

Given the relatively long duration of the construction phase, it is expected that there will be opportunities for skills transfer within the workforce. Skills development will, however, be given additional priority during the operational phase. All workers will receive additional skills such as health and safety training and job specific training (eg defensive driver training). All workers will have a minimum of five days HSE awareness training. In addition, Site Foremen/supervisors will receive an extra 3-5 days training on HSE.

Procurement of goods and services during construction

The construction of the marine terminal will require a variety of goods and services. The goods and services that each contractor will require will not be known until after the contracts are awarded, but will typically include:

- catering services to camps and construction sites;
- laundry services to camps;
- security services at camps and construction sites;
- supply of vehicles[1] (including dump trucks, font-end loaders, tractors, trailers, bulldozers and cranes);
- provision of food supplies (indirectly through catering services);

[1] All vehicles will be required to meet the BTC Project standards.

- supply of construction equipment including: compressors; back hoes; bending, bevelling and cutting rigs; drills; generators; ground breaking equipment; road rollers; side booms; pumps; welding machines; X-ray equipment; water tanks etc;
- provision of construction materials including: aggregates/sand; concrete; building materials; local produce; timber and equipment hire.

Indirect benefits and impacts

This employment of local labour will generate the following indirect benefits:

- increased demand for goods and services as a result of increased available income;
- generation of skills and experience that may assist people to secure other employment;
- demonstration that employment can be managed in a fair and transparent manner;
- reduced cost to the project, as local workers do not need to live in construction camps;
- improved community relations.

There are a number of potential negative impacts associated with the employment of local labour. These impacts (listed below) are however considered to be insignificant alongside the benefits that will be delivered to local settlements.

- Workers may give up their normal employment (formal, self-employed or informal) for higher-paid temporary employment during construction of the marine terminal. This can result in the loss of longer-term livelihoods. However, households are considered best able to make decisions about their future wellbeing. The responsibility of the project will be to provide clear information on the limited timescales of employment opportunities.

- Other family members such as children may take over work (eg agricultural work) during the construction period. If children do take over work responsibilities, this could affect school attendance.

- Employment may change the socio-economic status of individuals and disrupt relationships within a settlement. The magnitude of this would depend on the relative size of the income earned by the worker. However, this potential impact is considered insignificant in contrast to the tension that would result should recruitment practices not be open to all.

- Wage levels could potentially be pushed up where there is a shortage of labour, making the contracting of seasonal cultivators too expensive for local landowners. This is not considered to be a significant impact, given the low percentage of temporary labour that will potentially be employed on the project.

- Increased spending power of employees may temporarily increase the cost of local supplies. Again, given the relatively low percentage of the local population that will be employed on the project, this is not considered to be significant.

12.13.1.2 Optimisation objectives

The Project aims to maximise the opportunities for local employment while recognising the varied skill sets necessary for the construction and operation of a marine terminal and other limitations such as the project timetable, financial constraints and safety of the project.

In order to maximise opportunities for employment, the Project have committed to the following objectives:

- to increase employment of country nationals, and in particular, directly affected settlements and residents of the district and province in which the project is being developed. This will be subject to availability of appropriate skills;

- to establish recruitment procedures that are transparent, public and open to all regardless of ethnicity, religion, gender or sexual orientation;

- to manage expectations on employment opportunities, by providing information on the level and duration of employment requirements.

12.13.1.3 Optimisation measures

The following optimisation measures will increase the prospects for the employment of and procurement of local goods and services by Turkish nationals, particularly those living in settlements directly affected by construction and residents of Ceyhan and Yumurtalik districts and Adana province. There are six types of optimisation measures, namely:

- those that will optimise local employment opportunities;
- those related to the integrity of the recruitment process;
- measures to deliver skills to employees;
- measures needed to manage public expectations on employment;
- measures for sourcing local goods and services;
- measures for employment during operation.

Optimise local employment opportunities

Contractors will be required to maximise the use of local workers on the project. Priority for unskilled work will be given to settlements directly affected by the marine terminal. Semi-skilled workers to be sourced from Adana Province, where possible. Skilled workers will be sourced from within Turkey. Expatriates will only be used where their particular skills and experience are required.

Opportunities for direct employment will be constrained by the availability of appropriate skills and levels of experience. Taking into consideration the apparent lack of skilled workers in the vicinity of the marine terminal, the focus of the employment strategy will be on the unskilled and semi-skilled workforce. The Project expects that:

- the majority of the unskilled workforce (target of 90%) will come from the settlements directly affected by marine terminal construction;

- a high proportion of the semi-skilled workforce (target of 80%) will come from districts within Adana province;

- a high proportion of the skilled workforce will be Turkish nationals (target of 80%).

Should the Contractor feel that these targets cannot be met, then s/he must provide a thorough explanation and justification, to BOTAŞ, of the reasons why this is not possible.

The Project will agree on an Employment Strategy with the Contractor that will include the expected level of local input for all categories (skilled, semi-skilled and unskilled). This strategy will be written into the agreement of the Contractor and providing levels are acceptable to the Contractor such that financial and contractual limitations are not impaired, performance will be monitored against these targets. This information will be made available to third parties upon request. If these targets are not met, the Contractor will be required to provide justification to the Project.

12.13.1.4 Integrity of recruitment and employment process

The Project will develop an Employment Strategy. This strategy will be discussed and agreed with each Contractor. It will then be publicised and used as a benchmark for recruitment practices throughout the project. All sub-contractors employing more than 50 staff will be required to apply a similar strategy.

The employment strategy will include the following:

- Recruitment Principles explaining how they contribute to the Project Objectives;
- Mechanisms by which preferential recruitment of local workers will be achieved (refer to Box 6.8 in Section 6) for the currently preferred process for recruitment of workers);
- Mechanisms to ensure that the recruitment procedure is transparent and that there is no discrimination;
- Procedures to monitor the compliance of the construction Contractor with employment principles.

The Project will develop an employees' policy to cover employees and contractors involved in the project. This will include commitments to pay and conditions, collective bargaining, working hours, wage levels, maternity leave etc, that is in accordance with Turkish regulations and all relevant international standards (eg International Labour Organisation Conventions). Skills development and an alcohol and drug policy and disciplinary procedures will also be included. The policy shall ensure that wages for local workers are equivalent to what would have been paid to those doing similar work in Turkey and are above the statutory minimum wage.

Information provision

Providing information on employment opportunities and the recruitment process is an essential component of the employment strategy. It is required in order to manage expectations and allow individuals to decide whether they wish to apply for temporary employment. It is also required to ensure that all those eligible have access to the recruitment process.

The Employment Strategy will be distributed to all affected settlements, at least one month prior to the date of recruitment. This will include information on the projected number and duration of employment opportunities, recruitment procedures, pick-up points, the location of recruitment centres and dates of recruitment. This will be done via the following: distribution of leaflets and posters via local representatives (eg the Muhtar or mayor and sub governor);

placing information in public locations (eg bus stops, markets and coffee houses) and distributed orally (eg through the mosque). The Employment Strategy will also be disclosed in local and national media and on the Project web page.

The employment strategy will also be publicised to sub-governors and Muhtars in Ceyhan and Yumurtalik districts, as well as to all sub-governors throughout Adana province. All governors throughout Turkey will be informed. This will help to ensure that the employment strategy for the project is publicised as far a field as possible.

Procurement of local goods and services

As far as possible, the Contractor will source goods from local suppliers both through preferential letting of sub-contracts to local firms (subject to availability and cost) and purchasing of goods from local retailers.

The Contractor will be required to develop a purchasing strategy that outlines the percentage cost of goods to be sourced from suppliers in the districts and province in which the proposed BTC Marine Terminal is located. An outline of the way in which the Contractor will monitor the actual goods and services purchased at the district and provincial level will also be included. Agreed targets for local content will serve as key performance indicators against which the Contractor's performance will be monitored. The purchasing strategy will be required to adhere to all BP HSE policies and procedures.

Advance information on contracting opportunities will be provided to local businesses through trade and industry chambers and local business organisations in Adana Province, particularly Ceyhan and Yumurtalik districts.

Skills enhancement

Induction will be required prior to construction. The Project will carry out training of Contractors on the Project HSE and social policies and on requirements and plans including the SMMP for this project. All workers will have a minimum of five days HSE awareness training. In addition, Site Foremen/supervisors will receive an extra three to five days training on HSE.

The Contractors will be required to develop training strategies for potential employees. Training strategies will include provision for both pre-construction skills training and on-the-job training and identify the contribution that this strategy will make to the local content of employment (directly affected settlements, district, provincial and national levels), and also how it will improve the future employability of workers. The strategy should therefore focus on skills that are transferable, such as language and management skills, or where there is a future market in the local area (eg construction, driving etc).

12.13.1.5 Benefits during operations

The employment strategy for operations will be developed during the construction phase. It will be based on the objective of increasing the proportion of local staff employed in the operating company in line with a long-term view of 100% local operation. Expatriate and non-local staff will be selected for their training and coaching skills as well as their proven HSE and technical expertise.
The employment strategy for operations will be made public through the Project web site and through disclosure in settlements close to permanent facilities.

During operation, it is currently estimated that a total of 200 workers will be employed; of this total, approximately 90% will be skilled and semi-skilled workers and 10% will be unskilled workers.

12.13.1.6 Residual impacts

Expectations regarding employment on the BTC Project are high. The number of people who will gain employment on construction of the BTC Marine Terminal (approximately 400) although substantial, is low when compared to the population of the directly affected settlements and surrounding area. Residents in directly affected settlements who are unsuccessful in their job applications to work on the marine terminal construction, or within the camps, may become frustrated when they do not gain employment. It is also likely that residents of settlements just outside the directly affected project area will be frustrated that they will not get priority access to jobs despite their relative proximity to the proposed BTC Marine Terminal. These unmet expectations could create resentment towards those who succeed in getting jobs, and also towards the Project.

Measures to manage expectations regarding employment opportunities through the disclosure process of the EIA and also a wider communication strategy will help to reduce this potential impact.

12.13.2 Decreased access to fishing grounds

12.13.2.1 Impacts

Overview

The proposed BTC jetty development requires the establishment of a Security Exclusion Zone and a Manoeuvring Area, enforceable for the full life of the project. The exact coordinates and extent of these restricted areas is still being finalised. Any decreased access to marine resources within the restricted areas will, in the absence of mitigation, undermine the ability of fishing households to maintain their existing levels of livelihood.

Studies to assess the impacts of the Security Exclusion Zone and Manoeuvring Area on local fishermen are on-going. The fieldwork for these studies has recently been completed and the results thereof are undergoing final review. Compensation measures still need to be determined and the final results disclosed. The impact assessment results are, however, broadly in line with the conclusions reported in this document.
Causes of the Impacts

Loss of access to fishing grounds is a direct result of the establishment of the Security Exclusion Zone and Manoeuvring Area for the proposed BTC jetty. However, this restricted area is located within a larger 'Area of Operation' for the Toros Gubre Fertilizer Facility, operated by Tekfen Holding. This operating area, declared in 1983, encompasses the northern half of the Iskenderun Gulf and gives Tekfen Holding the sole right to undertake business operations in this area. Within the 'Area of Operation' a small zone is designated around the existing BOTAŞ jetty, referred to as the BOTAŞ Operating Zone (or Ceyhan Port Area)[1], where BOTAŞ holds the operating rights. The new jetty will require the Ceyhan Port Area to be extended in negotiation with Tekfen Holding.

[1] To prevent confusion between the Toros Gubre Operating Area and the BOTAŞ Operating Zone, the latter will be referred to by its other name, the 'Ceyhan Port Area'.

According to the Regulation of BOTAŞ (Ceyhan) Harbour (which designates the 'Area of Operation'), net fishing is not permitted in the following areas: existing BOTAŞ Marine Terminal, BOTAŞ Dortyol facility and Toros Gubre Fertiliser Facility zones. In theory, the extension of the Ceyhan Port Area does not therefore have any implications for net fishing, as the activity is already prohibited within this area. However, the reality is that net fishing (the main fishing method used among local fishermen) occurs regardless of the regulations (except in the Security Exclusion Zone and the Manoeuvring Area for the existing BOTAŞ jetty[1], see Box 12.8 and Box 12.9). Therefore, the establishment of the new BTC Security Exclusion Zone and Manoeuvring Area, where the prohibition on net fishing will be enforced, will bring to an end an activity, within this area, that constitutes an important source of livelihood for local settlements. This assessment therefore considers the impact on existing activities, regardless of legality.

Box 12.8 BTC Security Exclusion Zone

In accordance with Article 20 of Law No. 2565, a Security Exclusion Zone of 400m from the physical borders of the jetty will be proclaimed. This exclusion zone is an essential tool in ensuring the security of the jetty. As such it is considered a high security area falling under the protection of the Turkish Coast Guard. No unauthorised vessels will be permitted in this area.
(Source: BOTAŞ, Ankara office)

Box 12.9 BOTAŞ Manoeuvring Area

The borders of the Manoeuvring Area for the existing BOTAŞ jetty are stipulated in the Regulation of BOTAŞ (Ceyhan) Harbour. In order to ensure the safe manoeuvring of tankers approaching and leaving the jetty, the CMT Port Captains have recommended that the Ceyhan Port Area be increased to encompass a distance of 1.8 km (one nautical mile) from the physical borders of the new jetty. This will require an amendment to the existing port regulation. The Ceyhan Port Area will stretch along the full length of the Golovasi coastline. The following key conditions apply to the Manoeuvring Area:

- Marine traffic (eg local fishing vessels) will be permitted to travel in transit through the Manoeuvring Area. However, when tankers approach the jetty from the direction of Golovasi, all marine traffic will be halted for at least 2 hours.
- In accordance with the Regulation of BOTAŞ (Ceyhan) Harbour, fishing by line and net will be prohibited in the Manoeuvring Area.

(Source: BOTAŞ Ankara office and existing Marine Terminal)

Direct impacts

Understanding the impacts of decreased access to marine resources requires an assessment of the following:

- the relationship between the location of the Security Exclusion Zone and Manoeuvring Area and the fishing grounds used by local residents;

[1] In the Manoeuvring Area (for the existing BOTAŞ MarineTerminal), line fishing is currently being allowed as it poses less of a safety risk than the nets, which are harder to move out of the way in the event of a tanker arriving or an unexpected emergency.

- the importance of the impacted fishing grounds for the settlement/s concerned (ie frequency with which they are used and type and extent of marine resources found within the fishing ground/s);

- the extent to which fishing contributes to livelihoods on the household, as well as the role it plays as a 'way of life'.

Discussion of these issues is based solely on information gathered from local fishermen. As such, the findings outlined below are considered to be preliminary, and will be revised on completion of the additional studies currently underway.

Loss of Fishing Grounds Due to the Security Exclusion Zone and Manoeuvring Area: the fishing grounds in the Study Area can be divided into four main zones (as defined by fishermen from Golovasi, Sahil Sitesi and Incirli):

- **Zone 1:** between the Sugozu Thermal Power Plant and the existing BOTAŞ jetty exclusion zone (approximately 4.5km along the coast and up to 1km offshore from Golovasi). Used primarily by fishermen from Golovasi and Sahil Sitesi.

- **Zone 2:** between the existing BOTAŞ jetty exclusion zone and the Sugozu Thermal Power Plant (approximately 4.5km along the coast and from 1km to 3.5km offshore. Used primarily by fishermen from Golovasi and Sahil Sitesi.

- **Zone 3:** between the Toros Gubre Fertiliser Facility jetty exclusion zone and the existing BOTAŞ jetty exclusion zone (approximately 1km along the coast and up to 3.5km offshore). Used primarily by fishermen from Incirli and Karatepe.

- **Zone 4:** over 3.5km offshore and is used primarily by non-local fishermen.

A map illustrating the zones identified by local fishermen as the main fishing grounds is provided in Section 10, Figure 10.29.

The restricted areas (see Box 12.10) associated with the new jetty will impact on Zones 1 and 2, both of which are used almost solely by fishermen from Golovasi and Sahil Sitesi.

Box 12.10 Establishment of Restricted Areas: Feedback from Local Residents

During consultation, the fishermen expressed concerns about the impact of new restricted areas on their fishing activities. Based on experiences of the Security Exclusion Zone for the existing BOTAŞ Terminal, one fisherman stated that *"the Ceyhan Marine Terminal exclusion zone makes net fishing impossible … if another jetty is established here, the fishing will die"*.
(Source: Fishermen from Incirli and Golovasi)

Value of Impacted Fishing Grounds: the value of the impacted fishing grounds for Golovasi and Sahil Sitesi is reported to be high. This is linked to the following factors, as defined by local fishermen:

- Zones 1 and 2 are used solely by fishermen from Golovasi and Sahil Sitesi. This is based, in part, on an informal agreement with fishermen from Incirli that both settlements will fish predominantly in areas off their own coast. Fishermen from Incirli and Karatepe therefore fish mostly in Zone 3 (See Figure 10.22). Zone 4 is too deep for fishing with the nets used by local fishermen.

- Zone 2 is the most important fishing ground for Golovasi/Sahil Sitesi. It is here that they catch shrimp (*karides*), which have higher market value than other marine species[1]. Shrimp are also a localised species, thus adding to the value of Zone 2. *Lahos*, the most expensive type of fish, was only reported to be caught by fishermen from Golovasi/Sahil Sitesi, although it is not clear whether they are caught in Zone 1 or 2. Although shrimp are also caught in Zone 3, the sizes of the catches are reported to be much lower in this area.

- Zone 1 is the second most important fishing ground for Golovasi and Sahil Sitesi as it is here that fish can be caught all year round, even though the fish caught are not as valuable as the shrimp caught in Zone 2.

- Zone 1 and 2 offer the advantage of being much closer to Golovasi/Sahil Sitesi than Zone 3. This saves on fuel costs and enables the fishermen to throw their nets in the early evening (between 17h00 and 19h00), returning home for the night, and collecting their nets the following morning (between 7h00 and 10h00).

In summary, Zone 1 and 2 are of high value to the fishermen from Golovasi and Sahil Sitesi, both in terms of their respective resources, their nearby location and the near-exclusive use that they have of these fishing grounds. Based on information currently available, a reduction of the total area of Zone 1 and 2 is therefore considered significant in terms of the potential impact on livelihoods.

Implications for Securing a Living: according to local authorities and fishermen, the Iskenderun Gulf has experienced a decrease in fish stock since the early 1980s, due to increased environmental pollution, trawling and over fishing. Although the current fish stock is reported to be low, people still depend heavily on fishing as a main source of income. This is due, in part, to limited alternative forms of livelihood and the role fishing plays as a 'way of life'. Thus, in spite of decreased stock and the impact this has on fishing as a viable form of livelihood, the loss of fishing grounds in Zones 1 and 2 are likely to result in the following:

- **Decreased percentage contribution of fishing to household income:** fishing was reported as a main source of livelihood (subsistence and income-based) for 10 of the 26 households surveyed in Golovasi. Alternative sources of livelihood are limited within the project area due to limited and unevenly distributed agricultural land, decreased agricultural productivity and limited wage income opportunities.

- **Decreased ability to pay back debt owed:** high levels of debt were consistently reported among fishermen. This is understood to be a result of high equipment and fuel costs. As a result, profit margins from fishing are low. Already, decreased sources of livelihoods and the inability of the household head to care for the family is being linked to an increase in depression and alcoholism in the Study Area (as reported in the settlement and household surveys).

- **Increased fuel costs:** diminished fishing grounds are likely to force fishermen from Golovasi and Sahil Sitesi to travel further a field in search of alternative fishing grounds. This will result in increased fuel costs. In the context of high debt levels and low profit margins, the increased fuel costs may contribute to a loss of income earned from fishing, thus potentially impacting on levels of livelihood within the household.

[1] There is a river inlet at Golovasi which increases nutrient levels near the river mouth, creating a better environment for shrimp production. The fishing grounds off Golovasi are also considered to be less polluted than Incirli, where local residents complained about the environmental impacts of the Toros Gubre fertilizer facility.

Box 12.11 Impact on Livelihoods: Feedback from Local Residents

During consultation fishermen expressed concern about not being able to fish as a result of the proposed Security Exclusion Zone and Manoeuvring Area and how this would prevent them from meeting their families' needs. In the words of one fisherman *"how will we be able to look into the face of our children if we cannot feed them?"*

"Even though we do not profit much from fishing we still have the hope that the sea will continue to feed us. Even if we catch one or two fish a day we can give food to our children. This is not possible from any other place".
(Source: Fishermen from Golovasi)

Implications for Way of Life: for many of the villagers, fishing is a 'way of life' not only a source of income. For many families, fishing has been a family business for generations. Fishing is an activity in which the whole family is often involved (women and adolescents fix and clean nets). Loss of fishing as a form of livelihood could undermine cohesion of the family as a working unit. Furthermore, each boat has, on average, 3-4 fishermen from different households. This allows for a sense of community and helps establish relationships and support networks essential for survival among poorer settlements.

Box 12.12 Impact on Way of Life: Feedback from Local Residents

"We have grown up on boats and have been on the sea since childhood. Fishing allows us to have a different lifestyle to those that are occupied by agriculture."

"Sea is love to me; I am addicted to it; I cannot live on the land."

(Source: Fishermen from Golovasi)

Suitability of Available Fishing Alternatives

Formulating appropriate mitigation requires consideration of a range of options and an analysis of their suitability. Table 12.7 provides a summary of two options, including key constraints that need to be taken into account in the development of mitigation measures.

Table 12.7 Development of Mitigation Measures

Option A: USE OF ALTERNATIVE FISHING GROUNDS WITHIN 5 NAUTICAL MILES OF THE PROJECT AREA	
KEY CONSTRAINTS	• Size of catches reported to be lower in Zone 3 due to pollution from existing developments (eg Toros Gubre Fertilizer Facility) and lack of river inlet encouraging breeding of shrimp. • Gentleman's agreement with fishermen in Incirli that settlements will focus on fishing grounds closest to their stretch of coast. • Increased fuel costs due to diversion around existing and proposed jetty on route to Zone 3 or further up the coast. • Increased time required to travel to alternative fishing grounds. Preliminary findings suggest that the fishing boats are able to travel, on average, 3.5km per hour. • Boats do not have cabins for over-night purposes. As a result, fishermen need to return home for the night (after throwing nets) and return in early morning to bring in the catch. • There are reportedly a high number of fishermen already fishing off the coast of Yumurtalik (eg fishermen from Haylazli, Deveciusagi and Yumurtalik).
Option B: TRAVEL FURTHER AFIELD, BOTH OFF-SHORE AND/OR FURTHER UP OR DOWN THE COAST	
KEY CONSTRAINTS	• Boats are small and not considered sufficiently sea-worthy or powerful to travel long distances. • Fishermen do not have the necessary equipment for fishing in deeper seas. Nets used by the local fishermen cannot be used in deep seas. • Fishermen are concerned about travelling further a field in case of bad weather and due to the lack of docking facilities (for security reasons, boats are prohibited from docking at the BOTAŞ and Toros Gubre jetties, regardless of weather conditions. The same is likely to apply for other jetties in the Iskenderun Gulf). • Increased fuel costs associated with travelling further a field. • Boats do not have cabins for over-nighting purposes, thus limiting the distance they can travel. • Fishing grounds of Sarigol, Adalar, Arap bogazi and Dalyan (south-west of Yumurtalik) already utilised by Haylazli and Deveciusagi.

12.13.2.2 Impact summary

Direct impacts

Diminished access to marine resources as a result of the establishment of the Security Exclusion Zone and the Manoeuvring Area is considered to be certain, although the extent of this impact is yet to be confirmed. These impacts will mostly affect fishermen in Golovasi and Sahil Sitesi, although a decrease in their fishing grounds may force them to fish in Zone 3 (in spite of the gentlemen's agreement with Incirli and Karatepe), thus putting pressure on the livelihoods of other fishermen[1]. Decreased access to marine resources, as a result of the BTC Jetty, is considered to be *long-term*.

Impacts on livelihood assets

An assessment of the livelihood assets within Golovasi and Sahil Sitesi, shows that decreased access to marine resources will result in a loss of the following types of assets:

[1] The occurrence of this impact depends on the extent to which fish in Zones 1 and 2 are localised species and therefore likely/unlikely to inhabit other fishing grounds. Shrimp, as a localised species, will be put under additional pressure in Zone 3, if the fishermen from Golovasi/Sahil Sitesi fish increasingly in this area.

- **Natural capital:** although marine resources could increase as a result of the breeding refuges created, access to resources within the existing fishing grounds will be decreased. In the absence of suitable alternatives (eg use of other fishing grounds with equivalent resources), this will result in a loss of natural capital.

- **Financial capital:** decreases in the size of daily catches will impact on revenue earned.

- **Social capital:** loss of earnings and decreased access to a subsistence livelihood has the potential to result in: 1) decreased social cohesion at the household level (as a result of increased pressure to secure a living and potential increases in depression and alcoholism); and 2) decreased social cohesion on the settlement level (as a result of increased conflict over scarce resources, and changes to distribution of wealth within the settlement, with associated changes to existing power structures).

- **Human capital:** a deterioration in health as a result of emotional stress (possibly including depression and alcoholism) and decreased levels of nutrition (in the absence of disposable income for food provision and possibly decreased fish for consumption).

In the absence of appropriate mitigation, a loss of capital assets will occur, resulting in a reduction in the current levels of livelihood for fishermen in Golovasi and Sahil Sitesi. Based on information currently available, households can be divided into two groups according to their ability to adapt to this change.

- Ability to adapt is predicted to be *very low* for fishermen/households where fishing is their main or sole source of income, for poorer households (with less savings and higher debt levels), for older fishermen (who are less able to pursue alternative livelihood options) and for fishermen lacking transferable or alternative skills.

- Ability to adapt is predicted to be *low to medium* for fishermen/households for whom fishing is a secondary source of employment, who have accumulated savings as a financial buffer, who are younger and therefore more able to start anew or who have transferable or alternative skills. The current lack of alternative sources of livelihood is a crucial factor in this rating.

12.13.2.3 Significance criteria

A decrease in access to marine resources will be considered significant if the proposed mitigation measures are insufficient to maintain the original standards of living of the affected households[1].

12.13.2.4 Mitigation objectives

The Project has committed themselves to the following mitigation objectives:

- To ensure that appropriate compensation is provided to fisherman affected by the establishment of the Security Exclusion Zone and Manoeuvring Area, as determined in the land acquisition process;

[11] Following completion of the additional studies, appropriate methods and targets for monitoring standards of living will be developed. These will take consideration of other factors contributing to decreasing fish stock, and ensure that monitoring activities address BTC related issues.

- To ensure continued access to port facilities;
- To prioritise local residents for employment opportunities, subject to availability of appropriate skills.

12.13.2.5 Mitigation measures

The following mitigation measures have been developed to meet these objectives:

Compensation Strategy

A procedure for compensation will be developed and targeted at registered fishermen who incur a loss of livelihood as a result of the construction and operation of the BTC Marine Terminal.

Continued Port Access

The Project will maintain access to the Golovasi Port throughout construction and operation.

Employment Strategy

Contractors will be required to maximise the use of local workforce on the project. Settlements directly affected by the marine terminal will take priority, followed by workers in Ceyhan and Yumurtalik districts and then Adana province.

Training Strategy

Contractors will also be required to develop a training strategy for potential employees, thereby maximising the opportunities for employment of local residents.

12.13.2.6 Residual impacts

The successful implementation of the above mitigation measures will assist in minimising the impact of the Security Exclusion Zone and the Manoeuvring Area. In keeping with World Bank requirements, the land acquisition process will include procedures for internal and external monitoring, as well as measures for addressing any feedback received.

12.13.3 Tourism

12.13.3.1 Impacts

Although tourism is not a major economic activity in the project area[1], there are households that do rely on it as a source of income, notably in the settlements of Golovasi, Sahil Sitesi, Incirli, Sugozu and Hamzali. There are also recreational facilities at the existing BOTAŞ terminal[2], although these are only accessible to BOTAŞ employees, their families and guests.

Factors that could affect the suitability of the project area for tourism activities include visual impacts of the marine terminal, including tanker traffic (operation phase), minor noise impacts (construction phase), and increased industrialisation in the project area (permanent).

[1] Only 8% of the total households surveyed identified tourism is a source of income.

[2] These facilities include a private beach, a guesthouse with approximately 50 rooms and a restaurant.

These predicted impacts (with the exception of increased industrialisation) are likely to affect the settlements of Incirli, Golovasi, and Sahil Sitesi and the BOTAŞ tourist facilities. However, both Incirli and the BOTAŞ tourist facilities are located within an existing industrial context, with tourism continuing regardless. As a result, the development of the marine terminal is not expected to impact on tourism in these two areas. Incirli will also be shielded from the new jetty by the existing offshore facilities.

Although a similar continuation of tourism could be predicted for Sahil Sitesi, this area is currently secluded, quiet and relatively unspoilt, in spite of a view of the existing jetty less than 3km away. This reportedly has attracted a high number of secondary homeowners (approximately 150) who have built holiday houses in Sahil Sitesi, and who use the location as a retirement and holiday retreat (see Plate 12.9).

In terms of visual impacts, Sahil Sitesi has been identified as the only settlement likely to experience major visual intrusion from the marine terminal development. The concern therefore exists that the visual impact will make the area less desirable as a tourist destination and reduce the number of tourists and amount of revenue generated.

Factors mitigating this concern include the following:

- the small proportion of surveyed households that identified tourism as a source of income (only one household in Sahil Sitesi and four in Golovasi) (this includes fishermen who occasionally earn money by taking tourists on boat-rides).

- a limited number of tourist facilities that stand to be impacted upon (two restaurants on the beachfront, both in the process of being completed, and a restaurant and small camping ground in Golovasi) (see Plate 12.10 and Plate 12.11).

- although an annual estimate of between 600-1,500 visitors come to Golovasi and Sahil Sitesi, including secondary home owners, there is a possibility that the increased industrialisation will not deter them.

In spite of these mitigating factors, the possibility exists that, as a result of the construction of the new jetty, secondary homeowners will not frequent Sahil Sitesi for as long or as frequently as they currently do[1]. This could have implications for revenue spent in Sahil Sitesi and Golovasi. However, increased industrialisation in the area will increase the size of the clientele for restaurants and local retailers, thereby compensating for the potential decrease in tourist and secondary homeowner trade. Furthermore, with the construction camp currently located within BOTAŞ property and therefore within commuting distance of Sahil Sitesi, the construction workers could also add to revenue spent in this settlement, although this would need to be in agreement with local residents[2]. Revenue from construction workers would, however, be a short-term benefit.

12.13.3.2 Impact summary

There will *definitely* be a permanent change to Sahil Sitesi as a result of the visual impacts associated with the proposed BTC Marine Terminal and increased industrialisation in the broader project area. The extent to which this will negatively affect tourist activities is currently unknown. However, using Incirli as a precedent (where tourism has continued in

[1] Results of the survey indicate that secondary homeowners come to Sahil Sitesi weekly or monthly, most commonly in summer between June and September.

[2] In the event that local residents agree to construction workers having access to local retail services, the behaviour of construction workers will need to be monitored by the community relations officers in order to ensure compliance with the stipulated Codes of Conduct for construction workers (see Section 12.8.2.4).

spite of adjacent industrial development), it is likely that tourism in Sahil Sitesi will carry on regardless. Should tourism and/or numbers of secondary homeowners decrease, this will only affect a very small proportion of households in Sahil Sitesi and local retailers in Golovasi. Increased industrialisation is, however, likely to bring additional clientele to the area, thus assisting households dependent on the tourist trade to adapt to this change.

12.13.3.3 Significance criteria

Impacts on tourist activities will be considered significant if there is a dramatic reduction in tourism activities following the construction of the proposed BTC Marine Terminal. The significance of any reduction will however, be assessed against the ability of these households to secure alternative forms of livelihood.

12.13.3.4 Mitigation objectives

In order to minimise any potential impacts on tourism activities, the Project has committed to minimising noise levels to legally acceptable standards, as presented in Section 12.7. No measures exist for mitigating the visual impacts associated with the jetty.

12.13.3.5 Mitigation measures

Specific measures that will be carried out regarding noise levels are included in Section 12.7.

The Projects Participants have also committed to a number of mitigation measures that enhance the procurement of benefits by local residents. These measures will assist in ensuring that local residents are compensated for any loss in tourism revenue. These measures include the following:

Employment strategy

Contractors will be required to maximise the use of local workers on the project. Settlements directly affected by the marine terminal will have priority, followed by workers in Ceyhan and Yumurtalik district and then Adana province.

Training strategy

The Contractor will also be required to develop a training strategy for potential employees, thereby maximising the opportunities for employment of local residents.

12.13.3.6 Residual impact

No residual impacts are expected.

Plate 12.9 Secondary Homes in Sahil Sitesi, Adana

Plate 12.10 Restaurant in Sahil Sitesi, Adana

Plate 12.11 Incirli Camp Ground, Adana

12.14 INFRASTRUCTURE AND SERVICES

12.14.1 Impacts

This section addresses impacts to infrastructure and services as a result of the construction of the on-shore and offshore facilities, including the construction of the pipeline through BOTAŞ property. The main focus is on utilities (telephone, energy, water and sewage treatment) and access to services. Traffic and waste are dealt with in the TMP and WMP. Impacts on infrastructure and services, as a result of in-migration to the project area, are discussed in Section 12.8.3.

12.14.1.1 Utilities

Project plans can be summarised as follows:

- **Telephone:** during construction the project will use both landline and mobile networks. During operation, the project will be largely self-sufficient.

- **Energy:** energy requirements during construction will be relatively limited and will not impact on local settlement needs. Energy requirements will be sourced from the existing terminal supply. If surplus capacity is not available, the Project will apply for an extension to the supply serving the existing BOTAŞ Marine Terminal through the relevant authorities or use mobile generators.

- **Water supplies:** water requirements for the BTC Terminal will be supplied from a well, located approximately 20km east of the existing BOTAŞ Marine Terminal. Water will be transported via a 6-8 inch water pipe to the BOTAŞ property. An additional well and pipeline to transport water to the BOTAŞ property is currently under consideration. The main requirements for water will be for hydrostatic testing of the tanks and pipeline. Additional water will be required for the construction camp and construction site.

- **Sewage Treatment:** a domestic sewage treatment system is currently utilised by the existing BOTAŞ Marine Terminal. This system has spare capacity and will therefore be used to service the construction camp within the BOTAŞ property. In the event that existing capacity is exceeded, separate sewage treatment package units will be used, thus ensuring that the project is self-sufficient.

- **Waste:** waste management arrangements and provisions will be prepared by the Construction Contractor in compliance with the BTC Project Waste Management Plan (See Appendix C3).

Potential impacts of the use of utilities during construction are the following:

- An overload of the existing service in particular for water supply and electricity (impacting on regularity of electricity supply).

- Accidental or planned disruption to utilities during construction.

- Potential for ‘spin-off’ benefits to local settlements from infrastructure required by the project.

12.14.1.2 Services

There will be no direct impacts on the education services, as all construction workers will be employed on a single status basis. The construction camp will also have its own health facilities and will not use the health services of the local settlements. Nevertheless, there are potential impacts associated with health provision and the perception of health provision by the local residents. These include the following:

- a strain on community relations close to construction camps due to the superior health provision provided to the construction workforce;
- diseases brought to the area by construction workers;
- blocked roads (as a result of traffic congestion) preventing access to health care or extended time to reach health care.

The first two of these impacts have been considered under community relations (see Section 12.8.1).

12.14.2 Significance criteria

Infrastructure and services have been identified as being of poor quality by the local residents: the telecommunications network is underdeveloped, electricity and water supply is irregular, and sewerage and waste facilities have limited coverage.

Given these factors, impacts on infrastructure and services are considered to be significant if:

- there is a permanent loss or improvement in the quality of the infrastructure or services that are used by local residents;
- there is a temporary disruption in infrastructure or services that impacts adversely on the ability of local residents to undertake subsistence or economic activities;
- there is a temporary or permanent change in access to emergency services.

Significance criteria used during the assessment are provided in Table 12.8. As for all aspects of the environment, mitigation was developed with the objective of preventing all significant impacts.

Table 12.8 Criteria for Identifying Significant Impacts on Infrastructure and Services

Infrastructure / Services	Significance Criteria
Roads	• Closure of roads that prevent public transport services from continuing. • Diversion of more than 500m for pedestrians or livestock.
Transport	• See TMP (Appendix C5).
Utilities (including telecommunications, water supply, sewerage, electricity)	• Any reduction in the quality of the services without three days prior notice. • Any planned reduction in the services for more than 12 hours without appropriate alternatives where risk assessment has shown this to be detrimental to health or livelihoods.
Emergency services	• Any reduction in the quality or access of the services, including time to hospitals.
Benefits	• Improvement to infrastructure or services, either temporary or permanent.

12.14.3 Mitigation objectives

The Project has committed to the following mitigation objectives:

- 'No permanent net loss' of infrastructure and services to local settlements;
- No significant temporary impacts on infrastructure or services;
- No reduction in services available to local settlements due to the use of that service by the Project.

The Project will seek opportunities for settlements to mutually benefit from the activities undertaken, and infrastructure required, by the Project.

12.14.4 Mitigation measures

12.14.4.1 General mitigation measures

The majority of the measures to be implemented are the responsibility of the Contractor. As such, detailed requirements will be included in the agreement of the Contractor. The Contractor will be required to incorporate them into their management plans and ensure that they are included in any sub-contracts. These requirements, plus additional mitigation measures that are the responsibility of the Project, are identified in this section.

The mitigation strategy is fundamentally the same for all types of infrastructure and services.

To minimise disruption to infrastructure and services, the Project will:

- use appropriate construction techniques, examples of which have been identified in Section 9. Although the contractors will be able to suggest alternate or additional measures, they will be required to demonstrate that these measures will achieve the mitigation objectives as efficiently as those specified in this EIA;

- work within specified working areas. These will be determined prior to construction and demarcated using fencing, marker posts or signs for roads. Any failure to stay within the terminal site and temporary construction areas will be a serious disciplinary offence that may result in termination of employment.

To avoid significant temporary impacts on infrastructure or services the project will:

- identify potential disruption in advance;

- where the planned disruption will last beyond 12 hours the Project will carry out a risk assessment in consultation with the affected settlements and appropriate authorities to identify the impacts that this disruption would cause. Where the risk assessment shows that there will be a risk to health or impact on livelihood of affected settlements, appropriate alternatives will be put in place, or the job will be re-planned;

- communicate the timing and duration of any disruption to infrastructure to settlements at least three days ahead of the disruption (see Section 10.10.2).

Should infrastructure or services be disrupted without warning, the Project will:

- wherever possible, inform the authorities of the affected settlements within two hours of the disruption occurring, providing the reason for the disruption and the expected duration of the disruption. Within one day, written information will be provided to the settlement Muhtar/s (or mayors of the district centres) providing details of the disruption, of measures already taken and any additional measures that will be taken to assess the damage caused as a result of the disruption. The CLO will ensure that there is an announcement in the mosque and that notices are posted on the settlement notice board, such that the local residents are informed of the disruption;

- ensure that it has the resources to respond to any such disruption within time periods that will not result in damage to the health or safety of those affected.

To avoid any net loss of infrastructure or services, the Contractor will:

- undertake a pre-condition survey to assess the existing condition of the working area (including local roads used by construction traffic). Photographs will be taken as a record of condition. Local authorities will be requested to verify these photographs and be provided with copies;

- agree a timetable of any planned disruption with the authorities and local residents. Should the disruption be judged by the affected party to result in a loss in livelihood, the validity of the claim and necessary compensation will be determined;

- where possible, immediately repair any damage to infrastructure caused by the construction. Such work will not cease until the infrastructure has been repaired to its pre-construction condition. All such restorations will be completed within two months of completing substantive work in that area. Should this timescale be expected to be exceeded, a plan for the work will be prepared and presented to the affected settlements and local authorities;

- resolve all complaints from settlements regarding interruption to infrastructure or access to resources within seven days. Where this is not possible, a response plan will be agreed with local settlements within this timeframe;

- inspect all restoration measures after completion of the works and periodically during the lifetime of the project. Any deterioration related to inadequacy of construction and restoration activities over the first year will be restored by the Contractor.

To avoid any net loss of infrastructure or services, the Project will:

- monitor the compliance of the Contractor with the above measures;
- hold post-construction community meetings to discuss any residual problems.

Specific additional measures for mitigation of impacts on particular infrastructure and services are identified in the following sections.

12.14.4.2 Additional mitigation measures for utility services

- The Project will hold discussions with the utility service providers to identify if the use of the services by the project will result in a reduction in service received by local settlements.

- In cases where utilities need to be disrupted for less than 12 hours the CLO will inform the leaders of local settlements within 2km of operations, ensure that there is an announcement in the mosque and that notices are posted on the community notice board at least three days in advance of disruption.

- Where deliberate disruption to utility services (telephone, electricity, water) for more than 12 hours is required, the Project or the Contractors will liase with the responsible Authorities/Suppliers to provide alternative supplies. Where alternative supplies cannot be provided, a risk assessment will be carried out including assessment of the impact that a disruption to services will have on the livelihood of local residents. This will require consultation with the affected settlements. Where the risk assessment demonstrates either an impact on livelihoods, or where the disruption is not acceptable to local residents, the job will be re-planned.

- Subject to the full and effective implementation and maintenance of the BTC Project's Waste Management Plan, the implication for existing waste management and disposal facilities will be fully considered in the finalisation of the Contractor's waste management arrangements.

12.14.4.3 Potential benefits: infrastructure spin-offs

The Project is likely to require the construction of new infrastructure and may require the enhancement of some existing infrastructure. There are examples where projects have successfully managed to work together with government, civil society and local residents in order to pool skills and resources so as to achieve sustainable benefits for local residents. For the marine terminal, areas where these 'spin-offs' may be realised include the following.

- **Water:** boreholes may be required to provide water to the construction camp. Such systems may be able to be left or extended to benefit local residents.

- **Roads:** upgrades of local roads may be required to facilitate increased traffic to the marine terminal during construction.

- **Schools:** facilities and resources at local schools may be increased to accommodate the children of foreign, skilled workers. This may result in opportunities for more local pupils to attend.

- **Health Facilities:** the Contractor will be prepared, at the request of the Project, to hand over camp medical facilities to neighbouring settlements at the closure of the camp.

In these cases, enhancements will, where possible, be linked into existing infrastructure plans in order to contribute to long-term enhancement of the infrastructure in the project area. Where these enhancements are beyond project requirements, the Project will look to partner with other agencies to share the costs and to ensure that the infrastructure will be appropriately maintained such that benefits are maximised over the long term.

Prior to construction, the Project will develop a strategy for taking such opportunities forward where possible.

12.14.5 Residual impacts

The mitigation measures identified above, implemented correctly and in full, will minimise the majority of significant impacts on infrastructure and services. However, in a project of this

size there may be instances when infrastructure and services are disrupted without notice and prior planning. Where such disruptions affect income generation (subsistence and income-based), this will need to be dealt with through the compensation and Complaints Procedure.

Significant additional benefits for local residents may be able to be realised by the Project should they be successful in linking project infrastructure needs into existing infrastructure plans.

BIBLIOGRAPHY

Ref 1 World Bank (1991) Environmental Assessment Sourcebook. World Bank.

9 THE MARINE TERMINAL

9.1 INTRODUCTION

The proposed BTC Pipeline will culminate in a crude oil storage and export terminal (the BTC Marine Terminal) which is to be located near Ceyhan on the Gulf of Iskenderun on the coast of the Mediterranean Sea (see Figure 9.1). The proposed terminal and associated facilities will comprise an integral part of the BTC Pipeline Project.

Owing to the complexity of the proposed BTC Pipeline Project, this EIA Report addresses the proposed Pipeline (Volume II) and Marine Terminal (Volume III) separately before presenting the overall findings of the integrated BTC Pipeline Project (Volume IV). This section of the Report describes the proposed BTC Marine Terminal and associated facilities. The proposed BTC Pipeline is described in Section 4. An effort has been made to assist the reader by presenting all pertinent information regarding the Marine Terminal and associated facilities within this section of the Report. However, the design, construction and operation of the Terminal is inextricably linked to that of the Pipeline, which has been comprehensively described in Section 4. In order to minimise extensive repetition, this section makes reference to the appropriate subsection of Section 4 when the subject matter is deemed to have been adequately covered in that section.

In the course of basic and detailed design, a number of strategic and design options have been considered for the BTC Marine Terminal. This has included alternative site locations, process configurations, emissions control and sources of raw water. The principal alternative options are discussed in Section 2. This section of the Report describes only the finally chosen concept (except where significant design options remain to be made, in which case this is identified).

9.2 GEOGRAPHICAL CONTEXT

The proposed BTC Marine Terminal is to be located on the north-eastern shores of the Gulf of Iskenderun (36°:53':00" north and 35°:56':06" east). It will be sited adjacent to the Iraq-Turkey Pipeline (ITP) Marine Export Terminal (hereafter referred to as the Existing BOTAŞ Marine Terminal).

The various components of the marine terminal will occupy a total area of approximately 135 ha. The elevation of the terminal complex site ranges from approximately 125m to 7m above sea level. This difference in height is a key feature of the site, as it will enable oil to be gravity fed from the oil storage tanks downhill to the export jetty.

9.3 SCHEDULE FOR PROJECT DEVELOPMENT

The main mobilisation will commence in Autumn 2002 with groundbreaking commencing in late December 2002. Construction of the BTC Marine Terminal is scheduled to last approximately 20 months. Commissioning is scheduled to commence in October 2004 with normal operation scheduled to commence in February 2005. The schedule for the sequencing of the remaining project activities is presented in Figure 9.2.

Figure 9.1 The Location for the BTC Marine Terminal at Ceyhan

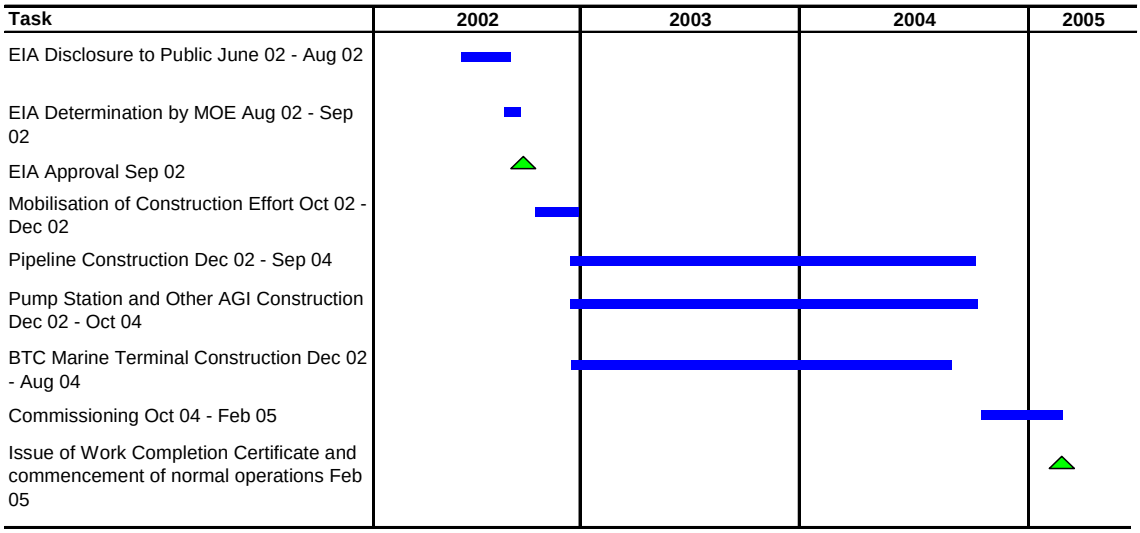


Figure 9.2 Anticipated Schedule to Project Completion

It is anticipated that the BTC Marine Terminal and its associated facilities will have a lifetime of approximately 40 years and that they will be decommissioned thereafter in accordance with international standards in place at that time (see Section 9.8).

9.4 DESCRIPTION OF THE BTC MARINE TERMINAL

9.4.1 Facilities overview

An overview of the overall BTC Pipeline Project is presented in Section 4 of this report. The BTC Marine Terminal essentially comprises two sets of facilities:

- Ceyhan Export Terminal, comprising seven 150 800m^3 crude oil storage tanks plus associated receiving facilities, loading lines, administration and control buildings.

- Ceyhan Marine Facilities, comprising a fiscal metering station, a jetty capable of berthing two 300 000 DWT tankers simultaneously and facilities for loading oil on to the tanker.

An aerial view of the overall layout of the BTC Marine Terminal and proposed facilities in relation to their immediate surroundings is presented in Figure 9.3. A schematic of the principal terminal activities is depicted in Figure 9.4.

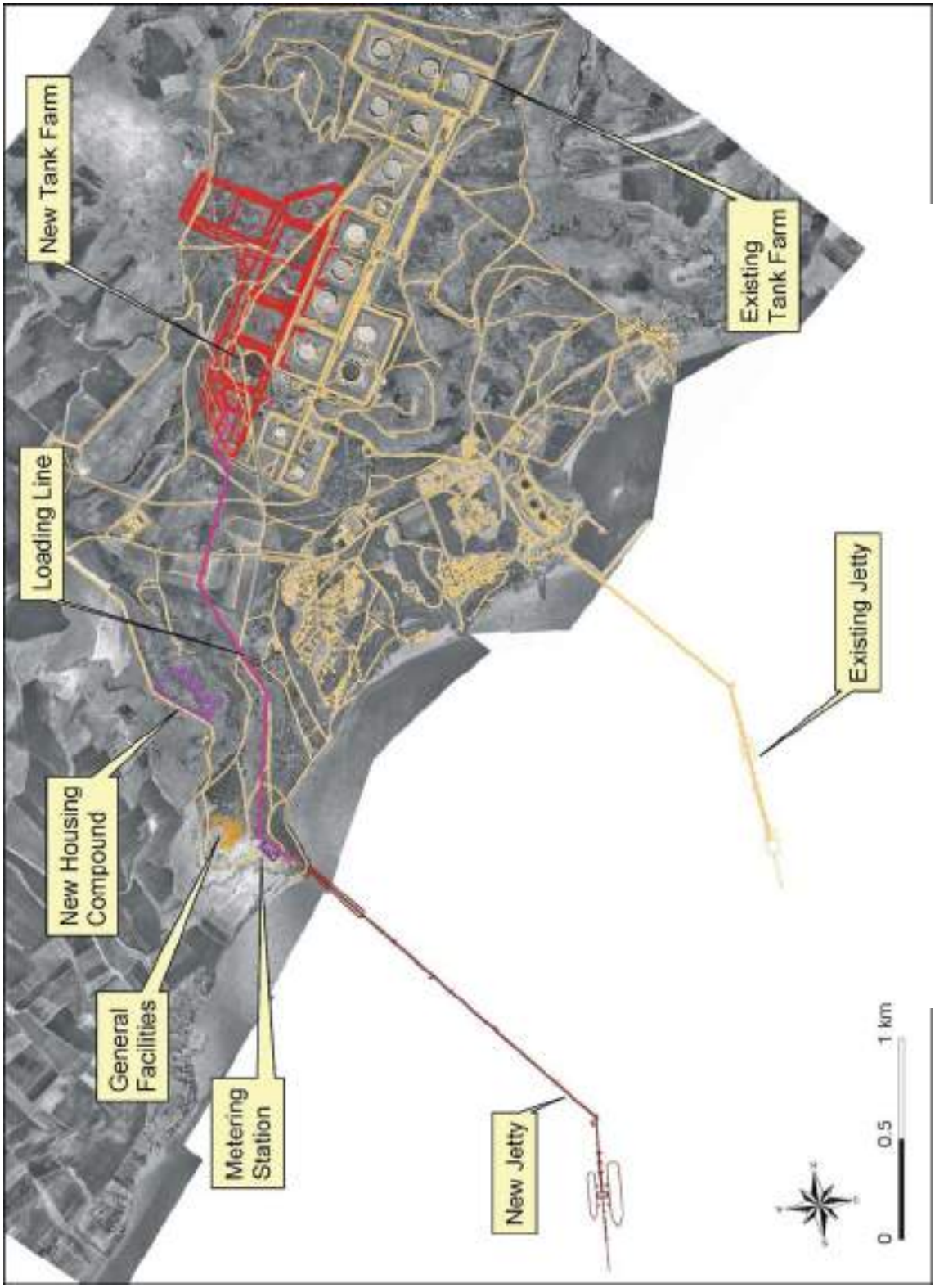


Figure 9.3 Aerial view of the BTC Marine Terminal Site

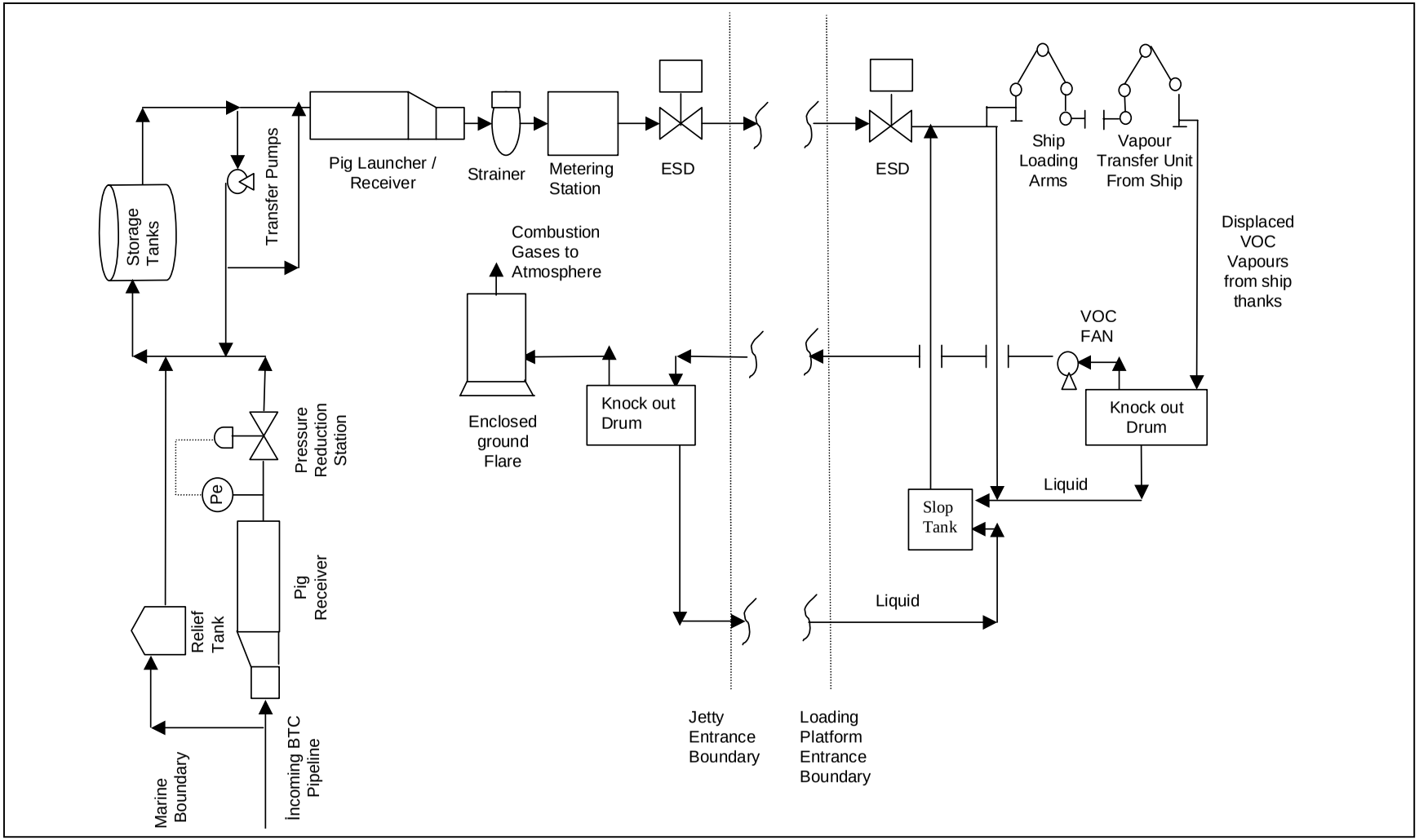


Figure 9.4 Schematic for BTC Marine Terminal

9.4.2 Receiving facilities

The Receiving Facilities serve as the interface between the continuous operation of the BTC Pipeline and the intermittent operation of the crude oil export shipping operations.

The incoming 34 inch (850mm) nominal diameter BTC Pipeline will enter the BTC Marine Terminal boundary from the north, close to the location of the proposed Tank Farm. The total area occupied by the Pipeline Receiving Facilities and Tank Farm is approximately 65ha.

The Receiving Facilities will regulate the pressure of the incoming crude oil stream such that the oil can be stored in tanks at atmospheric pressure. The Receiving Facilities will comprise the following components:

- Pig Receiving Unit;
- Surge Relief System;
- Terminal Pressure Reduction Station;
- Wax Handling System.

9.4.2.1 Pig receiver unit

Since the receiving facilities constitute the end of the BTC Pipeline, the Pig Receiver will receive pigs that have been launched down the final stretch of the pipeline from Pressure Reduction Station IPT1 (see Section 4).

The Pig Receiver will be designed to receive pigs of various types (see Box 4.1, in Section 4). Calliper and displacement pigs will be run down the Pipeline during start-up of the pipeline. Since the ACG crude is a waxy crude, frequent runs (possibly once or twice per week) with scraper pigs are foreseen. The pig receiver unit will therefore be fitted with an appropriate wax removal system. At certain time intervals (approximately once every 5-10 years) intelligent pig runs will be performed for assessing the integrity of the BTC Pipeline (see Section 4).

9.4.2.2 Surge pressure relief system

To safeguard the integrity of the final stretch of the BTC Pipeline (from Pressure Reduction Station IPT1) and the downstream BTC Marine Terminal facilities, the Terminal will be fitted with surge pressure relief valves, which will release any excessive pressure caused by transient flow conditions in the pipeline upstream of the Terminal. The Terminal will also be equipped with a surge Relief Tank, which has the capacity to hold the maximum quantity of oil that may be released during any foreseeable transient situation (such as failure of the pressure reduction system at IPT1 or unscheduled valve closures). Once normal operations are resumed, the contents of the Relief Tank will be pumped to the Terminal Storage Tanks for onward transfer to the export jetty. The Relief Tank will be of the cylindrical, vertical type according to API Standard 650. It will have a fixed conical roof design but will be fitted with an internal floating roof to minimise fugitive emissions of hydrocarbon vapours. Its dimensions will be 33m in diameter and 16m high, with a net working volume of 11,100 m^3. The relief tank will be bunded to accommodate 110 % of the net tank volume. It will occupy an area of approximately 0.60 ha.

9.4.2.3 Terminal pressure reduction station

The BTC Marine Terminal operates at relatively low pressure (the Storage Tanks operate at atmospheric pressure). The incoming BTC Pipeline on the other hand operates at significantly higher pressure reflecting the hydraulic head associated with a 120km final stretch of pipeline dropping in elevation from 1,350m to 120m above sea level. The Terminal Pressure Reduction Station serves as the interface between these two systems. It comprises a battery of pressure control valves that control the downstream pressure by regulating the flow of oil in the incoming BTC Pipeline.

From the Pressure Reduction Station the oil is routed to the storage facilities (see Section 9.4.3).

9.4.2.4 Wax handling system

ACG crude, which is anticipated to be a major constituent of the material transferred through the pipeline, has a wax appearance temperature of 37.7ºC. Since the temperature of the material in the pipeline will be below this temperature for much of its length, it is anticipated that waxes entrained in the crude oil will solidify and form lumps within the fluid. Also some of the wax may solidify on the internal walls of the pipe, thereby effectively reducing its diameter. For this reason, regular scraping will be required in order to control wax build-up in the pipeline. As set out in Section 9.4.2.1 above, a Pig Receiver will be incorporated into the design of the Terminal Receiving Facilities to catch pigs that are launched down the final stretch of the Pipeline. The wax handling facilities will deal with the wax gathered from the Pig Receiver.

A number of wax handling schemes have been evaluated. The currently favoured scheme involves re-injecting the wax into the main crude oil stream for onward transfer to the Storage Facilities before the scraper is removed from the scraper trap. The relatively small quantities of oily water effluent that will arise will be treated in the on-site oily water effluent treatment plant to the Project effluent discharge standards, which encompass World Bank standards and Turkish regulations (see Appendix D).

When the pig trap is opened, some residual wax will remain. The volume of this residual wax could be as much as 0.1 to 0.2 m^3 per each pig receiving operation. The pig and the residual wax from the trap will be dumped into a cleaning pit located immediately below the pig trap opening and will be pre-cleaned with diesel, which will dissolve any wax that adheres to the pig as well as the residual wax from the pig trap.

The dissolved wax/diesel mixture will be drained entirely to the Slop Oil Handling System (see Section 9.4.12) for re-injection back into the pipeline. There will be no residual discharges from this operation.

The final cleaning of the pig will be undertaken in the same cleaning pit, using a steam cleaner. Oily wastewater arising from this final cleaning operation will be routed to the oily water separation unit for treatment (by closing the valve to the slop oil handling system and opening the valve to the oily water treatment system).

9.4.3 Tank farm

The tank farm will be located approximately 127 to 135m above sea level to allow for natural gravity feed to the jetty and for loading. The land take for the tank farm will be approximately 65 ha**.**

The tank farm will comprise seven 150,800m³ capacity, floating roof storage tanks. Nominal dimensions of each tank will be 100m in diameter and 19.2m in height. The tanks have been designed to accommodate sloshing.

The footprint for each storage tank will be approximately 0.78 ha. The bunded areas for the storage tanks will be designed to accommodate 110% of the net tank volume and will be approximately 4ha in area. A suitable liner (potentially a bentonite mix) will cover the base of the whole tank farm to prevent any leakages through to the soil below. The liner material below the tanks will be designed in accordance with current practices for retaining fluids used in the EU landfill/hazardous waste industry. The permeability and thus integrity of the liner will be reported on and proof tested during construction, to ensure that it meets the specified requirements.

The base of each tank will be lined with 5cm sand and asphalt, which will be underlain with 10cm bitumen and gravel. A perforated steel pipe will pass beneath this layer within a layer of gravel and sand. Any leakages will be collected by the pipe and detected at the outlet. Beneath the pipeline the bentonite seal will serve to prevent leakages entering the soil. The sides of the tank bunds will be lined with sand asphalt, which is more stable in the hot weather conditions that prevail at the terminal site than most of the available alternatives.

The tanks will be constructed in accordance with American Petroleum Institute (API) 650. Each tank will be provided with six side entry mixers to prevent excessive wax formation of the crude oil within the tank.

Fixed foam rim seal fire fighting and external tank shell cooling systems will be provided in accordance with National Fire Protection Association (NFPA) codes (see Section 9.4.11).

Pipe headers and valve manifolds will be provided for loading and unloading individual tanks, as well as for transferring product between tanks. Two Transfer Pumps will be used to transfer product between the seven storage tanks and as boosters for when the transfer lines are being pigged.

Minimum safety distances between and around tanks will be in accordance with NPFA and Turkish Standards (1).

9.4.4 Transfer pipelines

9.4.4.1 Transfer lines

Twin 42 inch (1,050mm) nominal diameter loading lines, approximately 2.4km in length, will transfer product from the tank farm to the Jetty by gravity feed. Each transfer line (also referred to as loading line) will have provision for a pig launcher and pig receiver to allow bi-directional pigging of the lines. The two loading lines will be buried, and follow the route shown on Figure 9.5.

(1) The 'Charter on the Measures to be taken at the Works and Businesses which Utilise Flammable, Explosive, Hazardous and Detrimental Materials' issued by the Ministry of Labour and Social Security.

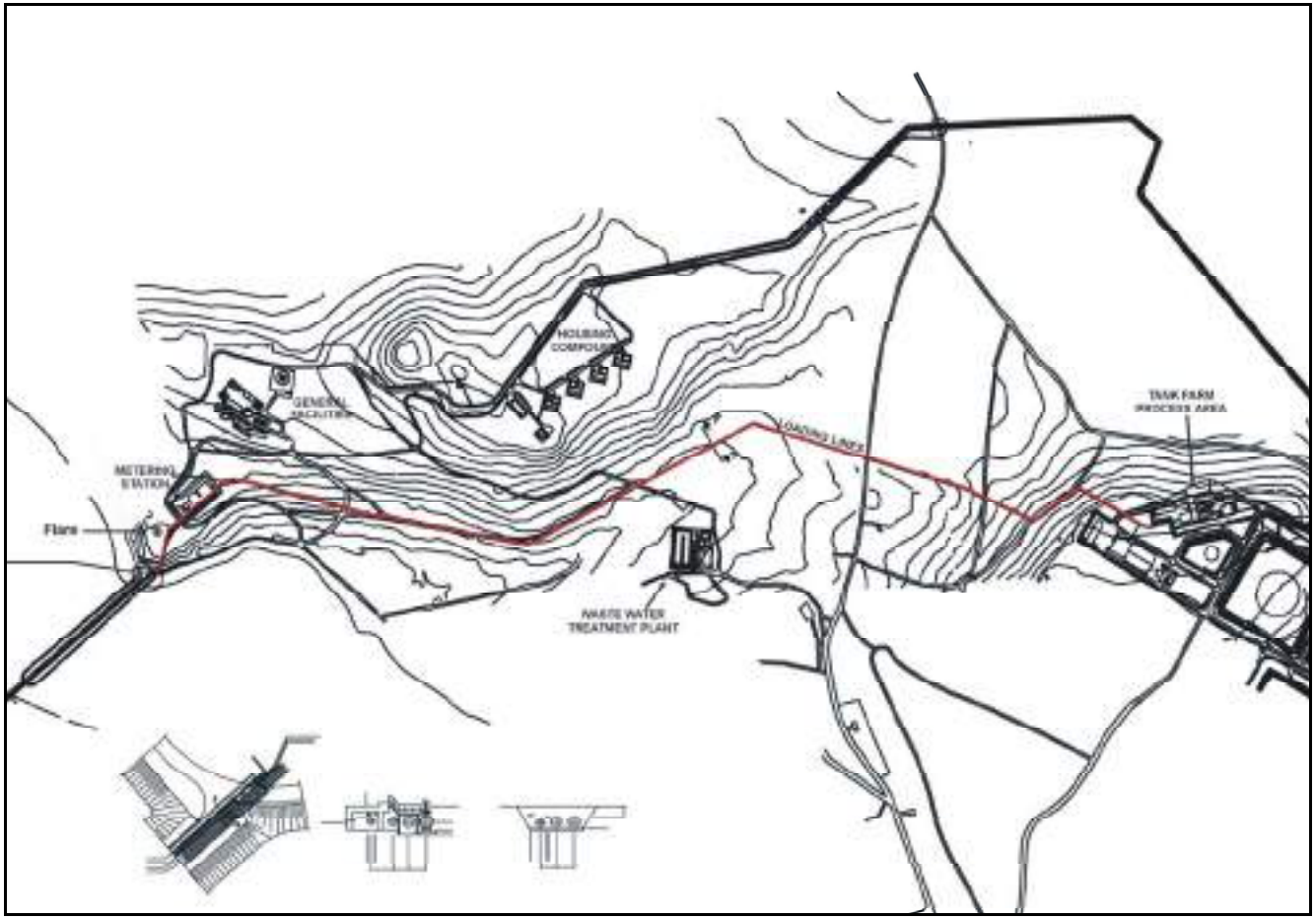


Figure 9.5 Transfer Pipeline Route and Cross-Sections

The loading lines will be laid on a sand bed in a trench that is approximately 2.3m deep, 5m in width at the bottom and 7.5m wide at the surface, see inset to Figure 9.5. Cathodic protection systems and a leak detection systems similar to that for the BTC Pipeline will be provided for the loading lines. Surge calculations have confirmed that no overpressure protection system is required for the loading lines onshore.

In the construction and operational phases of the project, the terms stated in the 'Regulation on Production, Packing and Sales of Natural, Mineral and Potable Water and Medical Water' issued in the Official Gazette dated October 18,1997 and numbered 23144 while using potable and utilisation water, and the terms stated in the circular dated April 29,1999 and numbered 5122 while supplying water by means of tankers, will be complied.

9.4.4.2 Inlet strainers

Three strainers, arranged in parallel configuration (one unit as stand-by), will be installed to protect the downstream process installations from being damaged by large solid particles entrained with the product stream. They will be tolerant to the wax content of the crude oil stream.

Maintenance and cleaning operations will be able to take place without interrupting the transfer of oil to the jetty. The sieve of the strainers will be removable to facilitate periodic cleaning.

9.4.5 Fiscal metering system

The fiscal metering system will measure sales quantities of crude oil and will be installed on the loading lines prior to the Jetty approach. The footprint of the metering system will be approximately 0.7 ha. The metering system will be of either the turbine or ultrasonic type or positive displacement (PD) type.

There will be two independent metering stations (one for each loading line). Each metering station will be equipped with seven identical meter runs, including one spare. A common shared meter prover will prove any one meter run at any time via the SCADA system. An inline analyser equipment will provide a record of quality of product being transported.

9.4.6 The Export Jetty

9.4.6.1 Introduction

Oil will be exported from the BTC Marine Terminal via tankers. A minimum water depth of 28m is required to allow safe tanker berthing and loading operations. The gently sloping seabed therefore requires a long jetty. The predominant wave direction in the bay is to the north and, to reduce the berthed vessels' exposure to these waves, the jetty will be orientated to the south.

From the shoreline, the twin 42 inch diameter loading lines will continue approximately 2,450m along the export jetty to the tanker loading berths located at the southeast end of the jetty. Two loading berths will accommodate vessels of between 80,000 DWT to 300,000 DWT.

A rock core approach causeway will extend approximately 365m from the shore in a south easterly direction, in order to gain a good depth of water. An approach trestle with pile foundations will then extend from this causeway, continuing to the southeast for approximately 1,610m. The approach trestle will then turn to face the south and continue for a further 390m to

the loading platform. An access walkway approximately 220m in length, orientated to the south, will then connect the last of the marine structures.

As stated above, the entire jetty will be approximately 2.45km in length from the shore to the loading platform. The two loading lines will run along the jetty, supported on trestles, to the loading area, transferring the crude oil for loading under gravity.

Tanker traffic will range between approximately 350 and 400 tanker movements per annum (1). The export jetty is shown on Figure 9.6.

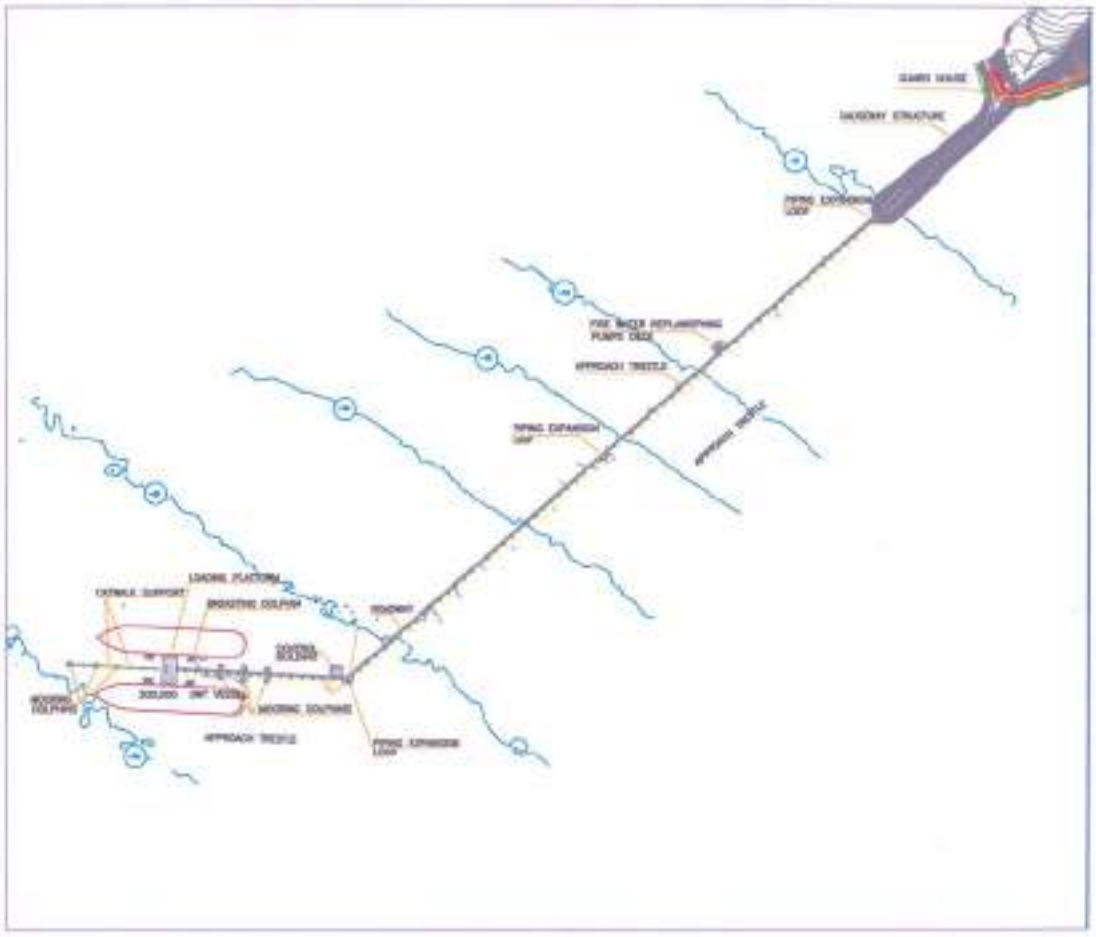


Figure 9.6 The Export Jetty Overview

9.4.6.2 Approach causeway

The approach causeway will essentially comprise a rock filled construction, with a coarsestone layer and rock armour protection (see Figure 9.7). A geotextile filter membrane laid on a stone cushion layer will separate the fill construction from the seabed to prevent settlement and the movement of material. A concrete roadway will be constructed on the causeway.

(1) Calculated in document ERM-REP-SEC-TRG-001 and advised by BOTAŞ.

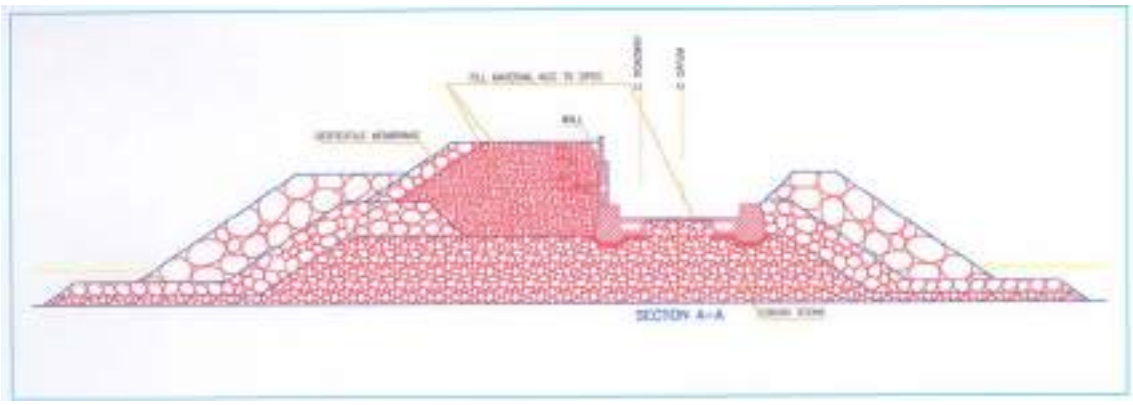


Figure 9.7 Cross section of the approach causeway

9.4.6.3 Approach trestle

The approach trestle, for access to and from the loading platforms, will be supported on steel piles and will extend from the seaward end of the approach causeway. The overall width of this structure will be 9m, 4.6m for the pipe systems and 4.4m for the roadway and pedestrian walkway.

A firewater replenishing pumps platform will be located approximately 870m from the shoreline. This will be a covered platform housing the water pumps and associated equipment. The platform will be supported on steel piles.

9.4.6.4 Jetty control building deck

The jetty control building deck will be located after the bend in the approach trestle. This will be an independently reinforced concrete platform supported on steel piles. Wastewater from the jetty control building will be collected in a $12m^3$ tank, and transported via pipeline to the new central treatment facility to be constructed within the Terminal complex (see Section 9.4.13.3).

9.4.6.5 Loading platform

The loading platform will be approximately 60m by 30m. The distance between the loading platform and moored vessels will be 5m (see Section 9.4.6.6 below). As with the approach trestle and control building deck, the loading platform will be supported by steel piles. The overlying concrete structure will be on two levels. The lower level will support the pipework and associated units and will be set at 4.55m above sea level. The upper level will be set at 7.3m above sea level and will support the surface deck structures.

9.4.6.6 Breasting dolphins

Breasting dolphins together with a rubber fender system will take the impact of the vessel when it berths and will hold the vessel against the berth on the ‘berthing line’. The ‘berthing line’ will be a set distance of 5m from the loading platforms, firstly to ensure that no contact between the tanker and the platform takes place, and secondly to provide a suitable distance for the effective operation of the loading arms.

Four breasting dolphins in total (two per berth) will be set at a level of 4.0m above sea level. They will typically be mass concrete structures with steel piles driven into the seabed. A rubber fender system will be mounted on the vessel side of each structure to take the impact of the vessel.

9.4.6.7 Mooring dolphins

These structures, designed to hold the tankers on the berthing line via mooring lines, will be essentially similar in design to the breasting dolphins described above (ie mass concrete structures supported on steel raking piles driven into the ground). The mooring dolphin sizes will vary in size from 6m x 6m to 9m x 9m and will be set at 7m above sea level and are 4m deep. They will be designed to resist the varying degrees of mooring line intensity from the berthed vessels.

9.4.6.8 Walkway

The walkway will connect the southernmost loading platform and the three remaining mooring dolphins. The catwalk will comprise a steel access walkway with an open floor grating deck, 1m wide with handrails on both sides.

9.4.7 General facilities

9.4.7.1 Administrative and operational support facilities

The administration facilities will occupy approximately 2ha in total and are listed in Table 9.1 below.

Table 9.1 Description of administration facilities at the marine terminal

FACILITY	DESCRIPTION	AREA COVERED
Central Control Building	A four-storey building located within the Administration area, will be the base for monitoring and managing the entire pipeline.	15m x 12m
Administration building	Includes a restaurant and kitchen.	30m x 12m, 30m x 12m and 48m x 7m
Warehouse	Will be used to store mechanical materials, electric materials, electronic materials, paint and office stationery.	50m x 10m
Workshop and vehicle maintenance building	Will be used to repair trucks, electronic and mechanical components	40m x 12m,
Flammable storage	For the open storage of flammable materials – the building will be a solid structure on three sides. The floor will be reinforced concrete and the building will have an arched roof	15m x 12m
Transformer and heating station	This will house the heating unit for adjacent buildings, the high and low voltage units for the entire general facility and its jetty and the emergency power unit.	25m x 13m
Guardhouse	Located at the start of the jetty	
Helipad	Located adjacent to the administration buildings	50m x 50m

9.4.7.2 Housing compound

Accommodation will be provided for BTC Marine Terminal staff in the on-site housing compound, which will occupy approximately 5.5ha. There will be four accommodation blocks and each block will be six storeys high. Each block will contain approximately 12 apartments. The apartments will house an average of four people each and the housing compound will therefore provide accommodation for 192 people. A villa will be provided for the Terminal manager and a guesthouse providing accommodation for 10 visitors is planned.

9.4.8 Power supply and electrical facilities

Power supply will be provided from the grid via a 900m distant connection. The receiving substation will be located in the tank farm area.

Emergency diesel generators will be located at the General Facilities area and the Tank Farm area. These will be of sufficient capacity to keep the Terminal operational in the event of failure of supply from the grid, thereby contributing towards reliable and smooth operations at the Terminal. The generators will be tested once per month (for approximately 30 minutes) for automatic starting during power supply outages.

9.4.9 Diesel fuel supply

Diesel fuel will be supplied via road tanker for the emergency generators. The diesel system will comprise a holding tank and diesel distribution pump. As described in Section 9.4.2.4, small quantities of diesel will also be used to clean the pig receiver assemblies following pig retrieval.

9.4.10 Water supply

The BTC Marine Terminal will have an anticipated water demand of 220m^3/day to supply the following requirements:

- potable drinking water;
- service water;
- fire-fighting water.

Table 9.2 presents the anticipated volumes of water required for operation of the BTC Marine Terminal.

A water supply, treatment and distribution system comprising the following components will be provided:

- two fire water holding tanks and one or more potable water tanks (see Section 9.4.11);
- separate modular water treatment packages for service water and potable water respectively.

The fire water holding tanks or reservoirs will be continuously kept full (on level control) to ensure continuous supply for the treatment facilities.

Service water will be distributed for irrigation and cleaning.

Potable water will be treated to comply with the World Health Organisation (WHO) Guidelines for Drinking Water Quality and Turkish Standard TS266 Water Intended for Human Consumption (see Annex D). It will then be distributed for drinking and cooking, sanitary and washing and for equipment and material cleaning.

Table 9.2 Anticipated Water Requirements for the Marine Terminal

USE	VOLUME [m^3/day]
Potable Water	
• General Facilities	24
• Housing compound	37
• Jetty	2
• Tank farm/fire fighting building	2
• Laboratory	-
• Shore facilities	-
• Guard House jetty	-
Sub-total Potable water	*65*
Service water	
• General facilities	18
• Housing compounds	43
• Tank farm	7
• Utility washing	7
• Tank washing	80
Sub-total Service water	*155*
Fire water	
Volume of water in fire water tank	2 x 3400m^3 reservoirs
TOTAL	**220m^3/day + Fire water**

Source: [Ref 1]

Hydrogeological investigations are ongoing [Ref 2] to confirm the most suitable source of water supply for the BTC Marine Terminal. Based on the findings so far, water will most likely be supplied to the Terminal via pipeline from new wells which will be located within the Burnaz Springs area to the south of Turunchi village, approximately 15km east of the existing BOTAŞ Marine Terminal. This potential source is currently used by the existing BOTAŞ Marine Terminal and several other industrial users in the area. It is considered to be a sustainable source of supply for the additional BTC Marine Terminal demand, but this is being confirmed via ongoing investigations and consultations. A water supply line, which will run parallel to the water supply line serving the existing BOTAŞ Marine Terminal, will need to be provided.

The water will be treated at the BTC Marine Terminal[1]. Once finalised, the selected water supply option will be subjected to Environmental Appraisal.

1 Water supply will be in accordance with the provisions of the Regulation on Production, Packing and Sales of Natural, Mineral and Potable Water and Medical Water, Official Gazette Pronouncement No 23144 of 18 October 1997 and the terms stated in Circular No 5122 dated 29 April 1999.

9.4.11 Fire fighting system

A fire fighting system will be provided for the BTC Marine Terminal in accordance with ASME B31.8. A fire ring main will be installed and hydrants will be connected to the main line along its length. At the tank bund area fixed foam/water monitors will be installed. A fixed foam system will be fitted for the storage tanks. Fire protection measures will be in accordance with NFPA, ASME and Turkish codes (see Section 9.4.3).

The fire fighting system will comprise the following main components:

- two fire water reservoirs (3,400 m^3 nominal capacity each, sized for two hours combined storage capacity);
- static pressure tank (50m^3);
- three fire water pumps;
- foam storage and dosing unit;
- ring main, hydrants, monitors and connecting lines;
- two fire water trucks with foam concentrate storage and monitors;
- hand held fire fighting extinguishers, hose reels etc.

In the event of a fire, any oil-contaminated firewater will be drained via the primary withholding pond upstream of the stormwater pond (rather than directly to site effluent discharge). This will enable the plant to retain any oil-contaminated firewater for subsequent treatment in the site effluent treatment plant before discharging from the site.

9.4.12 Slop oil handling systems

Any oil that arises as a result of equipment maintenance or plant malfunction is termed ‘slop oil’. This oil is collected in a closed slop oil handling system, comprising a collection tank, recycle pump and dedicated piping to enable all slop oil to be recycled back to the process.

Given the dispersed distribution of the various terminal facilities across the Ceyhan site, it is not feasible to have a single slop oil handling system. There is therefore a discrete slop system serving the onshore facilities and another serving the jetty. Both systems are functionally similar; oil arisings from batch operations or maintenance are routed to a dedicated slop tank and the contents are then pumped back into the system. There are therefore no oily waste arisings from batch oil loading operations, routine change-out of strainers, change out of pig traps or draining of process equipment or metering station facilities.

9.4.13 Drainage and effluent treatment and control

9.4.13.1 Effluents requiring treatment

Aqueous discharges arising from the operation of the BTC Marine Terminal are summarised in Table 9.3. These apply to normal operations, ie they do not include storm events when run-off volume flows will clearly increase and be highly variable.

Table 9.3 Approximate Operational discharges from the BTC Marine Terminal.

Discharges	primary holding pond	treated wastewater	Irrigation and/or soakaway	24 m^3 per day
	general facilities	treated wastewater	Irrigation and/or soakaway	24 m^3 per day
	housing compound	treated wastewater	Irrigation and/or soakaway	38 m^3 per day
	Jetty	treated wastewater	Irrigation and/or soakaway	1.5 m^3 per day
	guardhouse	treated wastewater	Irrigation and/or soakaway	1.5 m^3 per day
	Tankfarm	treated wastewater	Irrigation and/or soakaway	2 m^3 per day

A central wastewater treatment plant will process the wastewater from the terminal facilities. The wastewater treatment plant will comprise a primary holding pond, biological wastewater treatment plant and storm water pond. The collection of stormwater and sewage for Terminal onshore facilities is illustrated in Figure 9.8.

9.4.13.2 Oily water treatment

Drainage from contaminated or potentially contaminated areas (vehicle washing, machinery etc) will be treated in an oily water system. Oily water sources at the marine terminal will include the following:

- storage tank bunds (tank roof runoff, tank drain, storm water in the bund area etc);
- process area bunds at the receiving station and the relief tank bund;
- fiscal metering station bund;
- car park area.

The oily water treatment will comprise three stages of treatment in series:

- a grit chamber for solids removal by gravity separation;
- a gravity oil separator whereby surface oil separates out from the denser aqueous phase;
- a coalescer for accumulating dispersed oil droplets from the residual aqueous phase.

The treated aqueous phase will then be routed to the stormwater pond of the wastewater treatment plant (see Section 9.4.13.4). The oil phase streams from the separator and coalescer stages will be routed to the slop oil handling system (see Section 9.4.12). Solids collected in the grit chamber will periodically be collected, washed and spread onsite.

9.4.13.3 Sewage treatment plant

The sewage treatment plant will treat all black water and grey water arisings at the Terminal. The plant will be a self-contained activated sludge package unit and will discharge via the stormwater pond. Sewage collected at the Jetty will be tankered to the central sewage treatment plant.

9.4.13.4 Discharge of treated effluent

All liquid effluent leaving the onshore facilities will be discharged via the stormwater pond and then through a single discharge location. All effluents will meet the requirements of World Bank guidelines and Turkish Regulations (see Appendix D).

The stormwater pond will be designed to hold approximately 30 days effluent and surface drainage at normal flow rates. The philosophy will be to maximise ullage within the withholding pond and stormwater pond such that the plant operator will be able to discharge effluent from the site under (semi-batchwise) controlled conditions according to the quality of treated effluent within the stormwater pond.

Both the contents of the stormwater pond and the site effluent outfall will be fitted with spot sampling facilities. The activated sludge treatment and oily water separator outlets will also be amenable to sampling. A sampling regime will be established for routine on-site determination of oil-in-water and coliforms. The operator will therefore have the facility to control release of treated effluent from the site according to effluent quality.

Irrigation is the preferred option for treated effluent. The feasibility of this is subject to ongoing evaluation. In any event, the discharge will have the facility to be routed to a tilebed seepage shaft unit. The location of this shaft will be 1.5km distance from the unconfined aquifer so as to minimise the likelihood of contamination of groundwater. This is subject to further investigations and is described fully in Section 12 of this report.

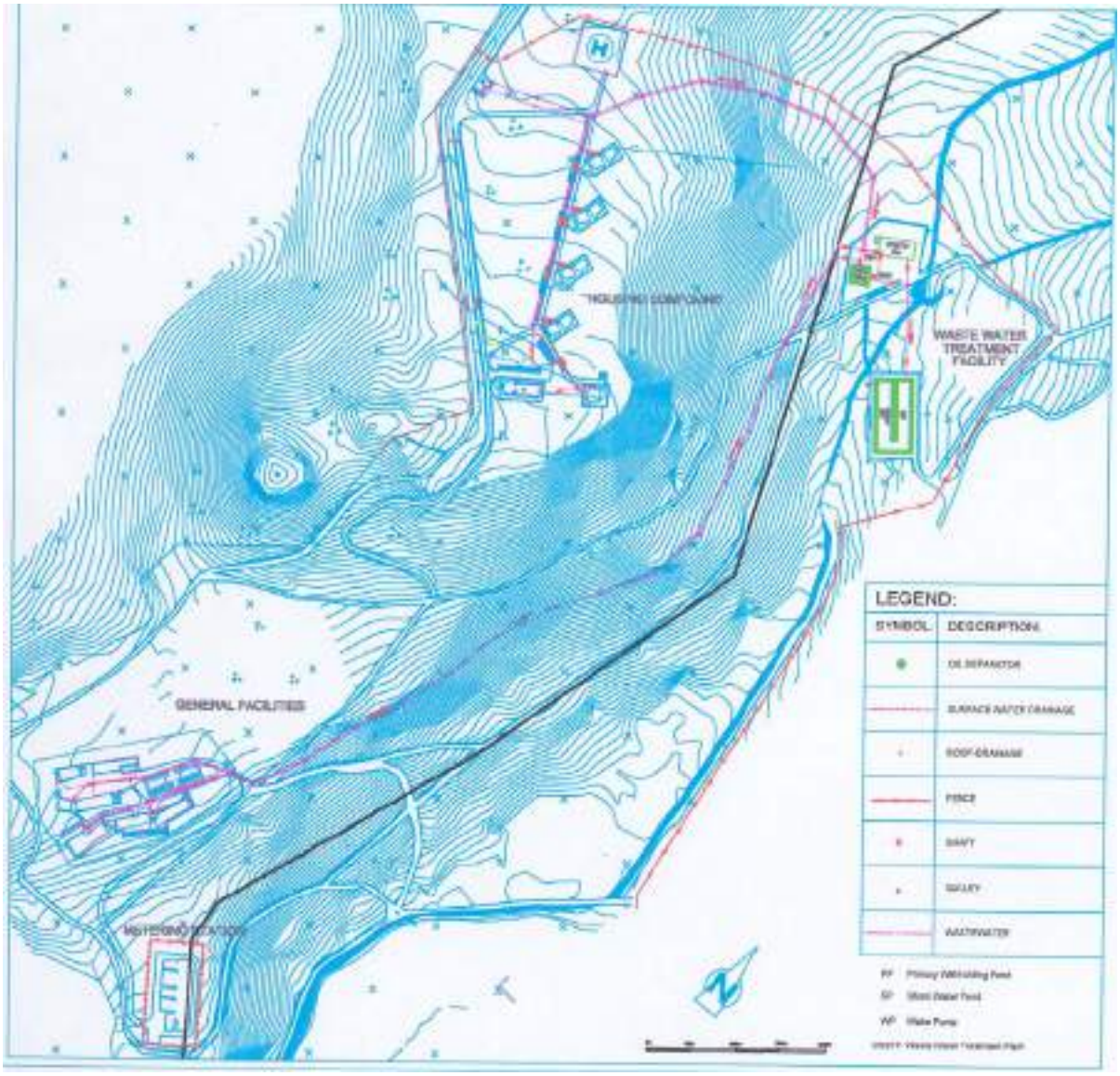


Figure 9.8 Collection of Oily water and sewage from onshore facilities

9.4.13.5 Effluent treatment of the marine facilities

There is no requirement for the treatment of ballast water, as only vessels with segregated ballast will be loaded at the jetty. Ballast water, therefore, will not be contaminated with oil and can be discharged directly to sea without treatment.

Surface drainage at the loading deck of the jetty will be routed to a dedicated oily water separator, which will treat the aqueous effluent to 5ppm residual hydrocarbons, within Turkish Regulations and World Bank guidelines. The treated effluent will be discharged to sea from the end of the jetty.

The oil phase will be routed to a slop tank, which will also collect any oil spillages in the vicinity of the loading arms. This tank will be periodically emptied by vacuum truck and the oil transferred to the slop oil handling system onshore. (See Section 9.4.12)

9.4.14 Enclosed Ground Flare (EGF)

During tanker loading the air space in the tanker's compartments will be displaced; this displaced gas will contain volatile organic compounds (VOCs). Consistent with international best practice, this displacement gas will not be discharged directly to atmosphere; rather, it will be routed to an enclosed ground flare (EGF) for combustion of VOCs prior to emission to atmosphere. The selection of EGF as the preferred method of VOC statement follows a detailed study (see Section 2.4.2.3).

The EGF will be located adjacent to the jetty entrance. A 24 inch (600mm) nominal diameter waste gas line, approximately 2,800m long, will be installed to convey up to 20,000 Nm^3h^{-1} of waste gas from the tanker loading area to the EGF.

The flare stack will measure 25m above ground level with a diameter of 10m and the system will have a landtake of approximately 0.16ha. Figure 9.9 shows a schematic diagram of a typical EGF and Figure 9.10 shows an example of an EGF once installed.

An airblower will enable the facility to achieve smokeless flaring and a pilot and purge gas system will be provided to assure safe flare operation.

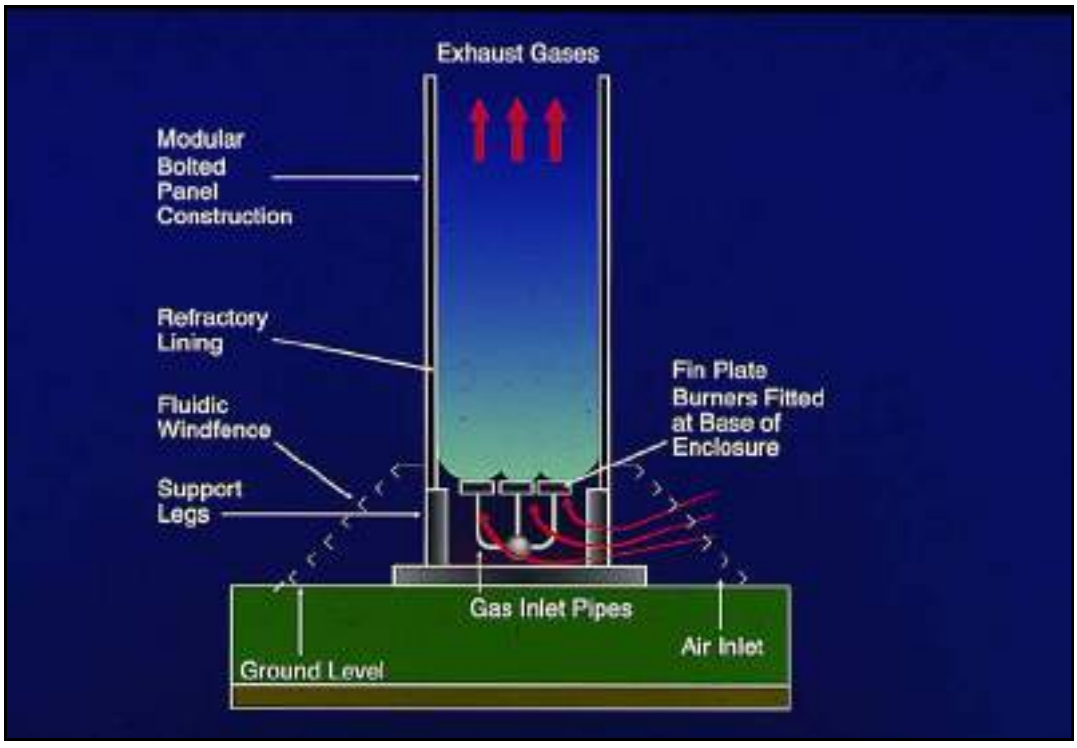


Figure 9.9 Schematic Diagram of a Typical EGF

Figure 9.10 Example of a Typical EGF

9.4.15 Lighting provisions

Outdoor lighting will be supplied from distribution boards that are located in the low voltage switchgear rooms in the Ceyhan Terminal area and at the Jetty.

Along the Jetty there will be street lighting fixtures, which are equipped with either high pressure mercury vapour lamps up to 150 W or fluorescent lamps up to 2 x 58 W. To minimise the voltage drop on the street lighting circuits of the Jetty distribution boards suitable for outdoor installation will be used. These boards will be equipped with two feeders for the lighting circuits and two additional socket outlets (400 V, three-phase, 32 A and 230 V, single-phase, 16 A) for general purposes.

The watch towers will be equipped with two swivel-mounted flood light fixtures, which will be equipped with high pressure mercury vapour lamps up to 400 W, mounted on a suitable location such as the balustrade.

The main supply for circuits for street lighting, flood lights and (if required) also for the circuits of shelter lighting and selected area lighting will be 400 V AC. To arrive at the lighting supply voltage of 230 V AC, each lighting pole will be equipped with an inside located fuse box; for shelters the lighting will be divided into three circuits.

All circuits with twilight switches will be provided with a manual override so that operation from the respective panel will be possible. Floodlights on the Jetty will also be operable from the central control system. Each floodlight circuit will be equipped with an additional switch,

integrated in the front door of the respective distribution board. The street lighting fixtures will be installed on poles with a height of 10m. The poles and all other steel construction elements provided for outdoor lighting will be hot dip galvanised. Lighting fixtures, equipped with fluorescent lamps up to 2 x 58W, for the illumination of selected areas will be installed on poles.

All lighting and socket outlet circuits will be equipped with moulded-case circuit breakers for switching operations and fault clearance instead of fuses. For circuits with a rated current up to 63 A, the use of miniature circuit breakers will be acceptable.

9.5 DESIGN CONSIDERATIONS

9.5.1 Designing for geohazards

The geohazards baseline for the site of the proposed BTC Marine Terminal is described in detail in Section 10.

An extensive geohazards study has been undertaken with the collaboration of a group of world class experts to characterise the seismic faults in the vicinity of the BTC Marine Terminal site for detailed design purposes [Ref 3]. This has enabled the Project to take full account of geohazards in the design of the storage tanks, the relief tank, the jetty and all the other facilities proposed for the Terminal site.

The study has provided the following:

- confirmation that the proposed site is acceptable for locating the Terminal and all associated facilities;
- confirmation that the Terminal facility can be economically designed and built using conventional and proven design and construction techniques;
- confirmation that the Yumurtalik fault is an active fault but that it does not pass through the proposed location of the BTC Jetty;
- the basis for establishing design parameters such as peak ground acceleration, seismic design for all major plant and equipment and design sloshing period for storage tanks.

9.6 CONSTRUCTION AND COMMISSIONING

9.6.1 Introduction

Construction of the onshore and marine facilities will be the subject of separate construction contracts. While the Construction Contractors will each be required to comply with all the requirements of this EIA Report, including the various Management Plans appended hereto, they will ultimately determine the precise approach they will follow to build and commission the plant and facilities for which they are responsible. Nevertheless, this section indicates the broad approach anticipated during construction and commissioning of the BTC Marine Terminal.

9.6.2 Construction camps and prefabrication areas

The construction camps for both Contractors (Onshore and Offshore) will be located north-west of the new tank farm area. They will be entered through a temporary gate beside the west main gate of the existing BOTAŞ Marine Terminal.

Water and power will be tapped from the supply of the pump station of the Yumurtalik - Kirrikale Pipeline and metered and will be compensated to BOTAŞ.

Disturbance to the operations of the existing BOTAŞ Terminal including transportation of construction materials through the Terminal will not be permitted, the following measures will be put in place.

- The entire area of the proposed BTC Marine Terminal will be fenced to avoid any disturbance to the operations of the existing BOTAŞ Terminal.

- The prefabrication yard for the offshore contractor will be located adjacent to the eastern main gate of the existing BOTAŞ Terminal. The size of the yard will be approximately 91,000 m^2. The yard will be fenced and have a separate entrance gate.

9.6.3 General good site management

The Construction Contractor will be required to adhere to the environmental, health and safety regulations and criteria, which are set out in the Environmental Specifications to Tenderers document, and in the relevant Management Plans produced as part of this EIA Report.

A number of pre-construction environmental surveys of the BTC Marine Terminal site and the vicinity will be undertaken in those areas where there is currently insufficient data to fully assess the significance of impacts, or where such data would enhance the ability of the Project to manage environmental issues during construction and operation of the Terminal. In a number of cases the results of these surveys could influence design options such as the location of water abstraction for example. Identified pre-construction studies to which the Project is committed are as follows:

- detailed botanical and faunal surveys will be carried out at specific locations, such as along the terrestrial route of the loading lines and the water supply line;

- due diligence soil sampling will be carried out in the vicinity of the proposed location for siting of the BTC Tank Farm;

- water supply sustainability studies (pump tests) will be carried out for potential groundwater sources for the Terminal.

9.6.4 Onshore construction programme

The construction programme will be of approximately 20 months duration, commencing in late December 2002. In this regard the Terminal's onshore facilities comprise a relatively simple set of plant and equipment. Having been the subject of in-depth field investigation and (ongoing) detailed design (with particular attention paid to designing for geohazards and mitigating

potential environmental and social impacts), construction of the onshore facilities will entail largely conventional and proven construction techniques.

Construction of the two loading lines will entail the same construction methodology and reinstatement standards as those adopted for the main BTC Pipeline, which is described in detail in Section 4.

Similarly, hydrotesting of the plant and pipelines will be undertaken to the same standards as those for the main BTC Pipeline with the anticipated added advantage of being able to use seawater as the test medium at the Terminal (see Section 9.6.6).

Reinstatement will be undertaken to the full provisions of the Reinstatement Plan.

9.6.5 Marine construction works (causeway and jetty superstructure)

It is anticipated that the marine construction works will take 20 months. The piling work is the main aspect of the jetty construction and will take approximately 13-14 months to complete. The causeway structure will be constructed first (taking three to four months) from the land. The rock core fill will be pushed from the shoreline until it is higher than the water level. Tracked machinery will then drive on the causeway and deliver the rock core fill, steadily progressing out to sea.

The material for causeway construction will be sourced from two licensed stone quarries within the District of Ceyhan. They are both located at a distance of approximately 16-20km from the BTC Marine Terminal.

As the approach causeway extends to the jetty, it is anticipated that barges will be used to lay the filter stone layer (although the actual method employed will be determined by the contractor). The armour rock layer is likely to be placed by crane, since this allows more accuracy than a barge. If barges are used, they will drop the rock from the base of the vessel. A mixture of both approaches may be adopted by finishing the armour layer by crane, as a last phase, once the majority has been placed by barge.

The suspension of fines from the core material into water will be reduced to the extent possible. The Environmental Specifications require that fines are removed and a certain grade of material is used. However, it is likely that there will be some release of suspended sediment.

The jetty will be piled by barge using a large crane (pile diameters are approximately 1.5 and 1.2m in diameter). One piling barge with two other support barges will most likely be required. The construction of the jetty will progress from the shore to sea. The piles will be driven through the sand and clay and seated onto the underlying rock base. Hence the piles will be driven until there is no more movement.

However, there is a possibility that some piles would be driven into the rock (no more than 5%). This would mean drilling into the rock and securing the piles with anchor bolts. The drilling would be through the concrete pile and the majority of the displaced sediment would be contained within the pile itself. There should be no displacement of sediment as the piles would be driven by hammering and not vibration piling.

For the superstructure and platforms both pre-cast concrete elements and *in situ* pouring are anticipated.

The control buildings will be built using conventional methods of construction.

9.6.6 Commissioning

Pre-commissioning and commissioning works for the BTC Marine Terminal will commence following the completion of mechanical works. Such activities are summarised in Box 9.1.

The pre-commissioning activity with the greatest potential for environmental impact is the hydrotesting of plant and pipelines.

The various plant and equipment comprising the BTC Marine Terminal, including the two loading lines, will require pressure testing prior to commissioning. Seawater, possibly inhibited with either corrosion inhibitor and/or oxygen scavenger chemicals, will be the primary medium used for executing the hydrotest.

The use of particular inhibitor chemicals will require the prior approval of the Project and the authorities. In any event, the concentrations of these chemicals will be very low (of the order of a few ppm).

It is expected that hydrotest water will, wherever practicable, be re-used from one pressure test to the next. Nevertheless, spent hydrotest solution will be discharged to sea at the end of the jetty. This will be done in such a way as to maximise dispersion.

9.6.7 Construction workforce

The following numbers of construction workers will be required for the construction of the BTC Marine Terminal:

Table 9.4 Estimates of Employment Opportunities during Construction

Task	Numbers of Workers	Skills Mix % (unskilled: semi-skilled and skilled)	Duration (peak employment for semi-skilled and skilled employees only)
BTC Marine Terminal – offshore			
Construction	120 workers	20:80	24 months
BTC Marine Terminal – onshore			
Construction	250 workers	40:60	30 months

9.6.8 Management during construction

Environmental issues will be managed during construction through implementation of the EMMP and support plans that are described in full in Appendix C. The requirements of these plans have been incorporated in the Invitation to Tender documents for the Construction Contractors and the successful bidder will have to adhere to them in full.

Box 9.1 Commissioning and Start-up Activities

Vessels
- dry out, if required, open vessel and install materials, if any;
- close after proper execution of closure permits.

Pumps and Drivers
- charge the lube oil, seal oil and oil cooling systems;
- operate equipment and make vibration, trip, governer and safe device checks and any operating tests and adjustments;
- obtain the assistance of a service engineer for technical advice during installation or start up, if desired;
- replace driver and equipment;
- maintain records, as required.

Tanks
- witness test and inspections as necessary (including hydrotesting);
- close after proper execution of closure permits.

Piping
- Hydrotest all piping;
- check pipehangers, supports guides and pipe specialities for hot settings and make minor adjustments, as necessary;
- install permanent filter elements, as required;
- verify that specified valve packing has been provided in valves installed;
- correct support, vibration and thermal expansion problems detected during commissioning;
- retorque all hot and cold service bolting during commissioning and start up, as required.

Electrical Power and Lighting Systems
- energize all substations after completion of all tests;
- check phase sequence, polarity and motor rotation;
- check installation of emergency power and lighting systems, including light intensity;
- provide a report for work completion.

Instrument Systems
- isolate or remove components for flushing operations and reinstall them on the completion of these operations;
- install any sealing fluids, as required;
- fully pressurize and energize the transmitting and control signal systems;
- provide a schedule of recorder charts.

Water Treatment
- make the necessary operating tests and adjustments to water treatment systems;
- obtain the services of a water consultant for operation, if required;
- purify potable water systems.

Waste Disposal
- operate all equipment and supply all chemicals and agents related to waste treatment;
- obtain the services of a waste treatment consultant for operation, if required.

Buildings
- operate heating, ventilating and air conditioning units and make all performance tests;
- obtain certificate and use, if required.

Miscellaneous Equipment
- check clearances on materials handling equipment;
- make all final adjustments during run-in and conduct any required performance tests;
- obtain a service engineer for technical assistance during installation or start up, if required;
- as required, obtain certification that all lifting and materials handling installations and other items of equipment comply with government regulations.

9.7 OPERATION AND MAINTENANCE

9.7.1 Operational philosophy

The following operational principles form the basis of the BTC Project:

- centralised remote operation and control of the entire Pipeline system, including the Pumping Stations and the Receiving Facilities of the BTC Marine Terminal (up to the Pressure Reduction Stations);
- simple operation with maximum possible support of automatic sequences;
- automatic control of unscheduled events by self-contained safety equipment;
- remote operation with LDS integrated into the SCADA System;
- the system operation shall ensure the delivery of the Design Flow Rates, with pump low flow / high flow protection and pipeline leak detection;
- slackline operation, while permissible, will be minimized to provide best conditions for leak detection; available equipment such as control valves will be operated to increase the inlet pressure in downstream stations to reduce slackline;
- controller parameters, setpoints, ramp function, software, etc will at all times be adjustable within a reasonable range in order to allow system tunings or modifications.

This operational philosophy will provide the basis for safe, reliable, steady state operations that are well within the design limits of the Pipeline system.

9.7.2 Maintenance philosophy

The basic principles of the overall maintenance philosophy for the BTC Project include the following:

- maximum use of easily maintained equipment;
- standardisation of the design of process facilities, instrumentation, procedures and documentation;
- maintenance of a spares inventory at suitable locations;
- training of personnel to effect a timely repair of failed equipment;
- use of vendor support;
- regular, preventative maintenance programs;
- written maintenance plans covering detailed maintenance procedures.

9.7.3 Marine operations

9.7.3.1 Introduction

An operational permit will be obtained from the Undersecretariat of Maritime Affairs after the general evaluation of the BTC Marine Terminal.

Operational restrictions will exist around both the existing BOTAŞ Marine Terminal and proposed BTC Marine Terminal. There is a Security Exclusion Zone around the existing jetty and there will be one placed around the proposed jetty as well which will comprise an area of 400m along either side of it (see Figure 9.11). In this Zone marine activities will be controlled and in some cases excluded (eg fishing, discharging of ballast, refuelling of vessels, waste disposal etc). There is a one nautical mile Operating Zone in the bay in which anchoring of ships, fishing and recreational activities are all prohibited. Access to the Security Exclusion and Operating Zones, and operations within them, will be controlled by the Ceyhan Harbour Authority.

9.7.3.2 Movement of tankers into the loading area

A total of around 350 additional tanker movements per year are expected once the proposed BTC Marine Terminal has become operational.

Tankers will approach the Terminal via the Gulf of Iskenderun. There are no designated shipping lanes within the Gulf [Ref 4]. Tankers servicing the BTC Terminal will then be directed to the loading jetty under the supervision of BOTAŞ tugboats and pilots (see further below).

The maximum speed at which tankers will be allowed to approach the jetty will be established and strictly enforced.

Marine traffic within the jetty area will be controlled by the Harbour Authority in accordance with the Ceyhan Harbour Operating Regulation. Ships entering the Bay of Iskenderun will be required to obtain prior permission from the Ceyhan Harbour Authority (which has a branch at the existing BOTAŞ facility).

9.7.3.3 Tanker loading

The design ship loading rate at each berth will be 9540m^3/h. Berthing, unloading and un-berthing of tankers from the loading jetty will therefore take up to 40 hours (assuming the largest design standard vessel of 300,000 DWT. The BOTAŞ pilot will remain responsible for the ship during this entire period.

One person will operate the loading arms from the stowed into the connecting position. The loading arms will be controlled by either radio or local panel control, for manoeuvring from and into stowed position, as well as for coupling procedures.

Loading arms will be fitted with range sensors to identify the position of the tanker. The sensors will generate flashing and sound alarms at pre-determined tanker locations to initiate valve closure and emergency release before the loading arm reaches its structural limit. A three stage alarm system will operate and if the tanker stops drifting before reaching the point of stage

three, no emergency release will occur. In case of an emergency release, the filled loading arm will be balanced so as to rise vertically.

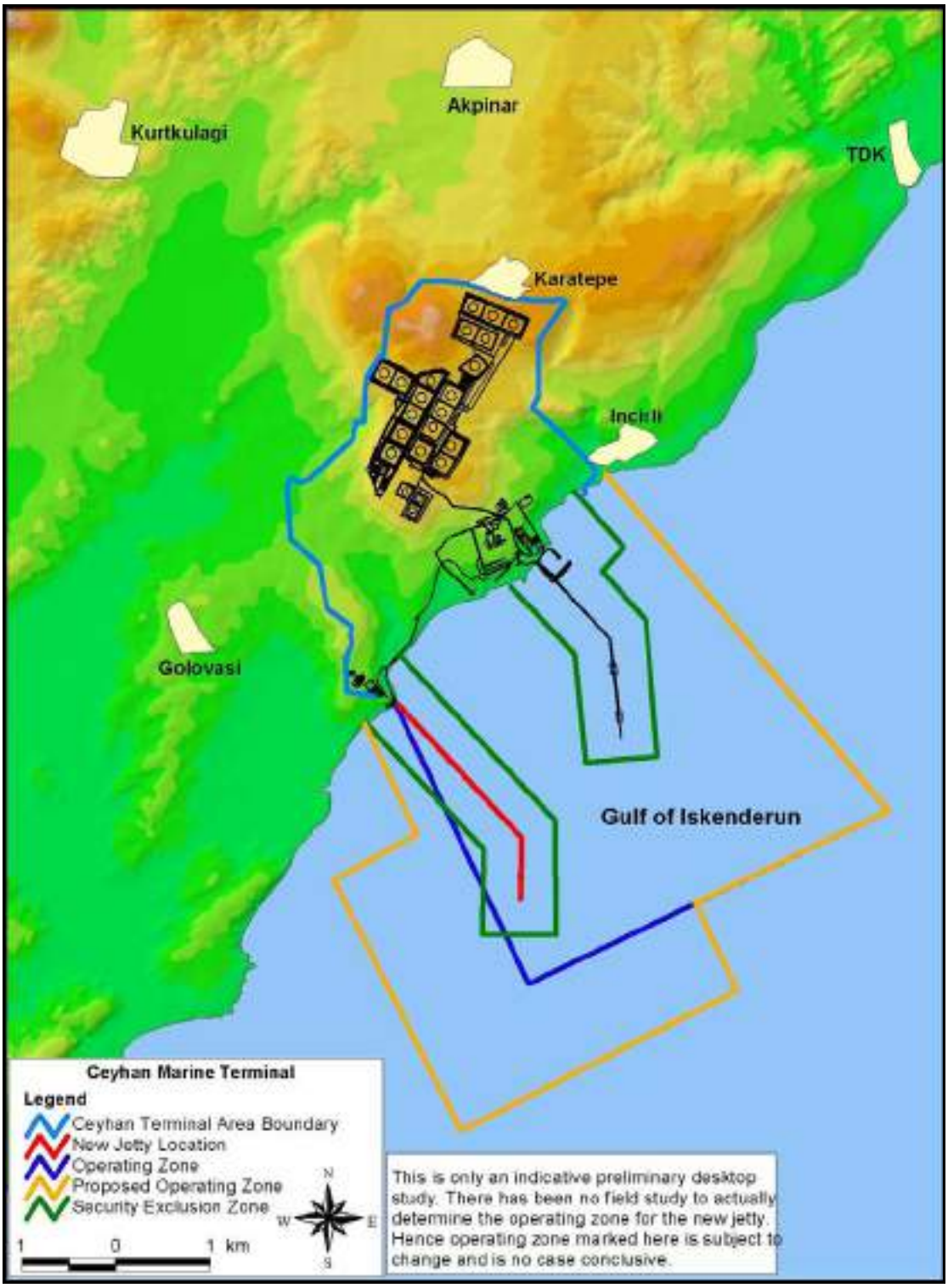


Figure 9.11 Exclusion Zone and Operating Zone

The Emergency Release System will comprise of a non-sparking emergency release coupling with a fire safe valve on each side. In addition to the electric and hydraulic safety devices, a mechanical interlock will be provided which will prevent separation before the isolation valves are closed, thereby safeguarding against unintentional release.

9.7.3.4 Tanker servicing facilities

From an anchoring zone defined in the Ceyhan Harbour Operating Regulation, ships will approach the loading jetty under the guidance of tugboats and BOTAŞ pilots. On approaching the facility, the tankers will be required to contact the BOTAŞ facility to give notice of their intent to enter the operating zone. A BOTAŞ pilot will then meet the tanker and takes responsibility for the ship during the entire berthing, unloading and unberthing process.

The following vessels will be obliged to employ a pilot:

- Turkish merchant vessels with a capacity of 1000 te GRT and more;
- foreign flag vessels with a capacity of 150 te GRT and more.

The pilots will board vessels in the southern area of the outer harbour limit and advise the master on local conditions, regulations and berthing on arrival at the harbour.

Each tanker will be accompanied by 2-4 tugboats depending on the size of vessel. Six tugs are currently in operation for the existing BOTAŞ facility, and it is anticipated that three additional tugs will be added and possibly more, to support the BTC Marine Terminal operations. Similarly, there are currently seven pilots working for the existing facility, which will increase to 12 (and possibly more) in the future. These tugboats and pilots will operate both jetties (ie the existing BOTAŞ Terminal and the BTC Marine Terminal).

9.7.3.5 Refuelling operations

Within the Security Exclusion Zone, refuelling of vessels will be prohibited.

9.7.4 Operational workforce

The BTC Marine Terminal is expected to employ 200 workers, comprising approximately 10% unskilled and 90% semi-skilled and skilled.

9.7.5 Emergency shutdown systems

There will be a dedicated, independently operating Emergency Shutdown System (ESD) for protecting the Pipeline and Terminal in the event of operating conditions deviating excessively from design conditions. The ESD will trigger the Station Control System (SCS) in order to shutdown other subordinated systems.

The ESD System will drive all safety related inhibits and interlocks. The SCS may initiate the closure of the ESD valves under certain operational situations either by automatic or manual command.

Other than the ESD there will be:

- pipeline shut down (initiated by the SCADA system);
- unit shut down (initiated by the unit control system, UCS);
- cascade shut down within the operation philosophy of the SCS.

The pipeline will be operated in accordance with the Operational Philosophy, which is summarised in Section 9.7.2 above. This will also include operational shutdown procedures (OSD), which will be initiated and executed by the SCADA System, SCS or UCS.

The objective of the ESD System will be to avoid any harm resulting from hazardous situations and reduce the consequences of an event on the pipeline or the environment.

To fulfill this requirement, the ESD System will offer more than a simple shutdown logic with a few failsafe functions. The extended functionality of the entire ESD System will incorporate the following basic functions:

- monitoring the correct function of SCADA System, UCS and SCS in conjunction with safety relevant key parameters;
- control and monitoring function for safety relevant station equipment units without integrated failsafe controllers;
- emergency shutdown function.

In order to monitor the correct operation of the SCADA System, SCS, UCS and equipment without integrated control units, the ESD System will collect safety relevant parameters independently of these systems and will initiate shutdown action in case of:

- detection of an illogical status of station equipment;
- process parameters which have reached defined limit values;
- a manual trip by push button has occurred.

To prevent serious damage to the pipeline or Terminal facilities, the ESD System will block dangerous actions and shut down station equipment or the relevant section(s) of the station safely. If the malfunction affects other local stations of the wider pipeline system, an ESD System with an overall view to the entire pipeline and the Terminal will be activated to handle this situation.

To provide this functionality, the BTC Pipeline and Marine Terminal will utilise a control logic system with a hierarchical structure of at least two levels:

- Overall ESD System;
- Terminal ESD System.

The installation of appropriate transmission facilities with redundant and independent communication lines will ensure a safe transmission of information between the individual ESD Systems at the Terminal (and Pipeline AGIs along the route) and the Overall ESD Systems at the two Control centers (ie Sangachal and Ceyhan).

9.8 DECOMMISSIONING

The project has a design life of approximately 40 years. It is currently envisaged that the various components of the Project (including the marine terminal) will be decommissioned thereafter.

9.8.1 Onshore project components

Where feasible, above-ground facilities will be left in place for further use. Where that is not appropriate, facilities will be decontaminated before abandonment in place or entirely dismantled and removed. Wherever possible, equipment and materials will be collected for reuse. A land contamination survey will be undertaken and site remediation will be undertaken if necessary.

It is likely that most or all of the equipment dismantling will take place within the confines of the Terminal. Largely, this means that any spillages resulting from the dismantling process will be contained within the site drains.

Pending governmental approval, buildings will be provided to local organisations for reuse. Otherwise, they will be demolished and properly disposed of according to the BTC Project's Waste Management Plan.

9.8.2 Onsite pipelines

The two loading lines will be cleaned, filled with inert gas, air or water and capped. They will be abandoned in the ground in a condition that is acceptable to the responsible authorities. This is seen to be the preferable option in environmental terms for the pipelines – the alternative, namely removing the pipes would involve excavation and disturbance to the environment. A more detailed account is presented in Section 4 dealing with decommissioning of the main BTC Pipeline.

9.8.2.1 Jetty

The jetty will be dismantled from the seaward end by crane barge. The rock and steel structures will be removed from the site by barge and taken to a quayside.

The modules and structural sections will then be placed on a lay-down area that allows access by workers during the deconstruction process. The objective of this process will be to prepare the various constituent parts of the structure to a condition whereby they can be reused, recycled or disposed of as waste. Some components may be re-usable and potentially be salvaged for resale. However, the potential for this is considered to be small because the components may be outdated, worn or the specification may make them unsuitable for re-use. The principle value of the components is anticipated to be in recycling. Material such as steel may be recycled through a steel foundry, thereby providing an overall resource saving through negating the need for refining the corresponding quantity ore.

The dismantling of the actual structures will be performed by teams using gas axes, electrical saws or mechanical shears. Structural steel will be reduced in size to pieces approximately $1m^2$ which can be fed into a furnace.

Where reuse is possible, the materials will be cleaned using high pressure water/solid CO_2. If reuse is not desirable, the steel and rock materials will be disposed of by a licensed waste contractor in accordance with the Waste Management Plan (Appendix C3).

9.8.3 Inventory of emissions and discharges

9.8.3.1 Emissions, discharges and wastes during construction

Emissions to air

There will be several key emission sources associated with the construction of the marine terminal, namely:

- intermittent, fugitive emissions of dust during the construction period;
- emissions from the exhausts of vehicles used for the transport of the workers, the transport of construction materials and of basic equipment;
- vessel engine exhausts;
- diesel fired power units and generators.

In addition, a number of wastes generated during construction (eg excess bitumen, oil wastes, paint sludge, polystyrene etc) will be incinerated in a mobile incineration system and this process will be monitored (ie measurement of ambient air quality and stack emissions).

The construction fleet will number approximately six vessels. There will be a significant amount of activity from construction and support vessels during the installation and commissioning stage. It is anticipated that the following vessels will be deployed:

- crane barge;
- barge with piling equipment;
- two support barges;
- two tug boats.

Vessels will generate atmospheric emissions during the installation and commissioning phases as a result of the combustion of marine diesel and fuel oil.

It is assumed that the construction fleet will use roughly 50te of fuel per day in total. Using generalised emission factors [Ref 1] and assuming vessels are using 1% sulphur fuel oil, this equates to the following approximate annual emissions:

- 3.0t NO_x;
- 4.0t CO;
- 163t CO_2;
- 1.0t SO_2;
- 0.2t hydrocarbons.

Discharges to water

Wastewater sources associated with the marine terminal construction will include:

- hydrotest water;
- sewage;
- rainwater accumulating at the tank farm facility;
- jetty loading arms and deck.

The largest single aqueous discharge will be from the hydrotest, which could be 4,300m^3 if both pipelines are discharged simultaneously.

Noise

Construction of the BTC Marine Terminal will encompass a variety of activities, which will potentially generate noise as follows:

- General civil works involved in constructing the tanks, general facilities and accommodation blocks will include the requirement for earth moving machinery, diesel generators, air compressors etc. In addition, blasting and piling may be required.

- Trenching and laying the loading line will involve specialist heavy equipment, including side boom cranes, as well as generators for welding equipment.

All construction activities will have associated noise from traffic relating to the delivery of materials and workforce. The management of traffic movement and the minimisation of disruption to communities within the vicinity of transportation routes will be addressed through provisions of the TMP (see Appendix C5).

Waste

Waste generated during the construction phase of the marine terminal will be dealt with in accordance with procedures set out in the Waste Management Plan (Appendix C3).

Table 9.5 provides a broad listing of the anticipated waste streams that will be generated by the construction of the Marine Terminal. The Waste Management Plan (Appendix C3) sets out a project strategy for quantifying, handling and disposing of the anticipated waste streams.

Table 9.5 Provisional Waste Inventory for BTC Marine Terminal Construction Phase

WASTE STREAMS	SOURCES	CLASSIFICATION (H or NH)*	MANAGEMENT OPTION	QUANTITY (TONNES)
Activated carbon	Spent fines from filtration systems	H/NH	Landfill	2
Aerosol cans	Empty containers, principally from personal use of deodorants and some chemical usage during construction	H	Pierce and recycle	0.5
Aluminium cans	Largely empty beverage cans	NH	Crush and recycle	20
Batteries Wet	Depleted cells used in vehicles and machinery	H	Recycle	1
Batteries Dry	Depleted cells used for personal stereos and other portable equipment, such as torches	H	Recycle	<0.5
Bitumen	Residues from road making. Mostly reused at the sites in road making	H	Incinerate	25
Black water				12,000
Bricks and building materials		NH	Landfill	6
Cables / copper	Off-cuts from construction of the facilities and temporary camps, plus removal during decommissioning	H	Recycle	<0.2
Cement dust		NH	Landfill	0.25
Chemicals	Spent chemicals and residues from all project phases, such as pipe coating, bleaches	H	Physical/chemical treatment; evaporate in drums; residue to landfill	TBD
Acids			Physical/chemical treatment; residue to landfill	TBD
Adhesives			Incinerate	<0.2
General Chemicals			Special treatment - disposal to a suitably licensed facility	3.5
Firefighting foam			Evaporate in drums; residue to landfill	0.2
Glycols			Evaporate in drums; residue to landfill	2
Solvents			Evaporate in drums; residue to landfill	0.2
Concrete / foundations	Deconstruction of facilities during reinstatement and site restoration	NH	Crush and use as building aggregate	10
Containers (large size)	Empty steel drums	NH	Recycle	TBD
Containers (other)	Empty steel and plastic containers or varying sizes	NH	Landfill	TBD
Contaminated water	Rainwater accumulating tank farm facility (approximately 7 storage tanks); from the jetty loading arms	H	Special treatment then discharge to sea via outfall	TBD
Contaminated wastes (waste oils etc)	Oil spillages and clean-up materials such as oil absorbers, grab packs and granules	H	Special treatment - disposal to a suitably licensed facility	TBD

WASTE STREAMS	SOURCES	CLASSIFICATION (H or NH)*	MANAGEMENT OPTION	QUANTITY (TONNES)
Dredged material (largely sand with some mud and silt)	Generated during construction of marine facilities, eg export jetty, breakwater, construction dock	NH	Due to the lack of any current marine industrial activity at the proposed jetty location, it is anticipated that such material will be uncontaminated. It is assumed that all dredged material will be discharged to sea in a designated dumping area subject to appropriate licence conditions by the relevant Turkish authority.	TBD
Drum cleaning waste	From cleaning steel drums of residual materials so that they may be re-used for other applications	H	Special treatment - disposal to a licensed facility	240
Electrical/electronic comps		NH	Landfill	<0.2
Electrical (eg switchgear)		H/NH	Landfill	<0.2
Exhaust catalysts			Landfill	<0.2
Filters air/oil	Spent filters from machinery and vehicles	H	Incinerate	0.25
Filters (water)		NH	Incinerate	0.75
Food	Scraps and other organic waste	NH	Incinerate	90
Diesel, Fuel and Oil Wastes	Oil absorbers, grab packs and granules	H	Incinerate	TBD
Diesel		H	Incinerate	3
Diesel generator lube oil		H	Incinerate	8
Misc oils (incl hydraulic)		H	Incinerate	0.75
Vehicle & equip lube oil		H	Incinerate	4
Glass	Empty bottles, largely from domestic use	NH	Recycle	100
Greases	Residues of lubricating products, plus some domestic greases	NH/H	Incinerate	TBD
Greywater				30,000
Hydrotest water	Discharges from hydrostatic testing of tanks pipelines (may contain chemicals, such as biocides and oxygen scavengers)	NH	Tested prior to discharge at a controlled rate to a site agreed with the MoE	160,000
Incinerator ash		H/NH	Landfill	120
Insulation	Offcuts from installation of insulation materials to piping and plant	H	Landfill	0.25
Light bulbs	Spent incandescent and fluorescent bulbs	H	Recycle - (fluorescent bulbs if in v. large quantities may require special treatment)	<0.1
Medical	Hazardous clinical waste, including sharps, needles, swabs, etc	H	Incinerate	<0.5
Packaging materials	Plastics, paper, cardboard, etc	NH	Recycle	TBD
Paint sludge		H	Incinerate	<0.5

WASTE STREAMS	SOURCES	CLASSIFICATION (H or NH)*	MANAGEMENT OPTION	QUANTITY (TONNES)
Paint and cans/brushes	Residues and discarded wastes from construction and maintenance activities, both oil and water based	H	Incinerate	<0.1
Paper and card	Wastes from office and domestic use	NH	Recycle/incinerate	90
Plastic bottles	Mostly discarded water containers and other domestic supplies; some industrial supplies	NH	Recycle	90
PPE and clothing	Discarded personnel protective clothing, overalls, boots, rags, etc	H/NH	Incinerate	3
Rags and oil absorbents		H	Incinerate	10
Refuse type wastes		NH	Incinerate	TBD
Sewage	Sewage from construction camps and temporary facilities	NH	Primary treatment of waste on site, then disposal of treated waste by appointed waste management contractor in agreement with local water authority	TBD
Sewage sludge	Hazardous residues from the sewage treatment facilities	H/NH	Special treatment - disposal to a suitably licensed facility	35
Steel	Offcuts from construction of pipelines and plants; removal of equipment during decommissioning	NH	Re-use - store useful components for future work and recycle remainder	150
Tyres	Worn discarded tyres from vehicles	NH	Recycle	<4
Washdown water	Runoff from cleaning vehicles, plant and other washing activities	H	Special treatment - disposal to a suitably licensed facility	80,000
Wood	Crates, pallets, sleepers, etc from supply of materials	NH		TBD
Timber		NH	Re-use	TBD
Trees, shrubs, branches		NH	Use as fuel (domestic etc)	TBD

* H = Hazardous; NH = Non-Hazardous

**Construction: Many waste streams that arise during construction of the marine terminal will be similar to those during pipeline construction. Those additional waste streams that are specific only to the marine terminal have been included. Pipe-specific waste (eg pipe bands, coatings etc) generated for the short length of pipeline from Terminal to Jetty has not been included, but will be less than 1% of that generated for the pipeline as a whole (see Table 5.1).

TBD – To be determined during ongoing engineering and Contractor selection.

9.8.3.2 Operational emissions, discharges and wastes

Marine-based emissions

Marine-based emissions of concern (ie those that have the potential to influence local air quality onshore) are those associated with the tanker emissions within the harbour, particularly while berthed. Atmospheric emissions from tankers' engine exhausts will be relatively minor and will be an intermittent source during operation. A modern tanker uses relatively little fuel while berthed. Given that the tankers are loading, rather than offloading oil, their fuel requirement will be even lower. Using typical emissions factors [Ref 5], and assuming both berths are in regular use, the anticipated annual emissions from tanker burning 1% sulphur fuel oil at the proposed facilities are as follows:

- approximately 22t NO_x;
- approximately 3t CO;
- approximately 1,200t CO_2;
- 7t SO_2;
- 1t hydrocarbons.

Land-based emissions

Anticipated operational emissions and discharges are as presented in Table 9.5.

Table 9.6 Operational Emissions/Discharges for BTC Marine Terminal

OPERATION	SOURCE	POLLUTANT	MANAGEMENT OPTION	QUANTITY
Emissions	tanker loading	CO_2 (Note 1)	EGF	152,450 te per year
	tanker loading	VOC	EGF	215 te per year
	tanker loading	NOx	EGF	36 te per year
	tanker loading	SO_2	EGF	387 te per year
	tanker traffic	NOx	untreated to atmosphere	22 te per year
	tanker traffic	CO	untreated to atmosphere	3 te per year
	tanker traffic	CO_2 (Note 1)	untreated to atmosphere	1,200 te per year
	tanker traffic	SO_2	untreated to atmosphere	7 te per year
	tanker traffic	hydrocarbons	untreated to atmosphere	1 te per year
Discharges	primary holding pond	treated wastewater	Irrigation and/or soakaway	24 m^3 per day

	general facilities	treated wastewater	Irrigation and/or soakaway	24 m^3 per day
	housing compound	treated wastewater	Irrigation and/or soakaway	38 m^3 per day
	Jetty	treated wastewater	Irrigation and/or soakaway	1.5 m^3 per day
	Guardhouse	treated wastewater	Irrigation and/or soakaway	1.5 m^3 per day
	Tankfarm	treated wastewater	Irrigation and/or soakaway	2 m^3 per day
Note 1: These CO_2 emissions have been used as the basis to determine total global warming potential expressed as CO_2 equivalent (CO_2-e) emissions in Chapter 16 (Cumulative Impacts).				

Noise

The main noise source from the operational BTC Marine Terminal will be the enclosed ground flare (EGF). Other sources are the transfer pumps located in the tank farm.

Waste

The waste arisings during the operational phase of the facility are the subject of ongoing detailed design and vendor selection for individual equipment items. Table 9.6 lists indicative types and quantities estimated from a number of sources. The Project is aware of the requirement to develop a waste inventory and to manage these wastes in accordance with the provisions of the Waste Management Plan (Appendix C3).

Table 9.7 Indicative Marine Terminal Operational Wastes (1)

TYPE	AMOUNT / YEAR
Domestic:	
• paper wastes	50 tonnes
• putrescible	40 tonnes
• glass	<25 tonnes
• plastic	<25 tonnes
• metallic	<25 tonnes
• textiles	<5 tonnes
• miscellaneous combustible	<25 tonnes
• miscellaneous non-combustible	<5 tonnes
• sewage sludge	<30 tonnes
• glack water	9000m^3
• grey water	21000m^3
Operational Terminal:	
• general waste suitable for landfill	3000 tonnes
• contaminated wastes (gloves, rags, absorbants etc)	<200 tonnes
• paper (office wastes)	<400 tonnes
• interceptor oil waste	<100 tonnes
• scrap metal wastes	<250 tonnes
• tank bottoms and cleaning	TBD

Shipping wastes (2) • oily sludge • oily bilgewater (average 15% oil content) • domestic waste • other (cargo associated) wastes	 TBD (2% of heavy fuel oil consumption) TBD (0.31m^3/1000tdw/month of operation) TBD (3.0kg/person/day) TBD (<0.01kg/day)
(1) Figures derived from multiple sources. (2) Ship generated wastes are enormously variable and linked to age of vessel, size of vessel, number of crew, days at sea since previous port call involving transhipment of waste to shore. Figures derived from 'A Waste Management Plan for Ship Generated Waste' prepared for Espoo Marine Committee, January 2000.	

BIBLIOGRAPHY

Ref 1 ILF-CAL-ESP-GEN-001, Revision B, 8/11/01

Ref 2 Water Supply Study of Ceyhan Terminal, ILF-REP-EMT-TRG-012 Rev C

Ref 3 Geohazard Assessment at Ceyhan Marine Terminal Report, ILF-TNO-EMT-TRG-002 Rev C

Ref 4 pers. Comm.with Operations Dept, BTC

Ref 5 Lloyds Register (1990) Marine Exhaust Emissions Programme: Steady State Operation. Lloyds Register, London.

10 MARINE TERMINAL – ONSHORE BASELINE CONDITIONS

10.1 INTRODUCTION

10.1.1 Geographical context

The proposed BTC Marine Terminal is situated in southern Turkey on the coast of the Gulf of Iskenderun near Ceyhan. The location of the proposed BTC Marine Terminal is shown in Figure 10.1 below.

The BTC Marine Terminal development will consist of both onshore and offshore facilities (as described in Section 9). This section describes the onshore environmental and social baseline; the offshore baseline is dealt with separately in Section 11.

10.1.2 Objectives

The approach adopted for the environmental and socio-economic data collection was designed to fulfil the following objectives:

- to understand key environmental and social conditions in areas potentially affected by the BTC Marine Terminal;
- to provide data to enable the prediction and evaluation of potential impacts;
- to understand the expectations and concerns of a range of stakeholders (eg impacted communities, authorities and NGOs);
- to inform the development of mitigation measures;
- to provide a basis for monitoring (along with control sites) future change and assess the effectiveness of mitigation measures.

Figure 10.1 Geographical Context of the Proposed Marine Terminal

10.1.3 Sources of information and methodologies

Environmental and social baseline data were collected through combinations of desk studies, questionnaires and consultation with local people. To summarise, the key information sources included:

- Phase I and Phase II Habitat Surveys and Bird Survey Report;
- archaeological surveys;
- studies on geohazards, geology and geomorphology;
- contaminated land survey;
- air quality and noise surveys at the site and around it;
- on-site observations at the existing terminal;
- photography and landscape assessment from selected viewpoints;
- community meetings with local settlements;
- questionnaires administered with the Muhtar (or other key representatives) of each settlement (also referred to as the 'settlement level questionnaire');
- questionnaires administered at the household level (also referred to as the 'household level questionnaire').

Supplementary detail on the social questionnaires is provided in Appendix A4 and A5.

The results of the questionnaires provided a wide range of socio-economic data for the settlements surveyed. Some of the information collected is directly related to the predicted impacts of the BTC Marine Terminal (eg data on fishing as a source of livelihood enables an understanding of the impacts of decreased access to fishing grounds). Other data (eg information on land ownership or items owned by households) are essential for predicting and understanding changes to the overall 'balance of assets' in any particular settlement (see Box 10.1). These assets include natural capital (eg land, water), physical capital (eg transport, services), human capital (eg skills, education), financial capital (eg income, savings) and social capital (eg leadership and representation). It is this balance of assets that affects the ability of a settlement to cope with the changes brought about by the BTC Marine Terminal. If one asset within a settlement is lost (eg land), but other benefits are gained (eg employment), then the overall balance of livelihoods may remain the same. These different forms of capital (as found in the survey area) are described under each of the section headings, including a more detailed justification for why the data were collected.

Box 10.1 Livelihood Assets

The livelihood assets within any particular settlement can be grouped into the following forms of capital.

- **Natural capital:** land, water resources, livestock, fishing, aggregates, environmental quality etc.
- **Physical capital:** transport, communications, energy, housing, water and sanitation, schools, health facilities.
- **Human capital:** population numbers, skills, knowledge, ability to work, health, education.
- **Financial capital:** incomes, savings and credit, pensions.
- **Social capital:** leadership and representation, networks and groups, tolerance, access to wider institutions, ability to influence decision-making.

10.1.4 Study area

The study area for the onshore facilities is defined as:

- the permanent and temporary footprint of the onshore components of the terminal (tank farm, general facilities, transfer lines etc);

- the general immediate resources and communities that could potentially be affected by offsite impacts (noise, air quality, traffic, socio-economic benefits).

The wider coastal resources that could be impacted by an oil spill are discussed in Section 11.

The area encompasses a variety of natural and artificial habitats, including maquis, semi-natural and managed wooded areas, agricultural areas and landscaped gardens. These habitats are further discussed in Section 10.9.

Table 10.1 lists the nine settlements involved in consultation and questionnaire activities. Incirli, Karatepe and Karayilan are located in Ceyhan district and Sugozu, Hamzali, Haylazli, Deveciusagi, Golovasi and Sahil Sitesi in Yumurtalik district (see Figure 10.1*)*. These settlements can be divided into both neighbouring and non-neighbouring settlements. Neighbouring settlements have land directly adjacent to the existing BOTAŞ property and are most likely to be the primary receptors of impacts associated with the BTC Marine Terminal. These receive priority focus in both the baseline section and in the subsequent assessment of impacts. Conversely, non-neighbouring settlements are defined as those whose land is not adjacent to the BTC Marine Terminal. The latter are located between 1km and 30km from the BTC Marine Terminal.

Table 10.1 Summary Table of Household Surveys

	Distance from BOTAŞ Boundary Fence (approx.)	TOTAL POPULATION	TOTAL NO. OF HH*	NO. OF HH SURVEYED	TOTAL POPULATION IN RESPONDENT HHS	% OF POPULATION SURVEYED
Neighbouring Settlements						
Golovasi	1.5km west	1710	450	26	127	7.4
Sahil Sitesi**	<1km west	Not available	150	8	9	-
Incirli	<100m east	500	100	23	103	21
Karatepe ***	<100m north	500	80	30	127	25
Non-Neighbouring Settlements						
Sugozu	6km southwest	1150	300	25	90	8
Hamzali	5km west	500	100	23	98	20
Haylazli	24km southwest	1000	160	30	127	13
Deveciusagi	28km southwest	900	244	30	154	17
Karayilan****	1km north	Not available	Not available	5	-	-

* HH = households
** Some settlements in Turkey have multiple units with a central core *(koy)* and one or more hamlets *(mezras).* Sahil Sitesi is a small precinct of Golovasi, primarily used in summer by secondary homeowners. The population of Sahil Sitesi is difficult to ascertain because most people live in the settlement only during the summer months.
*** Karatepe is one of three settlements of the municipality of Kurtpinari.
**** Karayilan is also a settlement within Kurtpinari Municipality. It does not have its own Muhtar. No information is therefore available from the *settlement level questionnaire*.
Source: [Household Survey and Settlement Level Survey]

10.1.5 Section contents

The onshore environmental and social baseline aspects at, and in the vicinity of, the proposed BTC Marine Terminal site are described under the following headings:

- Climate and Meteorology;
- Landscape;
- Soils;
- Geology and Geohazards;
- Surface Water and Groundwater;
- Biological Environment;
- Air Quality;
- Noise;
- Cultural Heritage;
- Demographic and Migration Patterns;
- Land Ownership and Use;
- Livelihoods, Employment and Skills;

- Infrastructure, Utilities and Services;
- Attitudes and Perceptions towards the BTC Marine Terminal.

10.2 CLIMATE AND METEOROLOGY

10.2.1 General

The climate of Turkey is classified as 'warm temperate' with a number of variations. The study area experiences a typical Mediterranean climate with warm wet winters and hot dry summers with little or no rainfall from May to September [Ref 1]. The Taurus Mountains in the north shield the area from the more extreme climatic elements inland.

10.2.2 Temperature

The mean annual temperature at Ceyhan is 17.8 ºC. In the winter months the Mediterranean Sea moderates the climate resulting in warmer winters [Ref 2] than inland. The lowest temperature recorded at Ceyhan was –11.3 ºC.

Ground frost in the region is infrequent and limited to the upper 20 cm of soil. Soil temperatures at Ceyhan do not generally drop below 0 ºC, with temperatures recorded close to the soil surface (5 cm depth) of 2.9 ºC [Ref 3]. At Ceyhan itself, ground frost has never been recorded.

More comprehensive meteorological data are available for two coastal stations at Iskenderun approximately 60km south-east of the proposed BTC Marine Terminal location and at Yumurtalik, 30km to the south-west (see Plate 10.1).

Table 10.2 presents the long-term monthly average temperatures published by the General Directorate of Meteorology between 1939-1990 for Iskenderun station and between 1964-1990 for Yumurtalik station [Ref 1].

Table 10.2 Monthly Average Air Temperature in the Iskenderun Region (ºC)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Iskenderun												
Average	11.7	12.5	14.7	18.4	22.0	25.3	27.8	28.4	26.6	22.1	17.5	13.4
Maximum	15.4	16.3	18.7	22.3	25.5	28.4	30.4	31.3	30.1	26.8	22.0	17.4
Minimum	8.2	8.9	10.8	14.2	17.8	21.6	24.5	25.1	22.7	18.2	13.9	10.1
Yumurtalik												
Average	10.2	10.9	13.3	17.0	20.7	24.0	26.8	27.3	25.4	21.1	15.9	11.8
Maximum	15.0	15.8	18.2	21.6	24.7	27.6	30.0	30.9	30.4	27.2	21.6	16.8
Minimum	5.9	6.4	8.8	12.3	15.6	19.2	22.4	22.7	20.2	16.2	11.4	7.6

Table 10.2 indicates that there is little variation between the two locations at different times of the year and that the data are probably representative of the terminal location. Iskenderun has a slightly higher mean average monthly temperature.

10.2.3 Precipitation and humidity

There is a large variation in the total annual rainfall between the coastal plain and the mountainous region to the north of Ceyhan. Total annual precipitation in the coastal plain is approximately 670mm. There is little variation between monthly and daily maximum rainfall at Iskenderun and Yumurtalik (see Table 10.3).

Table 10.3 Monthly Average and Daily Maximum Rainfall (mm) in the Iskenderun Region

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Iskenderun												
Total Monthly Average	106.7	91.6	90.4	63.8	46.2	26.0	5.5	15.8	34.5	93.4	77.2	98.5
Max daily	89.5	60.2	96.1	83.4	72.7	114.4	38.8	54.6	60.9	82.6	126.9	155.3
Yumurtalik												
Total Monthly Average	125.4	93.9	86.7	62.8	64.5	19.6	9.7	6.7	17.0	75.2	90.3	118.1
Max daily	75.0	71.8	54.4	67.7	210.8	43.8	43.8	32.7	113.8	120.4	113.2	74.6

Note: These values are long-term averages over a 60-year period.
Source: [Ref 2]

Rainfall is highest in the winter months between November and March. Monthly winter rainfall averages 93mm for Iskenderun and 103mm for Yumurtalik. Rainfall during the summer months drops to less than 10mm at both Iskenderun and Yumurtalik. Rainfall intensity within this region was measured as 110mm hr^{-1} [Ref 2].

Snow is confined to the upper slopes of the Taurus Mountains to the north of the BTC Marine Terminal and is not experienced in the coastal zone.

10.2.4 Wind

Winds are light, averaging 1.5-2.0m s^{-1}. They blow from the north-east off the Taurus Mountains for the majority of the year (see Figure 10.2). The wind changes to a westerly direction in April, which is associated with a strengthening of sea breezes. During the summer months (from June through to September), the prevailing wind direction is south to south-west. Wind speeds increase to a brisk 2.1-4.3m s^{-1} in the summer months, before reverting back to a northerly direction in the winter.

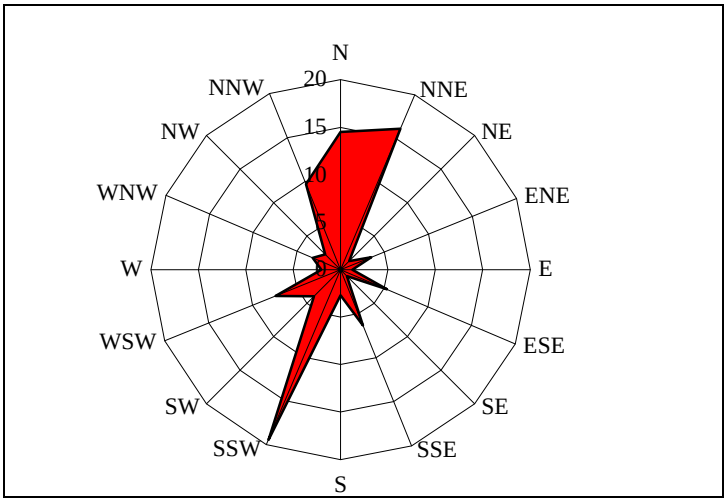


Figure 10.2 Annual Wind Rose
[Source: Yumurtalik Meteorological Station, 1996**]**

10.2.5 Fog and visibility

The monthly average foggy days (defined as visibility less than 1,000m) for Iskenderun and Yumurtalik meteorological stations are provided in Table 10.4. Limited data are available for both of these stations, although it is apparent that the fog is rare in the region and visibility is generally good all year round.

Table 10.4 Monthly Average Foggy Days in the Iskenderun Region

LOCATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Iskenderun												
Average	0.0	-	0.0	0.1	-	-	-	-	-	-	0.2	0.1
Yumurtalik												
Average	-	-	0.1	0.0	-	-	-	-	-	0.0	-	-

Source: [Ref 1]

10.3 LANDSCAPE

10.3.1 Topography

The proposed BTC Marine Terminal facilities will occupy an area ranging from approximately 125m to 3m above sea level and is located adjacent to an existing marine terminal complex, operated by BOTAŞ.

The general topography of the proposed BTC Marine Terminal site is characterised by a flat plateau interspersed with hills and some low eroding cliffs. The topography between the proposed marine terminal and the new jetty is characterised by south to south-westerly facing slopes. These slopes descend from 100m in height to chart datum over a distance of less than 1km (see Figure 10.3),[Ref 3].

Much of the existing tank farm at the north of the marine facility is situated on a plateau at a height of between 100-120m. The proposed tank farm will be located up-slope from the existing site, at a height of approximately 125m. The new accommodation and general facility areas will lie to the south of the tank farm, occupying approximately 7.6ha and 1.7ha, respectively.

10.3.2 Landscape character

10.3.2.1 The foreshore

The foreshore and beach area already have an industrial character due to the existing BOTAŞ jetty and associated facilities. The jetty is visible from over a relatively large area, as is the associated tanker traffic. Further human activity is apparent from the presence of coastal fishing settlements such as Sahil Sitesi and Golovasi (see Plate 10.1).

Plate 10.1 View of Existing Jetty from Proposed General Facilities Area

Figure 10.3 Aerial Photograph of the Existing BOTAŞ Marine Terminal

The coast is predominantly made up of a series of small rocky headlands, interspersed with small sand beaches (particularly on the southern side of the headlands). The land rises steeply away from the coast, and is mostly sparse scrub. Sand dunes are located along the coast of the existing terminal site between the existing jetty and the location of the proposed jetty.

Long distance views in both directions are limited due to the undulating coastal strip and existing jetty. Inland views are restricted due to rising high ground. The existing jetty is clearly visible from the coastal settlement of Sahil Sitesi where a number of secondary homeowners are resident.

10.3.2.2 Terrestrial landscapes

The terrestrial landscape is gently undulating. The terrain rises from the foreshore to the existing BOTAŞ tank farm, located on high ground, with maquis (scrub) and orchards providing a varied aspect to the surrounding areas. The tank farm is the dominant feature from most aspects, as it is situated on the highest ground on the seaward side of the broad Kalebogazi valley, which separates the terminal from the settlements of Narlik and Kurtkulagi (see Plate 10.2).

Plate 10.2 View of Kurtkulagi from the Proposed Tank Farm Site

Other components of the existing terminal complex contribute significantly to the landscape character, particularly the accommodation blocks. These, and other general facilities, are located on a gentle slope south of the tank farm, interspersed with landscaped gardens and stands of managed woodland. The accommodation buildings stand out by virtue of their height, and are clearly visible from the site of the proposed new general facilities along the coast to the south (see Plate 10.3). These facilities are, however, screened from inland views by a series of low rounded hills running broadly parallel to the coast, (approximately 130m above sea level). Scrub vegetation covers much of the slopes of these hills.

Plate 10.3 View of Existing Facilities from Proposed Accommodation Area

10.4 SOILS

10.4.1 General

The proposed BTC Marine Terminal site is formed of basalt and flysch units, overlain by the soil mantle. This soil mantle is represented by colluvium, topsoil and artificial fill in the tank farm area and solely by colluvium in the general facilities area [Ref 4 and Ref 5]. Colluvial deposits are likely to be derived from neighbouring rock formations and mainly composed of clayey sandy gravely cobbles/boulders and gravely clayey sand. Soil thickness at various locations on the site varies between 1m and 5.75m [Ref 4 and Ref 5].

10.4.2 Soil erosion and agricultural soil quality

10.4.2.1 Soil erosion

Areas of soil erosion at the proposed BTC Marine Terminal have been taken from erosion classifications used in the General Directorate of Rural Services (GDRS) erosion maps, which are derived from the Soil Survey Manual of Turkey. These erosion classes are defined in Section 5.4.4.

There are no areas of extreme or severe erosion within the proposed BTC Marine Terminal site (see Figure 10.4). A small area of severe erosion exists to the north of Karatepe settlement. Furthermore, there has been no history of subsidence or erosion during the 25 years that the existing BOTAŞ Marine Terminal has been in operation [Ref 6].

10.4.2.2 Agricultural soil quality classification

Agricultural land in Turkey is classified according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use for food production [Ref 6]. Section 5.4.9 (Table 5.6) provides definitions for the GDRS soil capability classes.

Two areas of soil capability Class II exist to the east of the existing BOTAŞ Marine Terminal, one of which slightly extends into the north-eastern corner of the site and will be crossed by the loading line route (see Figure 10.4). Areas of soil capability Classes III and IV, (ie possessing some form of agricultural activity), and soil capability Class VII, (ie with no economical agricultural purpose), exist within the existing BOTAŞ Marine Terminal site boundaries.

10.4.3 Soil contamination

Chemical analysis of soils at the proposed BTC Marine Terminal site was carried out for Total Petroleum Hydrocarbons (TPH), nickel (Ni), arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg) and vanadium (V) [Ref 7]. Table 10.5 provides soil sample information while Table 10.6 presents the hydrocarbon analysis results for the soil samples and Table 10.7 shows the metal analysis results.

Table 10.5 Soil Sample Information

Sample No	Easting	Northing	Location	Sampling Point	Date	Time	Depth (cm)
S1 S2	0760149	4087155	CMT Tank 7	SP1	28/07/02	17:00	10-20
S3 S4					28/07/02	17:00	25-35

Table 10.6 Hydrocarbon Analysis Results for Soil Samples

Location	Sampling Point	Sample No	Concentration (mg/kg)*					
			Benzene	Toluene	Ethyl benzene	Xylene	DRO	GRO
CMT Tank 7	SP1	S1	<0.02	<0.02	<0.02	<0.02	97	<1
		S3	<0.02	<0.02	<0.02	<0.02	153	<1

* < indicates that the concentration is below the method detection limit.

Table 10.7 Metals Analysis Results

Location	Sampling Point	Sample No	Concentration (mg/kg)[1]						
			As	Cd	Cr	Pb	Hg	Ni	V
CMT Tank 7	SP1	S2	2.30	0.200	143.00	10.10	0.023	179.00	102.00
		S4	2.50	0.021	148.00	10.40	0.021	172.00	106.00

The study results showed that concentrations of As, Cd, Pb, Hg and V at the sampling sites (S1 – S4) are below the established international guideline values and Turkish standards[1]. Vanadium concentrations at the CMT tank 7 sampling locations were relatively higher than that of the other sampling locations, but still remain lower than the relevant standards.

[1] Turkish Regulation for Control of Soil Pollution (Ref: Official Gazette, 10.12.2001

Total chromium levels were above Canadian agricultural and residential guideline values[1] as well as above Turkish standards for S2 and S4. Chromium concentrations in all of the samples are below the Dutch guideline[2].

The nickel concentrations for all the samples were above the Canadian guideline values. Since pH of the soil samples was measured above 7 and the majority of soils found in Turkey are basic (ie pH above 7), the Turkish soil quality standards for the basic soils are likely to be applicable for the soil types encountered within this project. In this regard, a nickel standard of 112.5mg/kg is used in this report to evaluate the soil analysis results. The nickel concentrations for the S2, S4 samples were above the Turkish soil quality nickel standard of 112.5mg/kg.

The relatively high concentrations of chromium and nickel found in the soil samples are indicative of some form of past contamination due to the partially high TPH results. Further, partially high vanadium concentrations, which are also an indicator of petroleum contamination, were found in the samples.

DRO concentrations in the samples were higher than the Canadian agricultural and residential guideline values of 100mg/kg.

[1] Canadian Environmental Quality Guidelines. Source: Canadian Council of Ministers of the Environment (CCME) 1991, updated 2001

[2] Proposed Dutch soil quality criteria. Source: van den Berg et al., 1993

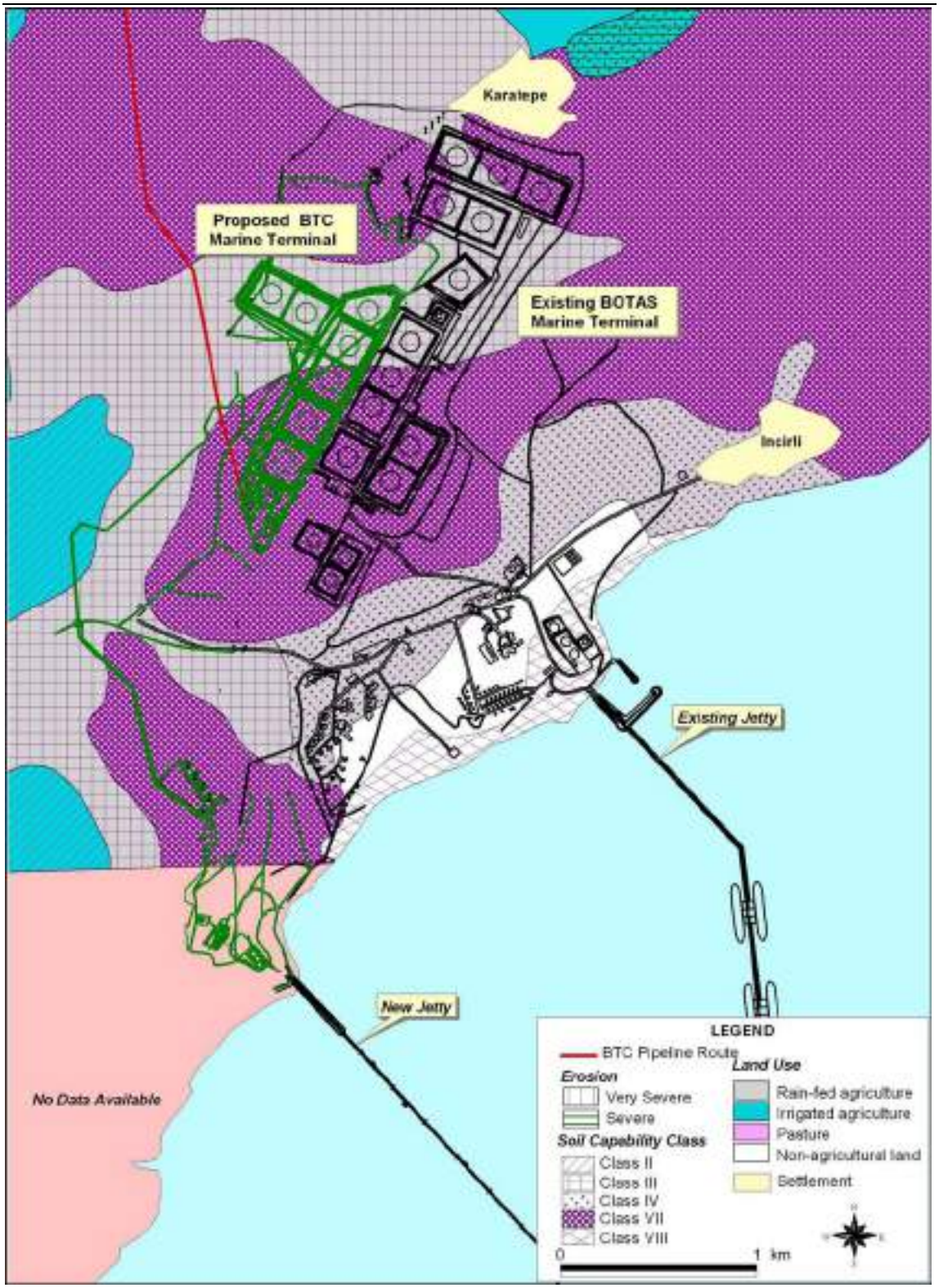


Figure 10.4 Soil Capability and Erosion Areas at the Proposed Marine Terminal Site

10.5 GEOLOGY AND GEOHAZARDS

10.5.1 Solid geology

The Cukurova basin is one of the major sedimentary basins in this region of Turkey and is bounded by the Amanos Mountains on the east, the Ecemis Fault Zone to the west, the Taurus Mountains to the north and the Mediterranean Sea to the south. It is divided by the Misis-Kyrenia fault that runs parallel to the coast into the Adana basin to the north and the Iskenderun basin to the south (see Figure 10.5). The BTC Marine Terminal is located on the Iskenderun basin [Ref 1].

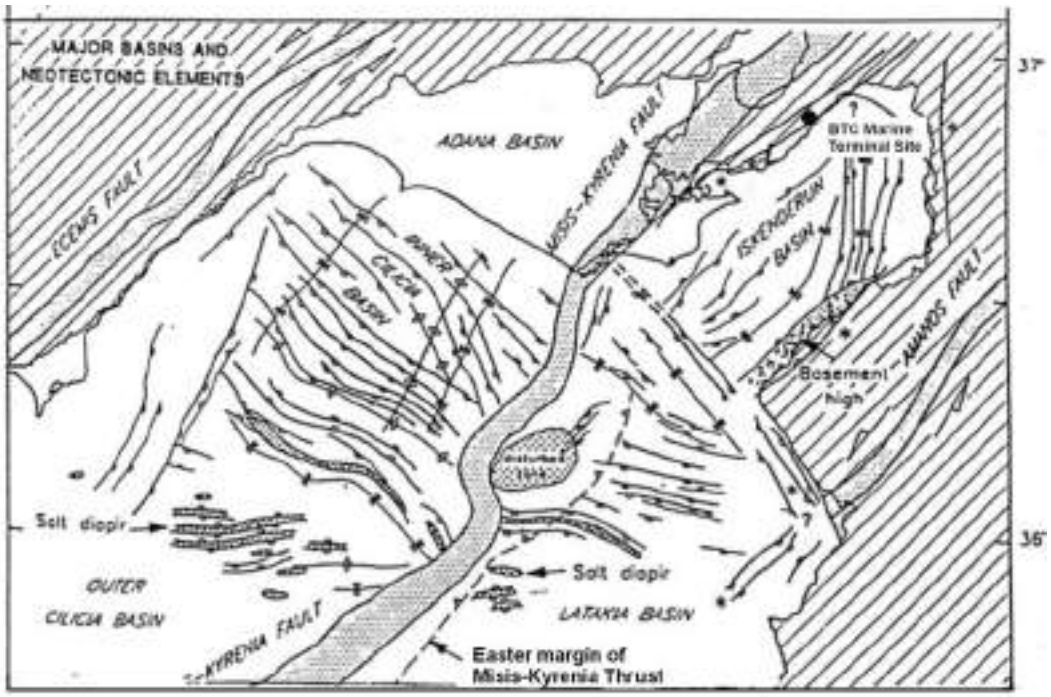


Figure 10.5 Major Geological Basins [Ref 1]

The geological sequence encountered in the vicinity of the proposed terminal is shown in Figure 10.6. This indicates that the area comprises early to middle Miocene clastic rocks, dominated by Karatas and Kizildere formations [Ref 8]. The Karatas formation, which extends north and south-west of the proposed BTC Marine Terminal, is composed of sandstone, sandy limestone, marl, limestone, siltstone and gravels. This is the oldest rock unit in the vicinity of the terminal. In contrast the Kizildere formation is located further west stretching along the coast to Yumurtalik. This formation is composed of sandstone, gravely marl and clay limestone.

Geological and geomorphological studies conducted at the existing BOTAŞ Marine Terminal indicate that it is located on volcanic rock, which is pyroclastic and basaltic in origin [Ref 8] (see Figure 10.6). The basaltic component was observed as lava plateaus with a flow direction to the north of the marine terminal. These lava flows vary in thickness, between 5m and 20m, but on occasion reaching up to 100m. They are dark grey to black in colour and often include gas.

Pyroclastic rocks were observed in two forms, as bedded lower pyroclastic rock and as tephra [Ref 8].

1. Lower pyroclastic rocks are Quaternary aged rocks and were observed throughout much of the area of the Marine Terminal study area. These rocks are composed of basaltic tuff, ash, lapilli, volcanic sand, local volcanic sandstone, clay and marl sequences and are usually poorly cemented and friable.

2. Tephra rocks are interbedded pyroclasts found predominantly near volcanic cones. Geological studies indicate the presence of this type of rock around Ceylan Hill [Ref 8] (see Figure 10.6). These rocks comprise yellow, red, brown and black coloured basaltic slag, tuff, ash, lapilli, volcano bomb, breccia and sand.

Further west of the existing Marine Terminal, alluvium material is present along Boyali Creek Valley, composed of unconsolidated silt and mud drained from the catchment area [Ref 8].

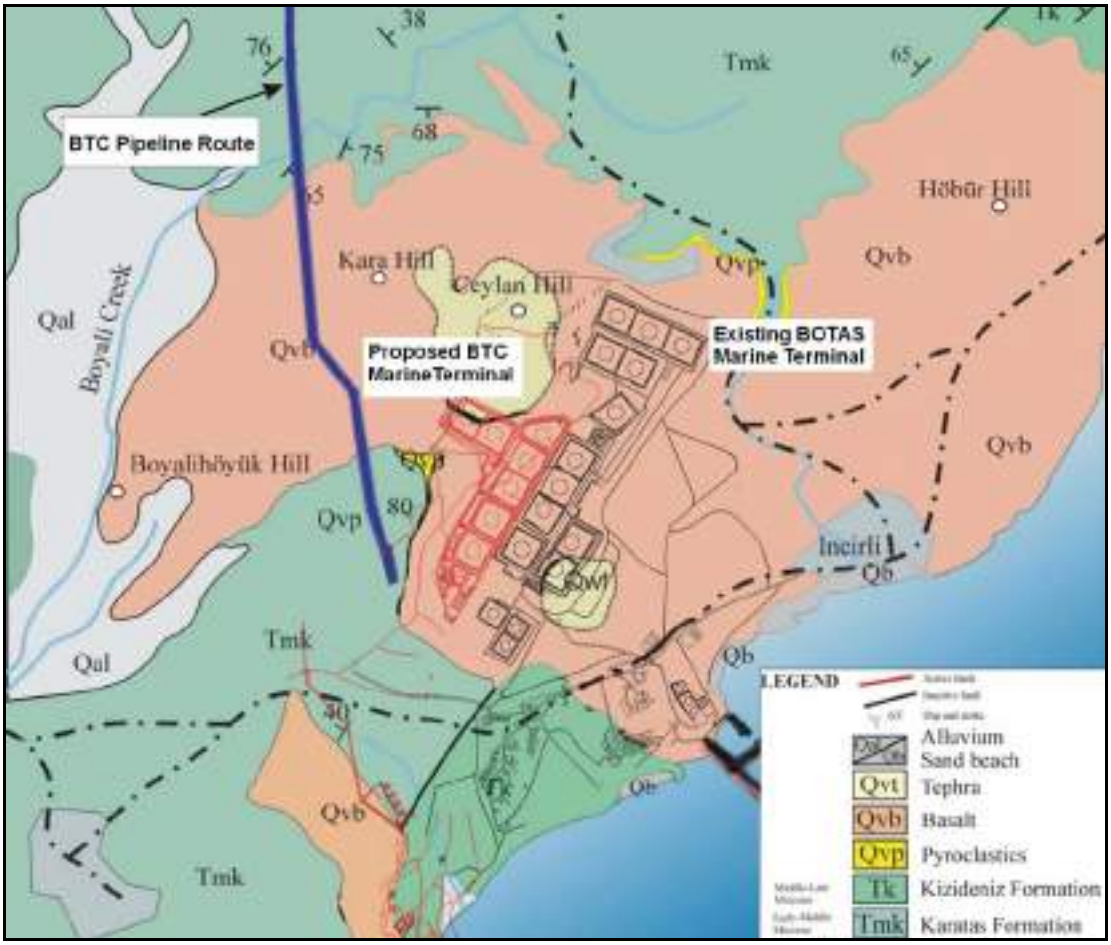


Figure 10.6 Geological Map of the BTC Marine Terminal Area

10.5.2 Landforms

Landforms of the area between the Misis Mountains and Iskenderun Bay are strongly influenced by the tectonic zones and bedding orientations in the sedimentary rock units [Ref 8]. Morphological features in the area of the existing BOTAŞ Marine Terminal include alluvium filled valley floors and depressions, which are elongated between eroded high land (see Figure 10.7).

Elevated topographical features in this area are formed by volcanic structures. Volcano cones are responsible for the formation of Kazankaya Hill, Ceylan Hill, Hoyuk Hill and north Incirli

[Ref 7]. These cones are of various sizes with slope gradients between 20-35°. There are no obvious craters on these cones.

Basalt lavas that spread out from volcanic cones have formed features such as lava plateaus and flows in the marine terminal area [Ref 7]. The proposed location for the tank farm is the flat area to the south of Ceylan Hill, which is identified as a lava plateau (see Figure 10.8). The basalts originate from the Kara Hill Volcano to the north of the site. Boyali Hoyuk and Uzunsirit lava flows are the longest lava flows in the vicinity of the BTC Marine Terminal study area, reaching up to 2km in length [Ref 7].

Alluvial sediments in the vicinity of the proposed BTC Marine Terminal were observed along Boyali Creek Valley to the north-west and west of the site [Ref 7]. Boyali Creek flows in a very narrow and shallow channel on these sediments, suggesting that the alluvial flats were formed as floodplains.

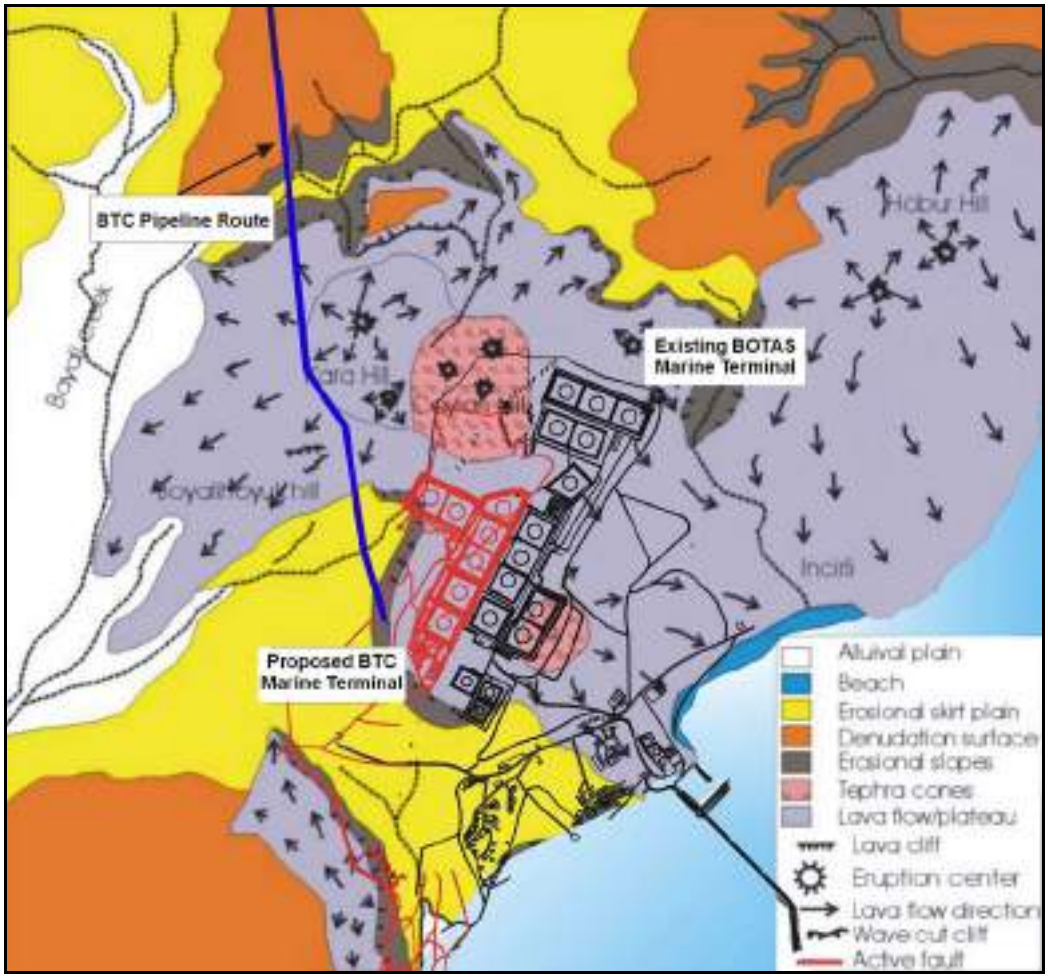


Figure 10.7 Landforms of the BTC Marine Terminal Area (ILF 2001)

10.5.3 Geohazards

10.5.3.1 Seismic activity

The BTC Marine Terminal will be located in a seismically active region of Turkey, between two faults, the Yumurtalik Fault and the Osmaniye-Karatas Fault (see Figure 10.8). These faults extend along the Misis Mountains. Study of the aerial photographs revealed that volcanic activity was associated with the NNE-SSW trending normal faults, which belong to the Osmaniye-Karatas and Yumurtalik Fault system [Ref 6].

Yumurtalik Fault is within the Osmaniye-Karatas Fault zone and extends between Karagedik and Yumurtalik [Ref 6]. The Yumurtalik Fault is not a continuous fault and consists of a number of small segments and/or parallel segments. It is a B-class[1] fault, approximately 62km long, and trenching studies indicate that it is an active fault showing one Holocene activity, (ie one activity during the last 10,000 years). Side scan sonar results and trenching studies have confirmed that the Yumurtalik fault will not be crossed by the new tank farm or the new jetty [Ref 9]. The Osmaniye-Karatas fault was identified as an inactive fault during trenching studies [Ref 9].

10.5.3.2 Earthquakes

The Adana region is known to be seismically active. The region has experienced 101 earthquake events in the last 2,000 years [Ref 1]. However, because of the short length of the faults in the region, large earthquakes (magnitude, M>7) are not historically known or expected [Ref 11]. These large earthquakes have not been recorded along the East Anatolian Fault on the eastern coast of the Gulf of Iskenderun and along the Dead Sea Fault (north-east of the gulf). Therefore, the risk of occurrence of a large earthquake near the proposed BTC Marine Terminal is minor [Ref 9].

Several earthquakes with M<7 have been recorded and have caused damage in the area (Celebi, 1999). These earthquake events have had varying intensity, magnitude and duration. Locations of earthquakes recorded in the region between 1900 and 1996, with a magnitude of ≥4.0, were obtained from the General Directorate of Disaster Affairs Earthquake Research Department [Ref 6] (see
Figure **10.9**).

In more recent years, two notable earthquakes occurring in 1945 and 1998 resulted in widespread destruction (see Figure 10.10). The 1998 earthquake occurred in the Adana basin in the districts of Adana and Ceyhan and was the last to occur in this region. The epicentre of the 1998 earthquake occurred 30km away from the proposed BTC Marine Terminal, (depth approximately 22km; M=6.3), causing considerable damage, with a total of 144 deaths [Ref 9]. However, due to the distance of the epicentre and the size of the earthquake, no damage was detected to any structures at the existing BOTAŞ Marine Terminal. The left-lateral fault that caused the earthquake is called the Misis-Ceyhan Fault.

[1] B-Class Fault: faults with indications of Holocene activity. Possible and probable displacements of centimetres to meters.

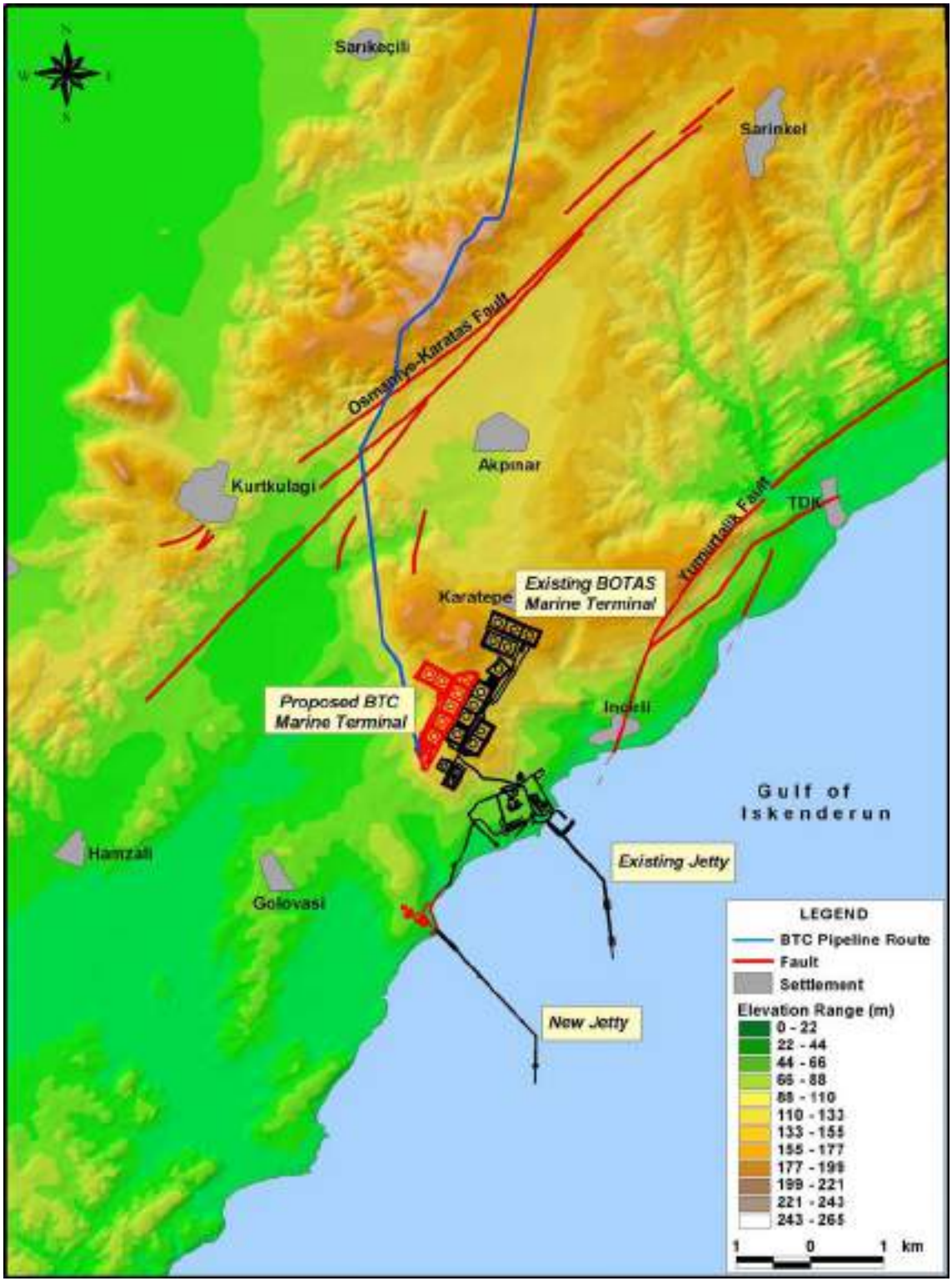


Figure 10.8 Major Faults in the Area of the Proposed BTC Marine Terminal [Ref 1**]**

Figure 10.9 Locations of Earthquakes (M≥ 4.0) in the Adana Basin between 1900 and 1996 [Ref 6**]**

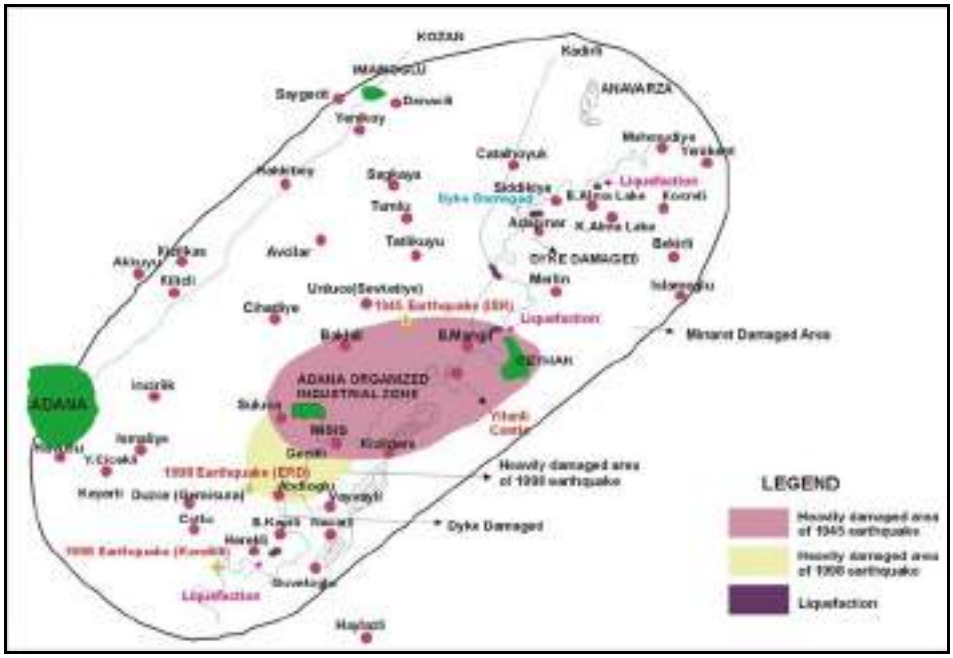


Figure 10.10 Damage Distribution Map of the 1945 and 1998 Earthquakes [Ref 1**]**

10.5.3.3 Volcanoes

There are 13 inactive volcanoes that exhibit Holocene activity in Turkey, though the closest to the proposed terminal, Erciyes Dagi-Stratovolcano, is approximately 190km away [Ref 9]. A stratovolcano comprises alternating layers of lava flows and volcanic ash, exhibits explosive eruptions during which ash may be carried thousands of miles. In general, this type of volcano erupts episodically over tens to hundreds of thousands of years and therefore has a low probability of occurrence [Ref 9]. There have been no volcanic eruptions in Turkey in the last 100 years [Ref 10].

The topography of the BTC Marine Terminal site was formed by volcanic structures within the Quaternary basaltic volcanism, which are inactive volcanoes [Ref 9]. Both Kara Hill and Ceylan Hill are old inactive volcanoes within the vicinity of the proposed site.

The greatest volcanic hazard that may arise at the proposed BTC Marine Terminal site is from ash fall. However, as the dominant wind direction at the site is from the north-east in the winter and SSW in the summer (see Section 10.2.4), the marine terminal is not situated downwind of any stratovolcanos. The risk of damage to the proposed BTC Marine Terminal as a result of volcanic activity is therefore expected to be negligible [Ref 9].

10.5.3.4 Landslides

The potential for mass movements, such as landslides, as a result of seismic forces acting on the lava cliff around the new tank farm and at the slopes of Ceylan Hill were investigated during geotechnical studies undertaken in 2001. Both field observations and slope stability calculations suggest that the potential for landsides at the proposed BTC Marine Terminal facilities is low [Ref 9 and Ref 4].

Geohazard studies also undertaken at the proposed BTC Marine Terminal site indicate that rock falls and block rolls are widespread on cliffs surrounding the lava plateau to the southwest of the proposed tank farm and to the north-east of the proposed housing compound [Ref 8]. Observations suggest that block rolls occur according to the position of fractures on the lava

[Ref 9]. The size of these rocks and stones can vary from a few centimetres up to a few metres. However, geohazard studies conclude that the risk of damage to the proposed BTC Marine Terminal due to landslides is expected to be minor [Ref 9].

A further detailed landslide hazard study investigated the two identified potential landslide hazards at the south-west corner of the new tank farm and at Ceylan Hill (north-east of the new tank farm) [Ref 13]. This study identified one shallow old landslide area at the south-west corner of the new tank farm, beside the volcanic rock escarpment, where basalt blocks fall down the cliff and spread randomly over the slope. Furthermore, surface water drains through joints in the lava cliffs and runs into the unstable material overlying the bedrock. The whole slope in this area is therefore considered a potential landslide area, where local and shallow landslides may take place in the colluvial cover on the bedrock [Ref 13]. However, any local landslides in this area are not expected to affect the new tank farm area.

A further potential landslide hazard was also identified during the landslide hazard study in the south-west area of the new tank farm. A fractured zone with a horizontal width of approximately 10 m along the cliff zone was identified at the volcanic rock escarpment. The fissures near the escarpment did not show signs of active deep-seated mass movement. Slope stability analysis in this area concluded that no deep-seated landslide hazards are expected at the south/west corner of the new tank farm [Ref 13].

At Ceylan Hill, the gradient of slopes is less than 15º near the proposed tank farm area and groundwater is not present. Based on site surveys during the landslide study and analysis of aerial photographs, there are no records of landslides taking place in the tephra unit in Ceylan Hill and the slopes here are not susceptible to such events [Ref 13]. The study therefore concluded that landslide hazards at this location can therefore be excluded.

10.5.3.5 Liquefaction

Liquefaction was observed during the Adana/Ceyhan earthquake in 1998 along the riverbanks of the Ceyhan River, approximately 15-20km from the proposed BTC Marine Terminal. Borehole data, soil investigations and seismic studies undertaken during subsequent geohazard studies at the proposed BTC Marine Terminal site conclude that liquefaction areas are not expected to occur at the new tank farm location due to the following [Ref 9]:

- the groundwater is below 30m; and
- the absence of relevant granular deposits as the bedrock is vesicular basalt below 1.5m to 10m of sandy gravely/clayey gravel soil and is underlain by basaltic breccia.

The potential for liquefaction (including lateral spreading) near the shoreline was also identified as minor during geotechnical studies [Ref 14]. Geohazard study conclusions regarding the potential for liquefaction along the alignment of the new jetty are discussed in Section 11.

10.5.3.6 Tsunamis

Tsunamis can be triggered by earthquakes, volcanic eruptions under the sea or landslides that displace water. However, there are no records of landslides and underwater volcanic eruptions in the Gulf of Iskenderun near the existing BOTAŞ Marine Terminal area [Ref 9]. Furthermore, the National Environment Research Council has recorded only a few tsunamis in the Eastern Mediterranean. A return period of 500 years yields an expected tsunami height of approximately 10m in the Eastern Mediterranean, for which no feasible counter design measures are possible. The usual lower limit for the onset of significant damage is a tsunami height of 4m. However, the risk of damage during the lifetime of the new jetty, (which is assumed to be 25 years), due to the occurrence of a tsunami is minor [Ref 9].

10.5.3.7 Other geohazards

Collapsing and expansive soil

Soil surveys conducted at the proposed BTC Marine Terminal site investigated the potential for soil collapse on the site. The terminal site is situated on vesicular basalt, basalt, sand and siltstone and claystone. Isolated gas pores in this material may exist, however, the extension of these pores is relatively small. In addition, soil types observed on the marine terminal site were determined as not susceptible to collapse. Therefore the risk of collapsing soil and subsequent damage to the tank farm and other structures is negligible [Ref 9].

Expansive soils can give rise to differential movement beneath structural foundations due to swelling and shrinking. Based on desk studies, the ability of flysch to swell or shrink is expected to be low. Additional soil investigations conclude that although there may be a potential for swelling in the area, it is anticipated to be low and the risk of this hazard is expected to be negligible.

Aggressive ground and groundwater

The potential for corrosion to the new tanks was assessed during site investigations. Soil resistivity measurements indicated that cathodic protection of the metallic components would be required up to 6 m depth [Ref 1 and Ref 9]. The risk of damage due to such a hazard is low.

10.6 SURFACE WATER AND GROUNDWATER

10.6.1 Surface water

There are few surface water features in the vicinity of the existing BOTAŞ Marine Terminal. Banyali Creek is the most prominent surface water feature, draining water to the west and north of Kara Hill (see Figure10.11). This creek has a number of ephemeral tributaries. The proposed tank farm facilities are located at the head of one such tributary, flowing south-west from the tank farm (see Figure10.11).

In addition, a small stream is present in a valley to the east of the tank farm. This surface water feature is supplied by water draining from Ceylan Hill to the west, and Hobur Hill to the east. The stream enters the sea at the settlement of Incirli, to the east of the existing BOTAŞ Marine Terminal.

Another ephemeral stream is located to the north-east of the proposed jetty, draining directly to the sea approximately 1km from the proposed jetty footing.

Gole pond is located 250m east of the existing tank farm at a height of 50m above sea level and lies within the existing BOTAŞ facility. The pond is approximately 5,000m^2.

10.6.2 Groundwater

There are considerable groundwater resources on the Cukurova plain, which lies to the north west of the proposed BTC Marine Terminal approximately 2km away (see Figure 10.11). There are two aquifer zones in the southern part of the plain (see Section 5.7.3) – an unconfined aquifer with a thickness of 100m and below this a confined aquifer with a depth of 150m. Groundwater quality in the unconfined layer is poor due to seawater intrusion, however, in the confined aquifer, the quality is high enough for use as drinking water. In the unconfined aquifer, groundwater is close to the surface and provides a source of irrigation for the intensive

agriculture in the area [Ref 2]. There is a smaller unconfined aquifer slightly closer to the proposed BTC Marine Terminal site.

Geotechnical studies carried out in the tank farm and general facilities areas of the proposed marine terminal indicate that the basalt and flysch[1] geological formation is generally poor in terms of groundwater in the immediate vicinity of the BTC Marine Terminal [Ref 4 and Ref 5]. Groundwater was found to exist near the sandstone layers in the flysch unit, although consideration should also be given to its existence along the boundary between the colluvium and the rock, particularly during wet seasons [Ref 4 and Ref 5]. However, these studies conclude that there are no substantial groundwater resources within the proposed BTC Marine Terminal area.

[1] Flysch: a sedimentary sequence consisting of marine deposits of dark, thinly bedded, fine-grained marls, sandstones, shales, clays, and muds.

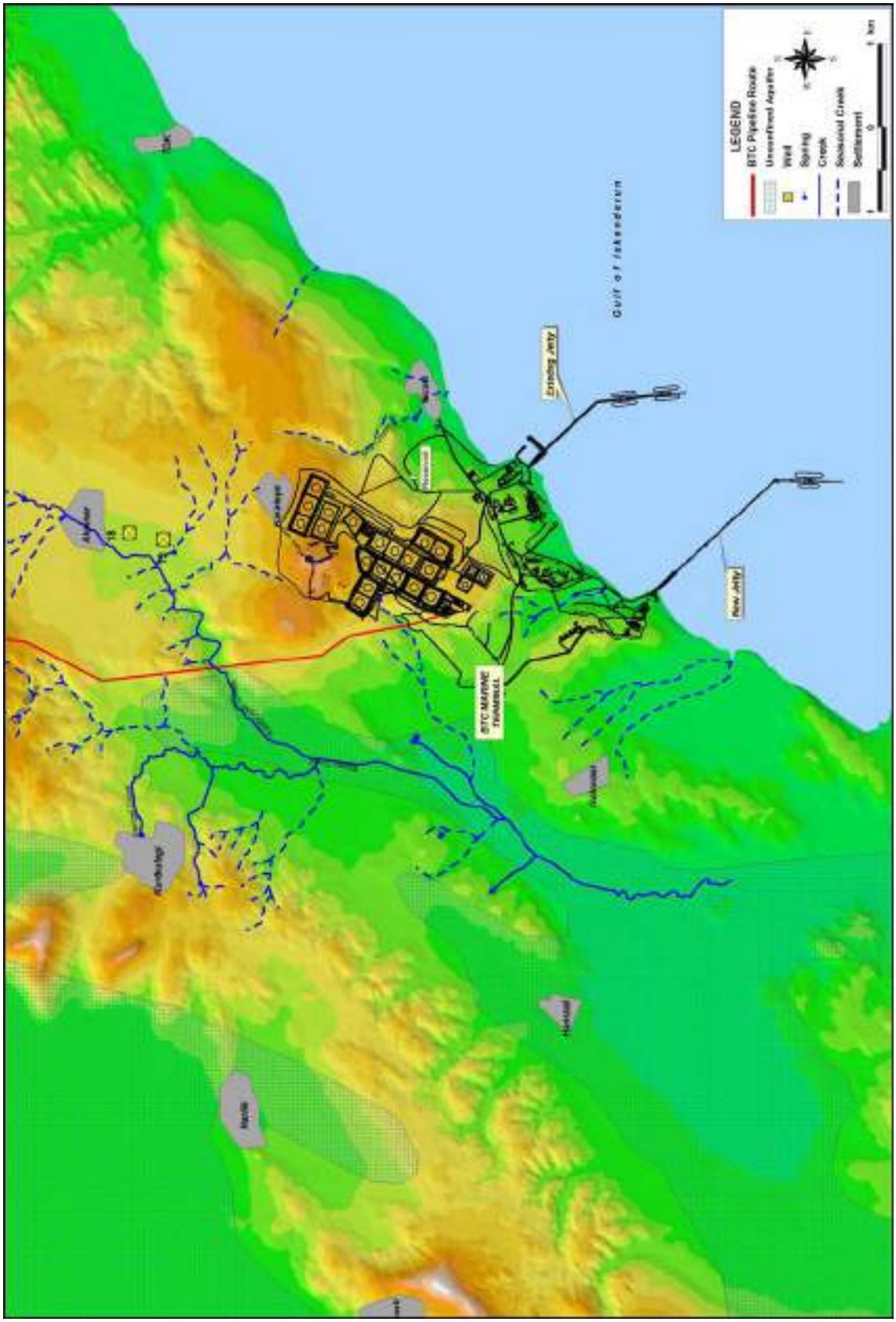


Figure 10.11 Surface Water and Groundwater Resources within the Vicinity of the BTC Marine Terminal

10.6.3 Irrigation

Irrigation systems are generally constructed by the State or by farmer co-operatives, but inevitably depend on the availability of water resources and topography (see Section 5.15.3). Contrary to the trend for Adana province, irrigation facilities are not widespread in the survey area and are only accessible to just over a quarter (27%) of the surveyed households, notably in the non-neighbouring settlements where commercial agriculture is more widespread.

Within the neighbouring settlements, Golovasi has the highest percentage of settlement land under irrigation (36%), followed by Incirli (33%). No land in Karatepe is under irrigation. See Plate 10.4 for an example of aerial irrigation in the study area.

Plate 10.4 Concrete Aerial Irrigation in Adana

10.6.4 Flood risk

The BTC Marine Terminal is situated on high ground (up to 125m above sea level), therefore, there is a low level of flood risk. Furthermore, the tephra and slag formation on Ceylan Hill and Kara Hill, which together form the drainage basin of the tank area, reduce the risk of surficial flooding in the tank area [Ref 8].

10.7 BIOLOGICAL ENVIRONMENT

10.7.1 Overview

The proposed BTC Marine Terminal site encompasses a variety of habitats, primarily maquis (scrub), semi-natural and managed wooded areas, agricultural areas and gardens associated with the site landscaping for the existing facilities (see Figure 10.12).

- Maquis scrub dominates the vegetation on the high ground at the tank farm location to the north of the facilities.
- The majority of land occupying the west of the facilities is used principally for agricultural purposes.

- Woodlands are located on the south facing slopes of the site, from approximately 100m above sea level stretching down to sea level, in places.
- The land occupying the southern area of the existing BOTAŞ marine terminal is mostly used for gardens, which form part of the landscaped terrain around the existing terminal facilities.

Habitat and faunal surveys and a Bird Survey have been undertaken at the proposed BTC Marine Terminal site [Ref 15; Ref 16]. These have identified key habitats and the presence of protected or important species, particularly within the site boundaries. Prior to the commencement of construction activities, detailed botanical surveys will be carried out at specific locations, such as along the terrestrial route of the loading lines, by an ecologist, (see Environmental Management and Monitoring Plan (EMMP), Appendix C1). This will serve as a guide during implementation of a Reinstatement Plan (RP, Appendix C2). In addition, faunal surveys will be undertaken prior to construction, to determine the presence and location of species within the proposed BTC Marine Terminal site and of nesting areas of resident bird species. These pre-clearance surveys will allow the development of site-specific measures to mitigate environmental impacts.

10.7.2 Protected areas

There are no internationally or nationally protected areas within the immediate vicinity of the BTC Marine Terminal. The nearest protected areas are as follows.

- Karatepe Aslantas National Park is approximately 60km north-east from the proposed BTC Marine Terminal. This is sufficiently far from the BTC Marine Terminal site as not to be at risk from impacts, including those that might arise from accidental events. It also has no ecological link to the site in terms of its habitat and species.

- Yumurtalik Lagoons Nature Reserve,, which is a 1st Degree Natural Site, is located approximately 25km south of the proposed BTC Marine Terminal. Yumurtalik Lagoons Nature Reserve is a huge complex of brackish and saline lagoons, salt and freshwater marshes, tidal mudflats, reedbeds, sand dunes and pine forests, which are important for a number of bird species. The reserve contains one of the few remaining Aleppo Pine (*Pinus halepensis*) forest communities, which are restricted in Turkey to West and South Anatolia (see Plate 10.5). This protected area was one of the sites included during the Bird Survey (see Section 10.7.3). A detailed description of Yumurtalik Lagoons Nature Reserve and its importance for bird species is given in Sections 11.4.8. The reserve would only potentially be at risk in the event of a large oil spill.

Plate 10.5 Aleppo Pine Forest at Yumurtalik Lagoons Nature Reserve

10.7.3 Protected species

10.7.3.1 Birds

A number of internationally and nationally threatened species were observed at or near the proposed BTC Marine Terminal site during the Bird Survey conducted between April and June 2001 [Ref 15]. In addition, a number of species were observed during a site walkover of the proposed tank farm and general facilities locations in October/November 2001.

The majority of birds recorded during these surveys were observed moving freely between the existing BOTAŞ Marine Terminal site and the surrounding farmland and are not known to breed in the area. These birds are therefore presumably passage migrants. The presence and locations of any nesting areas of resident species using habitats identified within the proposed BTC Marine Terminal site will be identified during habitat mapping and further ecological survey prior to the commencement of construction. Seasonal sensitivities for both breeding birds and passage migrants identified during the site walkover are discussed in Section 10.7.6.

Bird species recorded during both surveys are given in Table 10.8 and Table 10.9.

Table 10.8 Birds Recorded at the Proposed BTC Marine Terminal Site during the Bird Survey (April to June 2001)

Protection Status	Species
International Designation	
Annex I of EU Wild Birds Directive; Appendix II of CITES[1], CMS[2]; Annex A of EC Regulation 338/97[3]	Levant sparrowhawk (*Accipter brevipes*)
Annex I of EU Wild Birds Directive	honey buzzard (*Pernis apivorus*)
Annex I of EU Wild Birds Directive	booted eagle (*Hieraaetus pennatus*)
Annex I of EU Wild Birds Directive; Appendix II of CMS	glossy ibis (*Plegadis falcinellus*)

Appendix II CITES; Annex A of EC Regulation 338/97	barn owl (*Tyto alba*)
Appendix II of CMS	willow warbler (*Philoscopus trochilus*)
Appendix II of CMS	common redstart (*Phoenicurus phoenicurus*)
National Designation	
Species listed in Central Game Committee Decision regarding species for which hunting is forbidden nationally	graceful prinia (*Prinia gracilis*) hoopoe (*Upupa epops*) red-rumped swallow (*Hirundo daurica)*

1 CITES: Convention on International Trade in Endangered Species of Wild Flora and Fauna
2 CMS: Convention on Migratory Species
3 Council Regulation (EC) on the protection of species of wild fauna and flora by regulating trade therein (338/97)

Table 10.9 Birds Recorded at the Proposed BTC Marine Terminal Site during the Site Walkover (October/November)

Protection Status	Species
Internationally Protected	
Vulnerable under the IUCN 2000 Red List; Annex I of EU Wild Birds Directive; Appendix II of CITES[1]; Appendix I and II of CMS[2]; Annex A of EC Regulation 338/97[3]	lesser kestrel (*Falco naumanni*)
Annex I of EU Wild Birds Directive; Appendix II of CITES, CMS; Annex A of EC Regulation 338/97	long-legged buzzard (*Buteo rufinus*)
Annex I of EU Wild Birds Directive; Appendix II of CITES, Bern Convention, Bonn Convention; Annex A of EC Regulation 338/97	bonelli's eagle (*Hieraaetus fasciatus*)
Annex I of EU Wild Birds Directive; Appendix II of CITES, CMS; Annex A of EC Regulation 338/97	short-toed eagle (*Circaetus gallicus*)
Annex II of EU Wild Birds Directive; Annex A of EC Regulation 338/97	turtle dove (*Streptopelia turtur*)
Annex II of EU Wild Birds Directive	collared dove (*Streptopelia decaocto*)
Annex II of EU Wild Birds Directive	carrion crow (*Corvus corone*)
Annex II of EU Wild Birds Directive	magpie (*Pica pica*)
Appendix II of CITES, CMS; Annex A of EC Regulation 338/97	common kestrel (*Falco tinnunculus*)
Nationally Protected	
Species listed in Central Game Committee Decision regarding species for which hunting is forbidden nationally	crested lark (*Galerida cristata*) shore lark (*Eremophilia alpestris*) yellow-vented bulbul (*Pycnonotus xanthopygos*)

1 CITES: Convention on International Trade in Endangered Species of Wild Flora and Fauna
2 CMS: Convention on Migratory Species
3 Council Regulation (EC) on the protection of species of wild fauna and flora by regulating trade therein (338/97)

The Yumurtalik Lagoons Nature Reserve is also recognised as an Important Bird Area (IBA) (see Section 11). Of particular note is the local population of globally threatened white-headed duck (*Oxyura leucocephala*), which is categorised as Endangered under the IUCN 2000 Red List [Ref 15]. This species is given protection by the National Parks and Game-Wildlife Protection General Directorate (NPGWP) in Turkey through the 'Game/Hunting Commission Decision', which issues a decision annually prohibiting the hunting of the white-headed duck. Birds surveyed at Yumurtalik Lagoons IBA are further discussed in detail in Section 11.

10.7.3.2 Reptiles and Amphibians

A number of protected reptile and amphibian species were observed during ecological surveys at the BTC Marine Terminal site (Yusuf Gemici, *pers. comm.*).

- Asia minor spur-thighed tortoise (*Testudo greca ibera*) – listed as Vulnerable under the IUCN 2000 Red List;
- yellow tree frog (*Hyla savignyi*) – internationally protected under Appendix II of the Bern Convention;
- green toad (*Bufo viridis*) – internationally protected under Appendix II of the Bern Convention;
- snake-eyed lizard (*Ophisops elegans*) - internationally protected under Appendix III of the Bern Convention;
- Danford's lizard (*Lacerta danfordi*) - internationally protected under Appendix III of the Bern Convention;
- banded skink (*Mabuya vittata*) - internationally protected under Appendix III of the Bern Convention;
- European blind snake (*Typhlops vermicularis*) - internationally protected under Appendix III of the Bern Convention;
- Caspian snake (*Coluber caspius*) - internationally protected under Appendix III of the Bern Convention;
- dwarf snake (*Eirenis modestus*) - internationally protected under Appendix III of the Bern Convention.

10.7.4 Habitats and vegetation

10.7.4.1 Maquis (scrub)

Various types of scrubland occur throughout the Mediterranean region, each being differentiated by a particular plant assemblage and the type of soil on which it grows. Key component species of the Anatolian maquis, but which have no international or national protection, include:

- kermes oak (*Quercus coccifera*);
- myrtle (*Myrtus communis*);
- chaste tree (*Vitex agnus-castus*);
- mastic tree (*Pistacia lentiscus*);
- turpentine tree (*P. terebinthus*);
- thorny broom (*Calycotome villosa*);
- Syrian privet (*Fontenesia phyllarioides*);
- thorny burnet (*Sarcopoterium spinosum*);
- sage-leaved rock-rose (*Cistus salviifolius*);
- Etruscan honeysuckle (*Lonicera etrusca*);
- fruiting jasmine (*Jasminium fruticans*);
- prickly rush (*Ruscus aculeatus*);
- narrow-leaved asparagus (*Asparagus acutifolius*).

Habitat assessment of the proposed BTC Marine Terminal site shows that maquis scrub dominates much of the area (see Figure 10.12), and has an average height of 2m. During the evaluation carried out at these sites, which are in the possession of BOTAŞ, located in the

proposed Marine Terminal, eightendemic maquis species, listed in the Turkish Red Data Book, were observed on the proposed Marine Terminal site during this assessment. These are *Centaurea solstitialis sp. Carneola*, *Phlomis longifolia var. bailanica*, *Stachys pumulia*, *Glycyrrhiza flavescens*, *Verbascum linearilobum*, *Bupleurum zoharii*, *Crocus cancellatus sp. cancellatus* and *Allium gayi*. Although these species have not been assigned categories by the IUCN, they potentially meet the IUCN 2000 Red List criteria and could be assigned categories at a later date (Yusuf Gemici, *pers. comm.*).

Most species on the existing BOTAŞ Marine Terminal site are annuals. Germination begins at the beginning of March and continues until mid June.

Sparser scrub, with significant bare areas on limestone soil is termed garigue. Although this is found in the wider area, garigue habitats have not been identified at the proposed BTC Marine Terminal site.

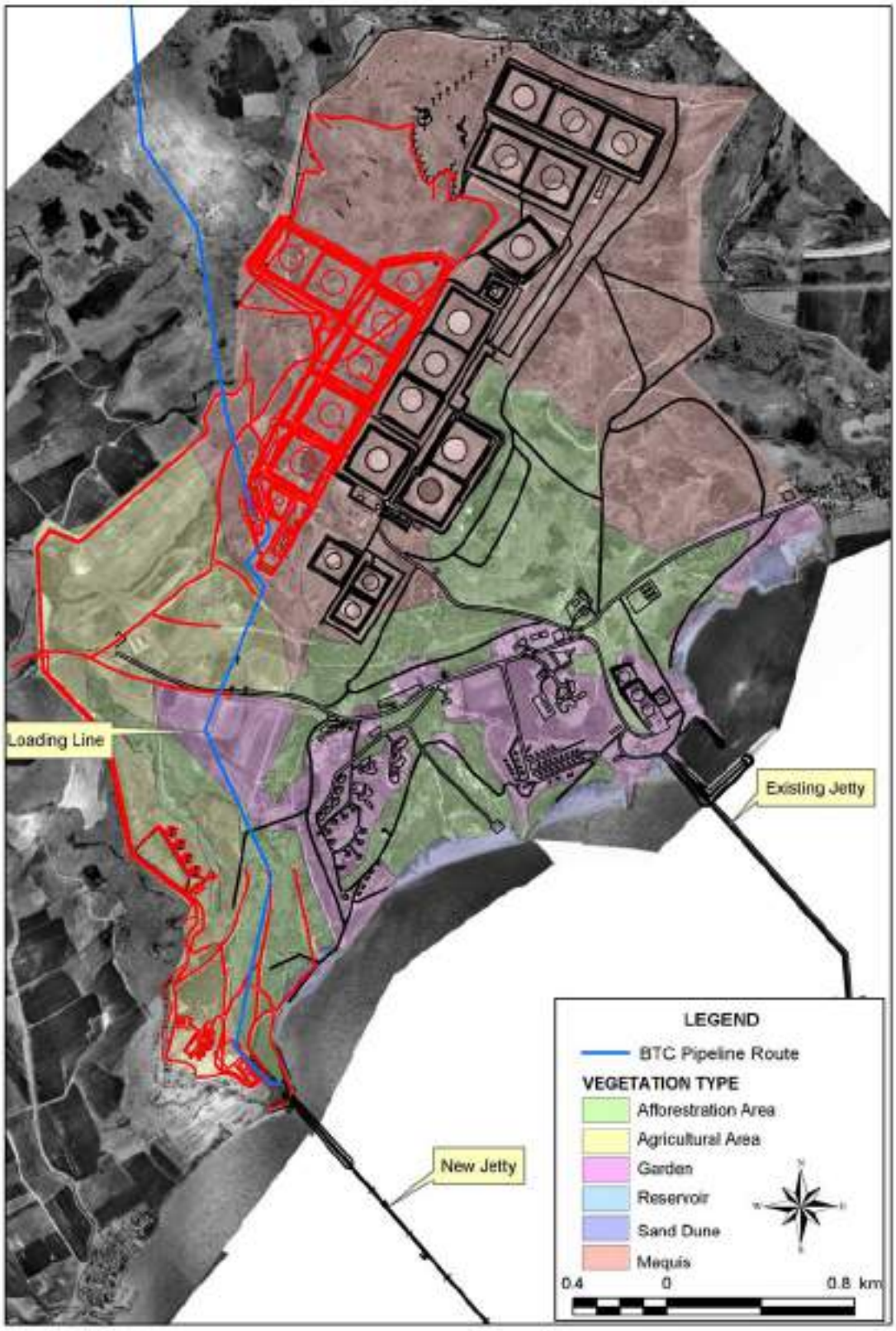


Figure 10.12 Vegetation Types in the BTC Marine Terminal Area

10.7.4.2 Woodland and orchards

The area around the proposed terminal facilities encompasses some significant plots of semi-natural woodland. Key species include the red pine (*Pinus brutia*), the umbrella pine (*Pinus pinea*) and the Mediterranean cypress (*Cypressus sempervirens*). These species, along with various other exotic tree and plant species, such as the eucalyptus *Eucalyptus canadulensis* and the acacia *Acacia cyanophylla*, were selected for afforestation of the existing BOTAŞ Marine Terminal site. Natural regeneration of this area was observed during surveys and afforestation was predicted to have taken place approximately 15 years ago [Ref 16].

Red pine occurs only in a managed plantation within the boundary of the existing BOTAŞ facility (see Plate 10.6). This species is ideally suited to the Mediterranean climate as it is not sensitive to soil or rock.

Plate 10.6 Red Pine (*Pinus brutia*) Afforestation at the Existing BOTAŞ Marine Terminal

The umbrella pine and Mediterranean cypress are relict species and have been planted along the borders of the red pine plantations [Ref 16]. Although they are not regarded as important for diverse flora, they do provide shelter and act as a habitat for some faunal species that cannot survive on the Cukurova Plain to the north, where intensive agriculture is undertaken [Ref 16].

Extensive orchards, predominantly citrus fruits and pomegranate (*Punica granatum*), have been planted on the grounds of the existing BOTAŞ facility.

10.7.4.3 Farmland

Agriculture is practised both on the site of the existing BOTAŞ facility and in the wider area to the north. Where terrain allows, intensive practices are used. The majority of agricultural land is of a relatively low quality within the boundaries of the existing BOTAŞ Marine Terminal site

(ie soil capability classes III, IV and VI) (see Section 10.3.2). Low quality agricultural soil capability classes IV and VII largely coincide with areas of afforestation.

10.7.4.4 Sand dunes

Sand dunes are found on the coastal fringe of the existing BOTAŞ Marine Terminal site, in a small sheltered bay between the existing jetty and the location of the proposed jetty.

The vegetation here is characteristic of the sheltered sandy coasts of West and South-west Anatolia. The dominant species are herbaceous, such as coastal morning glory (*Ipomoea stolonifera*), narrow-leaved bugloss (*Echium angustifolium*) and sea spurge (*Euphorbia paralias*), which grow to between 5–40cm high, and cover up to 25 % of the sand (see Plate 10.7). Their growth adds to the stability of the dunes [Ref 16].

Plate 10.7 Sand Dune Vegetation Dominated by Coastal Morning Glory (*Ipomoea stolonifera*) on the Beach at the Existing BOTAŞ Marine Terminal

There is also a sparse shrub community present (3% coverage), which grows to approximately 40cm high, comprising camelthorn (*Alhagi pseudoalhagi*) and Syrian mesquite (*Prosopis farcta*), neither of which are typical sand dune species. Over a small alluvial fan at the southern part of the beach where an ephemeral stream enters the sea, and the soil is composed of clay and sand, a dense semi-marshland community has formed dominated by Japanese blood grass (*Imperata cylindrica*), common reed (*Phragmites australis*), and tamarisk (*Tamarix smyrnensis*), growing to a height of up to 2m [Ref 16].

Although this type of sand dune vegetation is composed of common species, it is scarce locally, and greatly threatened along the coasts of west and south Anatolia because of the ubiquity of tourism development. The presence of sea daffodil (*Pancratium maritimum*) here is noteworthy since the species is a nationally rare plant and is listed in the Red Data Book for Turkey; see Plate 10.8. It prefers stable dune systems and is adversely affected by tourism, as it is frequently picked when found [Ref 16].

Plate 10.8 Specimen of the Sea Daffodil (*Pancratium maritimum*) – Growing at the BTC Marine Terminal Site

Sand dunes are also present beyond and to the south of the proposed BTC Marine Terminal site. They have an approximately 30 % coverage of shrubs, growing to a height of between 1.5 and 2 m. Dominant species include Oleander (*Nerium oleander*) and Chaste tree (*Vitex agnus-castus*), which were once widespread and dense throughout this area, but are now greatly reduced as a result of cutting by tourists [Ref 16]. Tamarisk (*Tamarix smyrnensis*) may also be found on alluvial sediments.

The field layer varies in height from between 20 and 40 cm, with the rush (*Juncus subulatus*) being dominant. However, Japanese blood grass (*Imperata cylindrica*) was found to grow to a maximum height of 1m. Sand dune communities in this area were observed to be species-poor due to the difficult growing conditions experienced [Ref 16], but provide important nesting habitat for Loggerhead and Green turtles (see Section 11.4.5).

10.7.5 Fauna

A detailed faunal survey will be conducted under the supervision of a qualified ecologist, (see the EMMP in Appendix C1), prior to the commencement of construction activities to identify the presence and location of threatened or potentially sensitive species at the proposed BTC Marine Terminal site.

The diversity of habitats within the existing BOTAŞ facility (and the proposed terminal) supports a commensurate diversity of fauna. The presence of large numbers of raptors on the proposed BTC Marine Terminal site indicates an abundance of rodents and other small mammals. The Brown Hare (*Lepus capensis*) has also been observed at the BTC Marine Terminal [Ref 16].

Bats were frequently observed at dusk throughout the site. The presence of significant stands of trees provides suitable habitat for several species. The managed woodlands on the terminal site also provide a habitat for species not found elsewhere in the wider area. For example, the goitred gazelle (*Gazella subgutturosa*), which is extinct in the wild in Turkey, has been re-introduced at the existing BOTAŞ facility, where a managed herd is corralled [Ref 16].

Several species of snakes and lizards known to be present in the area are presumed to frequent the site where a suitable habitat is present.

A number of protected amphibian species were observed during ecological surveys at the BTC Marine Terminal site (see Section 10.7.3.2). In addition, the European pond turtle (*Emys orbicularis*), which is listed as Lower risk-near threatened (LR-nt) under the IUCN 2000 Red List, was observed in irrigation canals within the immediate vicinity of the existing terminal site.

10.7.6 Seasonal sensitivities

Breeding birds are likely to be present between March and September, with the peak breeding season concentrated between April and July. Migratory birds generally pass through the area in the spring between mid March and late May and again during the summer/autumn between late July and mid October. Non-breeding summer visitors occur in the area between mid March and late August.

Passage migrants are also a potential seasonal sensitivity. These birds tend to congregate at staging posts, which may include wetland areas such as the Yumurtalik Lagoon, and will be susceptible to disturbance as a result of their low energy budgets. However, the presence of such staging posts is unlikely within the proposed BTC Marine Terminal site. Seasonal sensitivities for birds at Yumurtalik lagoons are discussed in Section 11.

Table 10.10 summarises the seasonal sensitivities for birds observed at the BTC Marine Terminal.

Table 10.10 Seasonal Sensitivities

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Birds												
Breeding Birds												
Passage migrants												
Summer visitor												

peak period other important period

No information is available for other habitats and/or species at the BTC Marine Terminal site other than those in Attachment 1 of the EMMP (see Appendix C1), which sets out seasonal sensitivities for species along the BTC Pipeline Route.

10.8 AIR QUALITY

10.8.1 Sources of information

An air quality sampling programme was developed taking into consideration the following factors:

- type of pollutants that will be emitted by the project activities;
- significance of the pollutant emissions in terms of quantity;
- existing air pollution sources near the project locations;
- seasonal atmospheric variations;
- proximity of population centres, and environmentally sensitive areas (ESAs) to the project emission sources.

In general, air emissions related to the proposed construction of the BTC Marine Terminal are minor in quantity and amenable to control through the adoption of standard mitigation techniques. However, Particulate Material (PM) emissions may be significant during the construction of the terminal. Therefore, PM measurements have been undertaken to determine the background levels.

Operation of the marine terminal may result in ground level concentrations of pollutants in the vicinity of the tank farm and the tanker loading area. Air quality has been monitored in the vicinity of the proposed BTC Marine Terminal and existing monitoring data for a nearby site has been referred to in the determination of background air quality.

The seasonality of the ambient pollutant levels has been taken into consideration. Typically, background air pollutant levels in the Adana Province are lower during the wet season (between January and May) [Ref 25] and higher in the dry season (between June and September) [Ref 17]. This is particularly true for the atmospheric PM levels, which are mostly generated by wind erosion. Measurements for PM and Volatile Organic Compounds (VOCs) have therefore been taken during the dry season in order to observe the worst-case ambient concentrations.

Ambient VOC levels were sampled in terms of total VOC concentration, which is a parameter commonly used for detecting the presence of organic pollutants that may potentially be emitted from oil export facilities.

The air quality measurement program entailed monitoring over a one-week period in the dry season between 21-28 September 2001 and in the wet season between 7 - 17 February 2002 to examine existing PM_{10}[1] and VOC levels at the proposed BTC Marine Terminal site. Figure 10.13 shows the locations of both PM_{10} and VOC sampling sites.

[1] **PM_{10}**: the fraction of suspended particulate matter (SPM) with an aerodynamic diameter of less than 10 micrometers (**μm**).

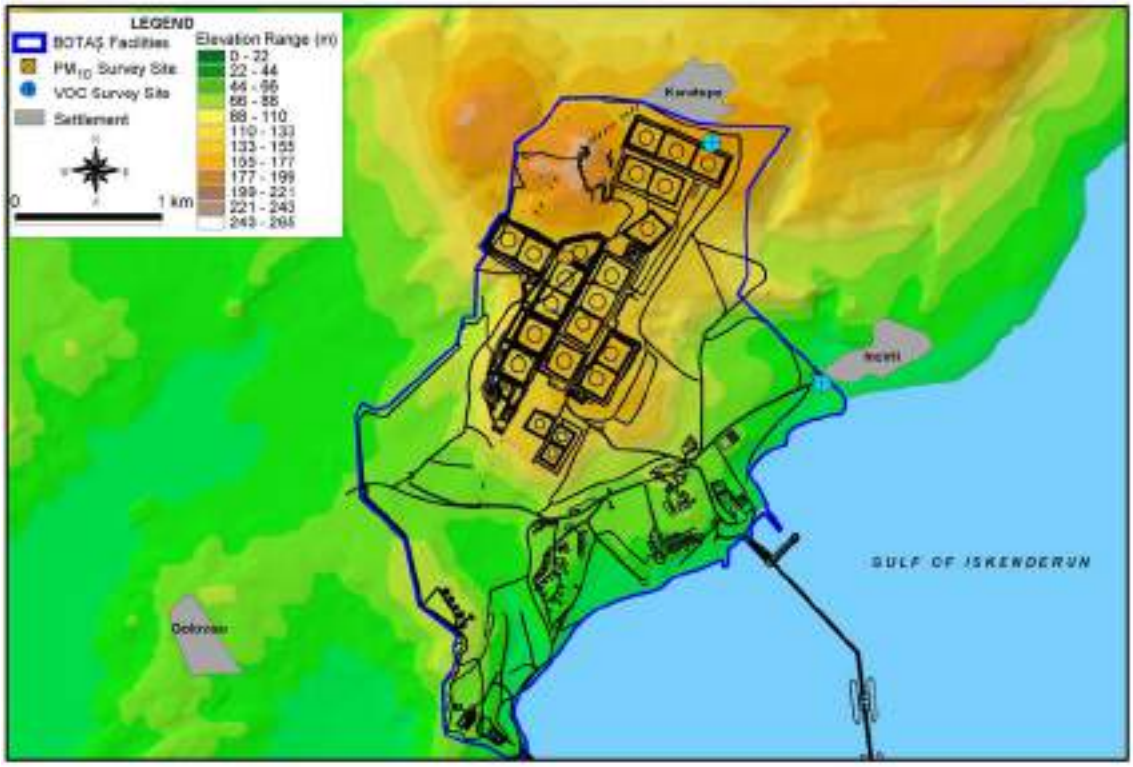


Figure 10.13 Location of Air Quality Sampling Sites in the BTC Marine Terminal Area

10.8.2 PM_{10}

PM_{10} concentrations were measured at the proposed BTC Marine Terminal site using a Minivol portable low-volume sampler equipped with a 10-µm inlet [Ref 17]. Seven daily average concentrations were measured. The results of the PM_{10} survey are given below in Table 10.11.

Table 10.11 PM_{10} Concentrations at the Existing BOTAŞ Marine Terminal Location

DATE	PM_{10} CONCENTRATION (µg m^{-3})
Dry Season	
22/9/2001	28.8
23/9/2001	23.1
24/9/2001	48.0
25/9/2001	57.4
26/9/2001	54.8
27/9/2001	49.1
28/9/2001	25.9
Weekly Average	41.0
Wet Season	
7/2/2002	25.4
8/2/2002	25.3
9/2/2002	43.2
10/2/2002	24.4
11/2/2002	32.1
12/2/2002	22.2
13/2/2002	37.1
Weekly Average	30.0

Source : [Ref 17]

Comparison of these concentrations with short-term limit values under the Turkish Regulation on Preservation of Air Quality (300µg m^{-3}) indicates that these values are well below this limit. Whereas, comparison with short-term limit values under European Community (EC) standards, (50µg m^{-3}), indicates that there are two instances where the short-term limit value is exceeded. The EC limit value allows a maximum of 35 exceedances of 50µg m^{-3} per year. However, it is reasonable to use the Turkish standard as the air quality benchmark since elevated atmospheric particle levels could be explained on climatic grounds.

10.8.3 VOCs

The VOC survey was conducted using a portable Perkin-Elmer Photovac Voyager Gas Chromatograph - Photoionization Detector (GC/PID) with a detection limit of 0.5 parts per million (ppm)[1]. Both continuous and source screening measurements were taken during the survey.

The existing BOTAŞ tank farm and marine loading facilities are the main sources of the ambient VOC. During the source screening survey, the highest VOC concentrations were observed in the ballast tank area of the existing BOTAŞ Marine Terminal (6.7ppm, or 10 g m^{-3} near the control room) as the ballast tanks are uncovered and receive oily ballast from incoming ships [Ref 17]. VOC concentrations at the existing tank farm were not as high, as the crude oil tanks are covered and sealed [Ref 17]. Ambient VOC measurements were surveyed through continuous measurements conducted at two locations in the immediate vicinity of the existing BOTAŞ facilities. These locations are the Incirli settlement entrance to the east of the existing BOTAŞ facilities and Karatepe settlement to the north-east. These sites were chosen because of their downwind locations from the existing facilities. Briefly, the survey involved taking a sample for 10 seconds every 5 minutes over a 24 hour period at each of the two locations, giving a total of 576 measurements.

During this survey, total VOC concentrations were all below the detection limit, with the exception of six instantaneous (ie 10s) measurements, given in Table 10.12. These measurements were probably due to changes in source strengths [Ref 17]. The highest instantaneous VOC concentration was observed at Karatepe settlement. Long-term VOC concentrations are likely to be significantly lower than these instantaneous concentrations.

Table 10.12 VOC Concentrations at the BTC Marine Terminal Location

LOCATION	DATE	TIME	CONCENTRATION (ppm)	CONCENTRATION mg m^{-3}
Karatepe	25/09/2001	16:02	6.7	10.1
Karatepe	25/09/2001	16:32	6.4	9.6
Karatepe	25/09/2001	17:01	8.5	12.8
Karatepe	25/09/2001	17:16	1.7	3.1
Karatepe	25/09/2001	17:31	7.2	10.8
Incirli	28/09/2001	02:19	3.1	4.7

Source: [Ref 17]

Under the Turkish Regulation for the Preservation of Air Quality, the VOC standard has been taken as the total hydrocarbon standard, an hourly maximum of 280µg m^{-3} (see also Appendix D), ie 0.28mg m^{-3}. It is difficult to make a comparison between the standard and the measured values. Only six out of 576 values were above the instrument detection limit and these were all

[1] Conversion factors from ppm VOC to mg m^{-3} are not straightforward. They vary from 1ppm = 1.8mg m^{-3} to 1ppm = 4mg m^{-3} for propane and heptane respectively. Taking a mean of 1ppm = 2.9mg m^{-3} the detection limit was in the order of 1.5mg m^{-3}.

very short-term episodes. However, the instrument detection limit of 1.5mg m^{-3} is also above the standard so there is no certainty that the values measured as below detection were not above the standard.

VOCs are not easy to address in terms of monitoring. Measured concentrations are easily influenced by transient sources such as road traffic and farm vehicles. VOCs are also difficult to address in terms of composition since they may comprise variable mixtures of alkanes and aromatic hydrocarbons etc. The alkanes may make up the bulk of the VOC but it is the aromatics that have the potential greatest human health implications. For these reasons a long-term monitoring programme has been set up to establish more information on VOCs in the project area. This will primarily involve a passive monitoring approach where BTEX (benzene, toluene, ethyly benzene and xylene) diffuser tubes are deployed and regularly analysed.

10.8.4 Existing air quality in the wider terminal area

Baseline information on the existing SO_2, NO_2, PM_{10}, and NO concentrations in the wider terminal area is available from two previous studies undertaken for the Sugozu Power Plant, which is under construction approximately 4-5km from the proposed BTC Marine Terminal. Information from this study is intended to supplement site-specific data already gathered and is considered indicative of the general conditions within the wider BTC Project area.

Long-term concentrations of SO_2, PM_{10}, NO, and NO_2 pollutants are presented in Table 10.13 [Ref 18]. The data were collected during two different seasons (spring and summer; ie wet and dry seasons).

During the wet season total PM (TPM) measured, whereas in the dry season, only PM_{10} was measured due to a difference in the use of sampling instruments for each season. Complementing these measurements, a long-term (annual) passive sampling monitoring study was also conducted [Ref 19]. In this study, annual average concentrations for SO_2 and NO_2 were 7 and 11µg m^{-3}, respectively.

Table 10.13 Average Pollutant Concentrations in the Wider Terminal Area

POLLUTANT PARAMETERS	GROUND LEVEL CONCENTRATION (µg m^{-3})	
	10 DAYS (Wet Season)	38 days (dry season)
SO_2	3.06 ± 0.89	4.84 ± 3.80
TPM	53.29 ± 18.75	7.76 ± 17.55*
NO	1.43 ± 0.30	0.32 ± 0.74
NO_2	6.44 ± 2.37	7.47 ± 4.20
NO_x	7.87 ± 2.52	7.80 ± 4.58

*Only particles with less than 10µm aerodynamic diameter (ie PM_{10}) were measured.
Source: [Ref 19]

The concentrations in Table 10.13 were measured over 10 days and 38 days for the wet and dry seasons, respectively. These values are not directly comparable with the standard short-term limit values, which are measured over a 10-minute to 24-hour period. Comparison with long-term limit values identified in the Turkish Regulation on Air Quality, EC standards and World Health Organisation standards has therefore been made.

Annual mean long-term limit values under the Turkish Regulation are 100µg m^{-3} for NO_2, 200µg m^{-3} for NO and 150µg m^{-3} for both SO_2 and PM; under EC standards, 40µg m^{-3} for NO_2 and 40µg m^{-3} for PM; and under the World Health Organisation standards, 50µg m^{-3} for SO_2.

The measured concentrations of all pollutants are below the limit values and therefore it is likely that the long-term limits will be met. The data indicate little in the way of combustion related

pollution in the area. This is with the exception of PM, for which the long-term limit value under the EC standard was exceeded during the wet season. However, this survey data should be treated with a degree of caution, as it may not be representative of the rest of the year and may have a natural rather than combustion source. However in 2003, approximately 18 months before the BTC Marine Terminal commences operation, the coal-fired power plant at Sugozu will become operational. This will constitute a substantial new source of combustion related pollution in the area and for this reason further long-term air quality monitoring of sulphur and nitrogen oxides and PM_{10} will be undertaken for the project area.

10.9 NOISE

Daily continuous (24 hours) measurements were conducted at two residential locations in the area – Karatepe settlement and the BOTAŞ lodges [Ref 20]. Karatepe settlement is near the existing tank farm of the BOTAŞ facilities whereas the BOTAŞ lodges are inside the existing BOTAŞ Marine Terminal area (see Figure 10.14).

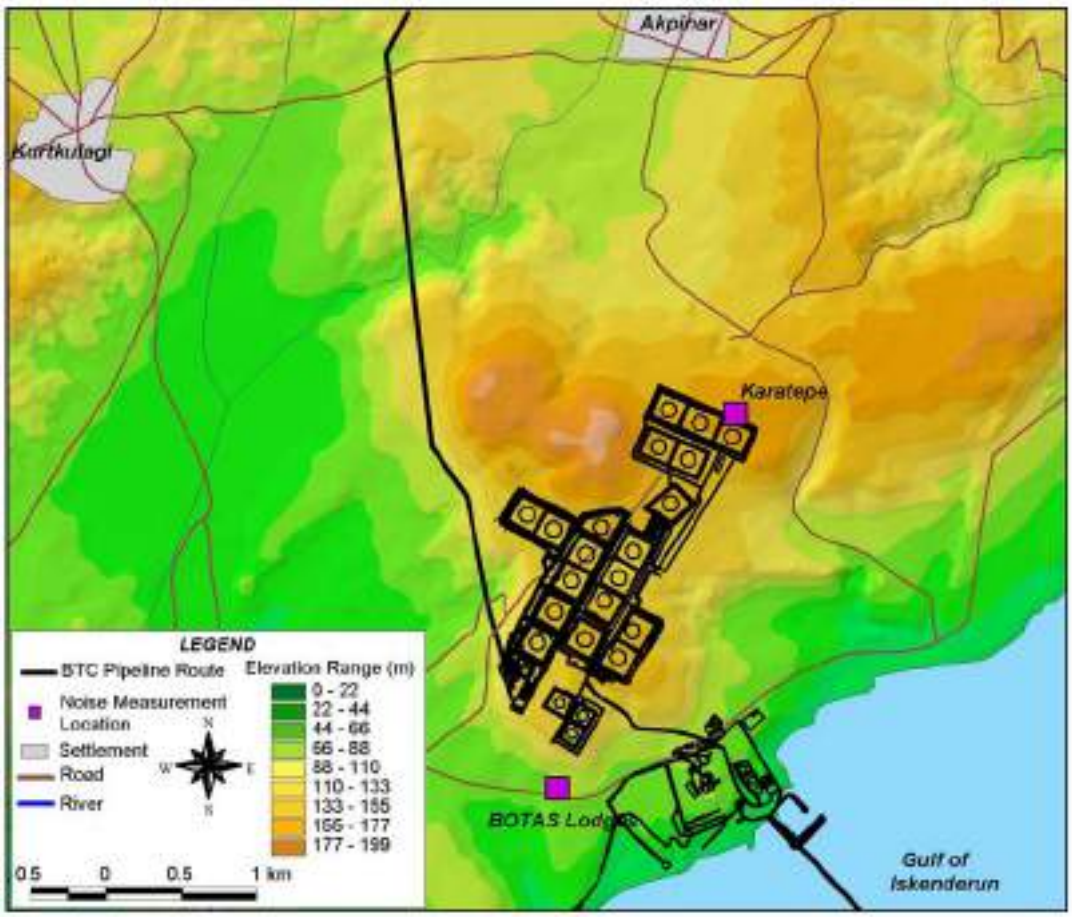


Figure 10.14 Location of Noise Measurements in the Vicinity of the BTC Marine Terminal

At Karatepe, day and night time L_{eq} values as well as daily average L_{eq} were calculated using the 24-hour continuous noise measurement records. These L_{eq} values are presented in Table 10.14 and Table 10.15 for weekend and weekday levels, respectively.

Table 10.14 Day and Night L_{eq} Values and Daily Averages of L_{eq} Measurements at Karatepe (weekend)

	DAY; 06:00-22:00 NIGHT; 22:00-06:00[1]	DAY; 07:00-22:00 NIGHT; 22:00-07:00[2]
L_{eq} (day)	43.3	43.2
L_{eq} (night)	36.4	37.3
L_{eq} (daily-24 hr)	41.0	

Table 10.15 Day and Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements at Karatepe (weekday)

	DAY; 06:00-22:00 NIGHT; 22:00-06:00	DAY; 07:00-22:00 NIGHT; 22:00-07:00
L_{eq} (day)	52.3	52.2
L_{eq} (night)	58.9	58.4
L_{eq} (daily-24 hr)	54.5	

Noise sources in the area comprise road traffic and daily activities of the residents as well as activities both at the existing BOTAŞ tank farm and jetty.

As shown in Table 10.14 and Figure 10.15 daily average noise levels at the weekend are lower than during the week. This is because the measurement location is close to the existing BOTAŞ Marine Terminal, where daily routine activities during the week are the main sources of noise in the area. Increased night time noise levels during the working week at Karatepe were likely to be caused by repair and maintenance work that was reportedly carried out during the cooler hours of the night between 15:00 and 08:00 hours [Ref 20]. Peaks were seen between 21:00 and 22:00 hours in diurnal records as a result of such works in the existing tank farm. These levels exceed the 45 dBA World Health Organisation criterion above which sleep disturbance may occur.

At the BOTAŞ Lodges, day and night time L_{eq} values as well as daily average L_{eq} were also calculated using the 24-hour continuous noise measurement records. These L_{eq} values are presented in Table 10.16 and Table 10.17 for weekend and weekday levels respectively.

Table 10.16 Day and Night L_{eq} Values and Daily Averages of L_{eq} Measurements at BOTAŞ Lodges (weekend)

	DAY; 06:00-22:00 NIGHT; 22:00-06:00	DAY; 07:00-22:00 NIGHT; 22:00-07:00
Leq (day)	50.6	50.6
Leq (night)	46.3	46.7
Leq (daily-24 hr)	49.2	

Table 10.17 Day and Night Time L_{eq} Values and Daily Averages of L_{eq} Measurements at BOTAŞ Lodges (week day)

	DAY; 06:00-22:00 NIGHT; 22:00-06:00	DAY; 07:00-22:00 NIGHT; 22:00-07:00
L_{eq} (day)	46.1	45.8
L_{eq} (night)	45.4	45.6
L_{eq} (daily-24 hr)	45.9	

[1] The Turkish Noise Control Regulation defines 'day' as 06:00 – 22:00 and 'night' as 22:00 – 06:00. This statement applies to Tables 10.11 – 10.14.

[2] The World Bank Noise Standard defines 'day' as 07:00 – 22:00 and 'night' as 22:00 – 07:00. This statement applies to Tables 10.11 – 10.14.

Comparison of Table 10.16 and Table 10.17 indicates that weekend L_{eq} values are higher than those recorded during the week, probably because BOTAŞ personnel spend most of their weekday time away from the lodges (ie administrative buildings, tank farm, workshop and jetty) [Ref 19]. Weekday noise levels are therefore lower in the vicinity of lodges.

Similarly, survey results at Karatepe show diurnal changes in noise levels at BOTAŞ lodges, with peaks between 21:00 and 22:00, due to loading/unloading at the jetty and maintenance works conducted in the existing tank farm.

10.10 CULTURAL HERITAGE

Desk studies and preliminary consultations with the Ministry of Culture and the Adana Provincial Directorate on the Protection of Cultural and Natural Entities were undertaken during the Basic Engineering phase and Scoping stage of the EIA. These identified two archaeological sites 1.5 km north-west of the proposed BTC Marine Terminal site. These sites are Boyali Mound and Mercimek Mound and were deemed vulnerable sites only in terms of the potential impacts associated with oil spills [Ref 2]. There were no archaeological sites identified within the BTC Marine Terminal [Ref 2].

Furthermore, baseline studies conducted during the Detailed Engineering stage also confirm the absence of archaeological sites in the area of the BTC Marine Terminal [Ref 22].

10.11 DEMOGRAPHICS

It is important to document existing population levels, migration patterns and gender/age balances as a benchmark for future change. This is particularly salient in view of evidence that in-migration associated with existing developments has already taken place and is shaping the gender and age balances of settlements in the existing BOTAŞ Marine Terminal area. Understanding the demographic characteristics of an area also allows for the prediction and assessment of the types of impacts likely to be experienced as a result of the proposed development (eg the existing ratio between numbers of residents and available services will provide an indication of the ability of the survey area to absorb additional population totals).

10.11.1 Provincial level demographic overview

According to the latest official census[1], the total population of Adana province in 1997 was just below 1.7 million. Annual population growth between 1990-1997 was approximately 1.2%, slightly lower than that for Turkey as a whole (1.5%). This increase was associated with in-migration from neighbouring provinces, particularly South-Eastern Anatolia, a direct result of increasing industrialisation and new development in Adana[2]. These include: 1) the South-eastern Anatolian Development Project; 2) the Adana-Yumurtalik Free Trade Zone (FTZ); 3) the existing BOTAŞ developments; and 4) Siemens Powerhouse (also known as Sugozu Thermal Power Plant) and Sanko Holdings Petro-Chemical Development to the south of the BOTAŞ property, both of which are currently under construction (see Plate 10.9). These developments in conjunction with the proposed BTC Marine Terminal development and jetties will continue to act as a growth magnet for the province and could potentially cause a change in livelihoods, through land take, decreased access to marine resources and greater opportunities (see Box 10.2, Box 10.3 and Box 10.4).

[1] State Institute of Statistics (Census 1997). Complete data for the 2000 Census is currently under review and has not yet been publicly released.
[2] In 1990, 70% of the Adana population lived in urban areas compared with 76% in 1997.

Box 10.2 South-Eastern Anatolian Project (GAP)

The South-Eastern Anatolian Project (Guneydogu Anadolu Projesi or GAP) is a multi-sectoral and integrated regional development project based on the concept of sustainable development. The project aims to eliminate regional development disparities by raising people's income level and living standards. The project also aims to contribute to such national development targets as social stability and economic growth by enhancing the productive and employment generating capacity of the rural sector. The project area covers nine provinces in the Euphrates-Tigris basins and Upper Mesopotamia plains (Adiyaman, Batman, Diyarbakir, Gaziantep, Kilis, Mardin, Siirt, Sanliurfa and Sirnak). The area between Iskenderun and Yumurtalik is regarded as the main gateway for the Project.

The regional development programme spans a range of sectors including irrigation, hydraulic energy production, agriculture, urban and rural infrastructure, forestry, education and health. Its water resources programme will involve the construction of 22 dams and 19 power plants and irrigation schemes in an area extending over 1.7 million hectares. The total cost of the Project is 32 billion USD.

Source: [Ref 24]

Box 10.3 The Adana-Yumurtalik Free Trade Zone (FTZ)

The Adana-Yumurtalik Free Trade Zone (FTZ) is located east of the existing BOTAŞ property near the settlements of Sarimirza and Ceyhan, close to the Toros Gubre Fertilizer facility. It was designated in 1985 to:

- increase export-oriented investment and production in Turkey;
- accelerate the transfer of foreign capital and technology to Turkey;
- provide inputs to the economy in an economical and orderly manner through the presence industrial;
- promote commercial and service activities; and
- increase the utilization of foreign trade opportunities and foreign financial instruments.

Source: [**Ref 26**]

The Adana-Yumurtalik FTZ is not yet operational and initial infrastructure is currently being established on site. It aims to increase the industrialization of the region by providing a tax free zone governed by international regulations for trade and other commercial activities. It is possible the Adana-Yumurtalik FTZ will one day be connected to the existing Mersin FTZ.

Source: Meeting with Yumurtalik Municipality Representative, Adana

Box 10.4 Existing and Proposed Marine Jetties in the Region

There are four existing active jetties in the region: 1) BOTAŞ Ceyhan operated by BOTAŞ, 2) BOTAŞ Dortyol operated by BOTAŞ; and 3) two Toros Gubre Fertiliser Facility jetties operated by Tekfen Holdings. Three additional jetties are proposed along the 15 km stretch of coastline including:

- the BTC Jetty which will be operated by BOTAŞ and is described in more detail in Section 9;
- the Siemens Powerhouse (also referred to as the Sugozu Thermal Power Plant) jetty which is under construction, although no vessel is expected to berth; and
- the Sanko Holdings jetty, (close to Sugozu), which will be used for transporting chemical materials. Construction has started, but was recently halted because of environmental concerns.

Plate 10.9 Sugozu Thermal Power Plant, Adana

10.11.2 Settlement level overview

Box 10.5 provides an overview of the demographic baseline for settlements potentially impacted both directly and indirectly by the BTC Marine Terminal. The findings are explored in more detail in the subsequent section culminating in Table 10.18, which provides a demographic summary by settlement.

Box 10.5 Overview of Demographic Baseline

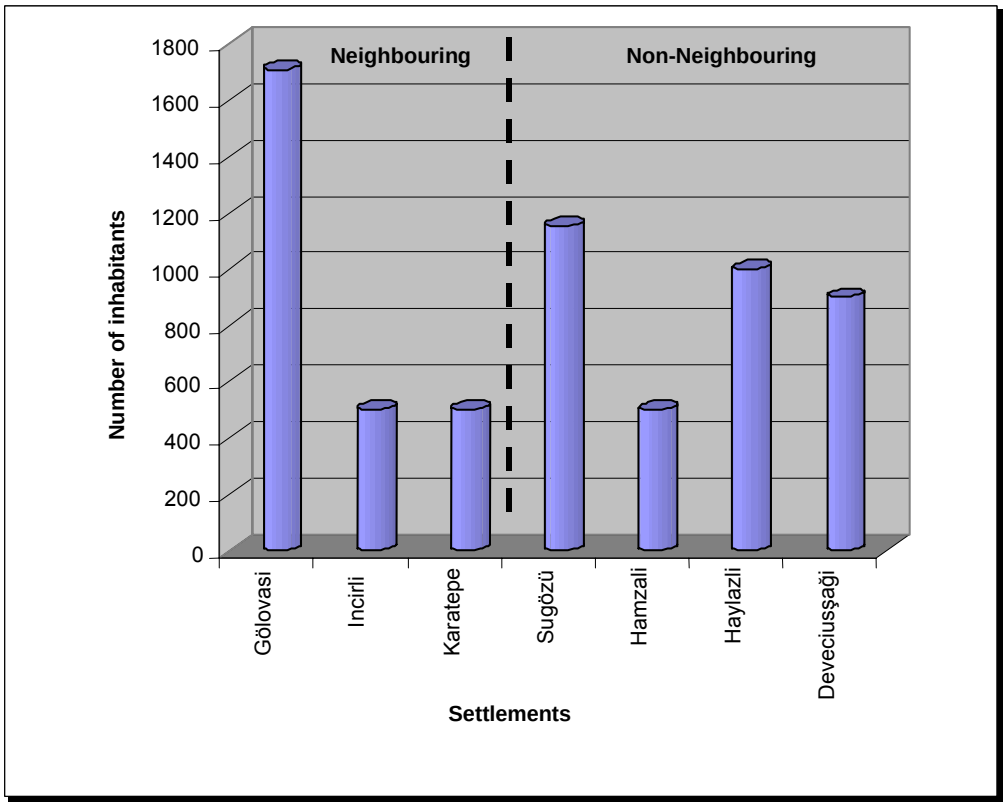
- **Provincial:** industrialisation is attracting a significant number of migrants to the province of Adana correlating with increasing population levels for the province as a whole. This trend is generally limited to urban areas of the province.
- **Population levels:** Golovasi (on the western boundary of the BOTAŞ site) is the largest settlement in the project area followed by Sugozu (a settlement close to Sugozu Thermal Power Plant, approximately 4-5km south-west of the BOTAŞ site). Only three of the Muhtars (of Golovasi, Incirli and Karatepe) reported a natural increase in population (ie birth rates exceeding death rates) in their settlements over the past five years.
- **In-migration:** according to the Muhtars, none of the surveyed settlements have experienced in-migration in *the past five years*, with the exception of Sahil Sitesi, which attracts people wanting to buy second homes in the settlement.
- **Out-migration:** this has been experienced in three non-neighbouring settlements (Sugozu, Hamzali and Haylazli) and is indicative of a lack of employment opportunities. No neighbouring settlements have experienced out-migration. Consultation findings indicate that the lack of out-migration among neighbouring settlements is due, in part, to expectations of employment from the proposed BTC Marine Terminal development.
- **Gender:** a gender imbalance is evident in the area (53% male) with a noticeably higher ratio of men in Incirli (60% men: 40% women), Haylazli (60% men: 40% women) and Sugozu (57% men: 43% women). This was not attributed by the Muhtar to in-migration over the past five years and could either be a result of earlier in-migration for existing developments (eg BOTAŞ Marine Terminal) or due to high female mortality.
- **Seasonal Workers:** 10% of the economically active population in Golovasi are seasonal workers migrating temporarily for construction or agricultural work. Very small percentages live in Deveciusagi and Karatepe.

- **Age Distribution:** Incirli exhibits the highest dependency ratio (1.6 dependents to every one working adult) and Golovasi the lowest (0.5 dependents per working adult). These dependency ratios are below the national average and associated with the demographic process of out migration, fertility (ie low birth rates) and mortality (ie high death rates).

- **Language and Religious Distribution:** the vast majority of the surveyed residents are Turkish speaking Sunni Muslims.

10.11.3 Population levels and household size

Population levels for each settlement are given in Figure 10.15. All three of the neighbouring settlements (Golovasi, Incirli and Karatepe) have experienced a natural increase in population attributed, by their respective Muhtar, to a rise in birth rates. No explanation was offered for this increase in fertility. With the exception of Sahil Sitesi, average household size for the surveyed settlements mirrors the Adana average (approximately five inhabitants). Both are lower than the average household size for Turkey, which is six[1], a trend indicative of more urbanised, nuclear households. The smaller average household size exhibited by Sahil Sitesi (three inhabitants) can be explained by the use of the settlement for retirement or secondary homes.



Source: Settlement Survey 2001
NB: Sahil Sitesi is a hamlet of Golovasi and is, where relevant, included with the Golovasi data. Karayilan has no Muhtar, hence there is no data from the settlement survey.

Figure 10.15: Population Levels in the Surveyed Settlements in the Marine Terminal Area

[1] Source: SIS, 1996.

10.11.4 Migration patterns and gender distribution

- **In-migration:** Sahil Sitesi is the only settlement in the project area where the Muhtar identified in-migration over the *past five years* - a trend associated with the construction of secondary homes by individuals from the Ceyhan district. However, the increased number of males in the survey area, particularly in Incirli and Haylazli where 60% of the population are males, suggests that male in-migration may have taken place prior to the past five years, as a result of the development of BOTAŞ Marine Terminal (see Figure 10.16).

- **Out-migration:** the non-neighbouring settlements, according to their respective Muhtars, have experienced out-migration in the past five years, due to a perceived lack of employment opportunities within the settlements. Residents from Sugozu tend to migrate to either Ceyhan to work in trade or to work in the construction of the nearby Sugozu Thermal Power Plant. For the latter, residents tend to stay in dormitories near the power plant to save on transport costs. Educated residents from Hamzali continue to migrate to Adana for work in the tertiary sector (eg as office workers). In comparison, there is no out-migration from neighbouring settlements. Residents in Karatepe explained this through their aspirations for permanent employment from the proposed marine terminal development and the strong solidarity and social networks amongst residents.

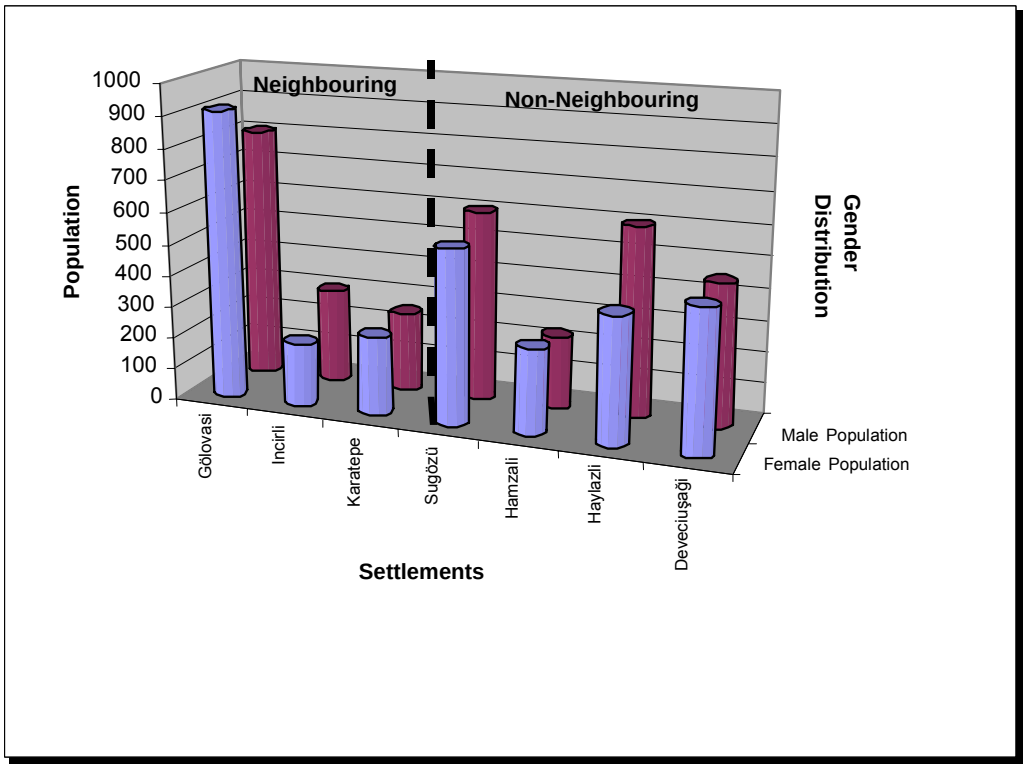
Box 10.6 Social Networks in Neighbouring Settlements

One experienced heavy machine operator stated: *'I am earning 150 million TL per month, but if I do the same work in Istanbul, I will earn the same money. At least here I do not pay rent and my family looks after me. When I was unemployed, my uncle looked after my family. Once, when my son got sick he covered all the medical expenses. Why then should I go to Istanbul?*

Source: Machine Operator, Marine Terminal Consultation

- **Seasonal Migration:** seasonal workers leave their settlements to work during peak harvest/ construction seasons. According to the Muhtars in the project area, seasonal workers only live in: 1) Golovasi, where they comprise 10% of the economically active population[1]; 2) Deveciusagi, where they comprise 2%; and 3) Karatepe, where they comprise 1%. Seasonal workers are hired periodically within the borders of Adana, between May and the end of November (see Plate 10.10). Not all seasonal workers are agricultural labourers. Some work as drivers for heavy construction machinery, notably in the summer months when construction is at its peak.

[1] For the purposes of the survey, 'economically active' individuals are between 19 and 59 years of age. Legally, however, economically active individuals are considered to be between the ages of 15 and 65.



Source: Settlement Survey 2001
N.B. Karayilan has no Muhtar, hence there is no data from the settlement survey

Figure 10.16: Gender Distribution for Surveyed Settlements in the Marine Terminal Area

Plate 10.10: Seasonal Cotton Worker's Camps along the Main Road between Ceyhan and Yumurtalik

10.11.5 Age distribution

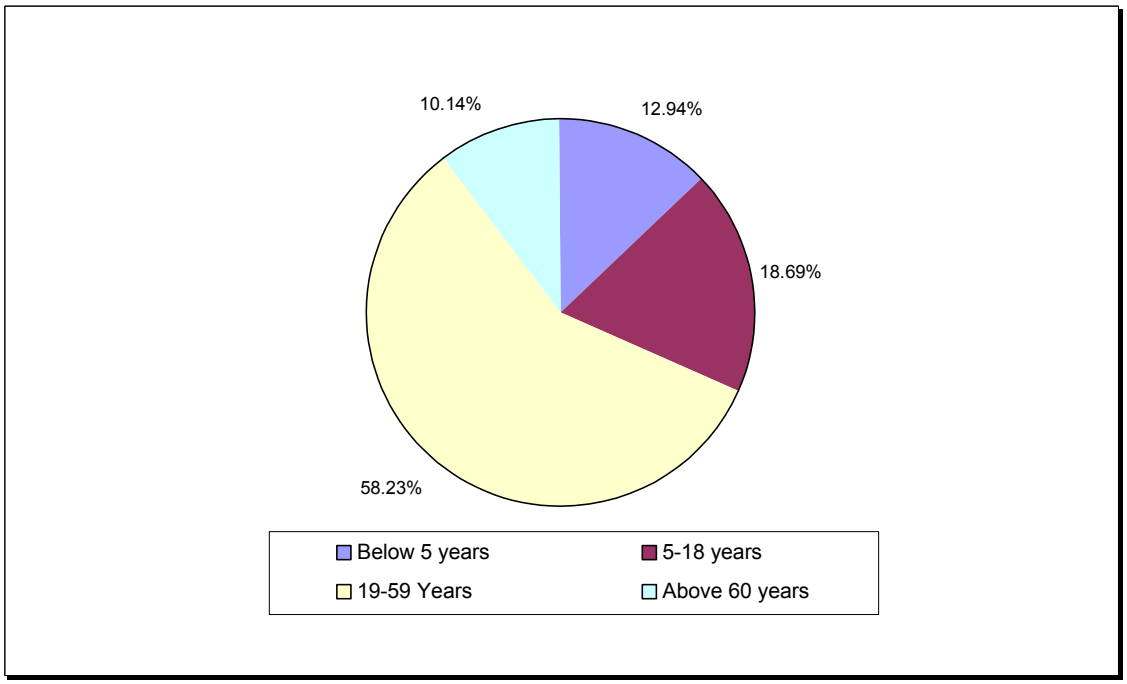
The findings highlight the following (see Figure 10.17):

- **Low fertility rates:** according to the Muhtars, settlements exhibit surprisingly low birth rates, a trend usually corresponding with increasing education levels (particularly of females) and access to family planning. For example, Golovasi has the lowest number of inhabitants under five years of age (8%, compared with the survey average of 13%). However, the Muhtars of the neighbouring settlements noted a rise in birth rates.

- **High mortality rates:** contrary to world-wide development trends, the low birth rates are not concomitant with an ageing population. Instead, the surveyed settlements exhibit a small elderly population, particularly in the neighbouring settlements. Golovasi[1] has the lowest number of elderly residents of both genders (5% compared with the 10% survey average), whereas Incirli and particularly Karatepe have very few elderly women (eg only 15 of the 55 individuals over 60 are female in Karatepe) contributing to the gender imbalance discussed earlier. One possible explanation for the small proportion of elderly people is that health services are insufficient to attend to the needs of the elderly as corroborated by the survey (see Section 10.14.4).

- **Low dependency ratios:** dependency ratios are the ratio of dependent individuals (children and retired adults) against individuals of working age (defined in this survey as between the ages of 19 and 59). They are important, because they are indicative of levels of development and the availability of adults for current and future employment. On average, 55% of the surveyed population is of working age. This ranges from 38% in Incirli to 66% in Golovasi, correlating with the highest (1.6) and lowest (0.5) number of dependents per working adult respectively. These very low dependency ratios emulate those found for Adana province and are typically associated with increased development and in-migration of working adults.

[1] Not including Sahil Sitesi where some of the secondary homes are used by retired inhabitants.



Source: Settlement Survey 2001

Figure 10.17: Age Distributions for Surveyed Settlements in the proposed BTC Marine Terminal Area

10.11.6 Language and religious distribution

Adana province is multicultural[1]. There are Arabic speaking groups of both Sunni and Alevi origin[2], a limited number of non-Muslim groups and a few immigrants of Kurdish origin or from the Balkans. However, the vast majority of inhabitants are Turkish speaking Sunni Muslims.

The main language spoken day to day in all surveyed settlements in the marine terminal survey area is Turkish and the residents are predominantly Sunni Muslim. However, four households in Golovasi, two in Sugozu, two in Hamzali and one in Haylazli speak west European languages and three households (one each in Incirli, Hamzali, and Deveciusagi) speak Arabic[3] on a daily basis. Only two households surveyed have Kurdish speakers (one each in Sahil Sitesi and Deveciusagi)[4].

10.11.7 Demographic summary

Table 10.18 summarises the demographic findings for each surveyed settlement.

[1] Andrews, PA (1989). Ethnic Groups in the Republic of Turkey (Weisbaden: Reichart, 1989).
[2] The two main Islamic sects in Turkey.
[3] Arabic is primarily taught in secondary education institutions (notably religious vocation schools). Therefore the low concentration of Arabic speakers is more likely to correspond to the settlement Imams rather than ethnic Arabs.
[4] It is possible, that this is an underestimation, respondents will not always admit to speaking different languages.

Table 10.18 Demographic Summary

SETTLEMENT	AVERAGE HH* SIZE	TOTAL POPULATION	NATURAL INCREASE	IN-MIGRATION	OUT-MIGRATION	GENDER DISTRIBUTION (M/F) (%)		DEPENDENCY RATIO ****
Neighbouring Settlements								
Golovasi	5	1,710	Yes	No	No	47	53	0.5
Sahil Sitesi **	3	-	-	Yes	No	-	-	-
Incirli	5	500	Yes	No***	No	60	40	1.6
Karatepe	5	500	Yes	No	No	50	50	1.0
Non-neighbouring Settlements								
Sugozu	4	1,150	No	No***	Yes	57	43	0.6
Hamzali	5	500	No	No	Yes	46	54	1.1
Haylazli	5	1,000	No	No ***	Yes	60	40	0.8
Deveciusagi	6	900	No	No	No	50	50	0.6

* HH = Household
** Difficult to ascertain as most people (many of whom are retired) live in the settlement only during summer months.
*** Although the Muhtars reported that no in-migration had been experienced over the past five years, gender ratios in these settlements (more men than women) indicate that in-migration may have occurred prior to the past five years and/ or high female mortality.
**** Defined as the number of dependents (<19 years and >55) for each adult of working age.
Source: Settlement Survey

10.12 LAND OWNERSHIP AND USE

10.12.1 Overview

The jetty development will result in the establishment of two security zones (an operational and exclusion zone), with a resultant decrease in access to marine resources within these designated areas. Similarly, increased industrialisation in the wider project area (of which the BTC Project is a part) will result in increased land take and the potential for in-migration to the area. Understanding the impact of this on the local population requires an analysis of the availability of land and land use in the area. An assessment of the impacts, outlined above, therefore requires the documentation of land ownership patterns, land use and availability of land prior to the development of the marine terminal. Box 10.7 provides an overview of land status within the neighbouring and non-neighbouring settlements.

Box 10.7 Overview of Land Ownership, Distribution and Use

- **Land Ownership:** the two most common land ownership patterns in the surveyed settlements are private and State ownership, although the former is more common in Golovasi, Hamzali and Haylazli. The prevalence of State land increases east of the existing BOTAŞ development towards the Adana-Yumurtalik Free Trade Zone, where land expropriation has taken place. Some of this land is rented, but in the case of land once owned by Karatepe, this lies unused.
- **Land Distribution:** in neighbouring settlements, land is concentrated in the hands of a minority (eg in Golovasi only 19% of all respondents own land with 80% of these owning more than one plot). Conversely, in the non-neighbouring settlements, more than 80% of surveyed households in Sugozu, Hamzali and Haylazli own land, with more than 50% owning more than one plot. These settlements are dependent on commercial agriculture as a main source of income.
- **Land Titles:** the non-neighbouring settlements, which are more reliant on commercial agriculture, have land titles for more than 90% of their land. Fewer households, between 50-80% have land titles in the neighbouring settlements. Consultation findings suggest that the vast majority of secondary homeowners in Sahil Sitesi lack land titles.
- **Irrigation:** of the neighbouring settlements, Golovasi has the highest percentage of land under irrigation (36%), followed by Incirli (33%). No land in Karatepe is under irrigation. Of the non-neighbouring settlements, Sugozu has 67% of its land under irrigation, in sharp contrast to Haylazli, with only 0.2% of land irrigated, explained by limited access to water resources in the latter.
- **Land Use - Crops:** grain is the most widespread crop and is primarily used for household consumption with the exception of the more market oriented settlements of Sugozu, Hamzali and Haylazli. Cotton is produced for the markets in all settlements and is grown, with the exception of Haylazli, on irrigated land. The non-neighbouring settlements exhibit greater crop diversification and grow nuts, grapes and watermelon.
- **Land Use - Livestock:** cattle and poultry are the most important livestock (particularly in Incirli and Karatepe) and are kept by 38% and 42% of surveyed households respectively. Sheep are only kept in Incirli and Karatepe. Animals are generally kept for household consumption.

10.12.2 Land ownership and distribution

Parts of Turkey have not undergone cadastral surveys, hence land ownership patterns are difficult to ascertain. A large proportion of land in Turkey is owned by the State and in Adana, State owned land is more common than communally owned land.

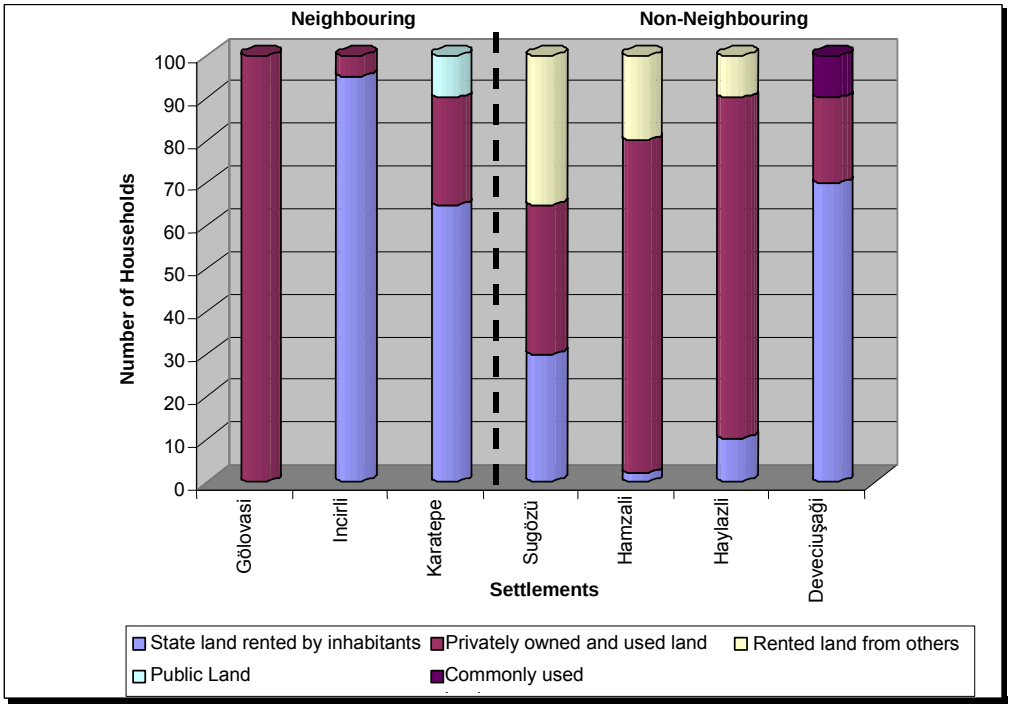
Figure 10.18 illustrates the main landowners in the surveyed settlements.

- **State owned:** in Incirli, Karatepe, Sugozu and Deveciusagi, the majority of land is State owned. Residents from the latter two settlements rent State land, whereas in Incirli and Karatepe a large proportion of once arable land was expropriated in the 1990s and designated a Free Trade Zone. Residents stated that the majority of this land remains unused.

- **Privately owned:** the bulkof land in Golovasi, Hamzali and Haylazli (100%, 78% and 80% respectively) is privately owned, in line with the high proportion of owner-occupied land found in settlements along the pipeline in Adana province.

- **Private rental:** the survey found a low proportion of rented land, controlled by an unstructured private rental market. Karatepe, Hamzali and Haylazli (all settlements where agriculture is the main source of income) do, however, rent land from a number of other neighbouring settlements.

- **Communal Land:** only 10% of land in both Karatepe and Deveciusagi is communal land. There is no communal land in the other surveyed settlements correlating with the low importance of commercial animal husbandry.



Source: Settlement Survey 2001
N.B. Karayilan has no Muhtar, hence there is no data from the settlement survey

Figure 10.18: Land Tenure in the Surveyed Settlements in the Marine Terminal Area

The main findings of the survey of land distribution are as follows:

- **Land Concentration:** the concentration of land into the hands of only a few landowners is most acute in the neighbouring settlements, particularly in Golovasi, where the minority are employed in agriculture and the majority in other sectors, most notably fishing and trade. Here, there are approximately four/five big landowners each within excess of 100ha[1]. Only 10-15 fishermen rent approximately 0.1ha of land each as a subsidiary form of income. In the non-neighbouring settlements, agriculture is more important as a source of income and most households own some land (see Figure 10.19).

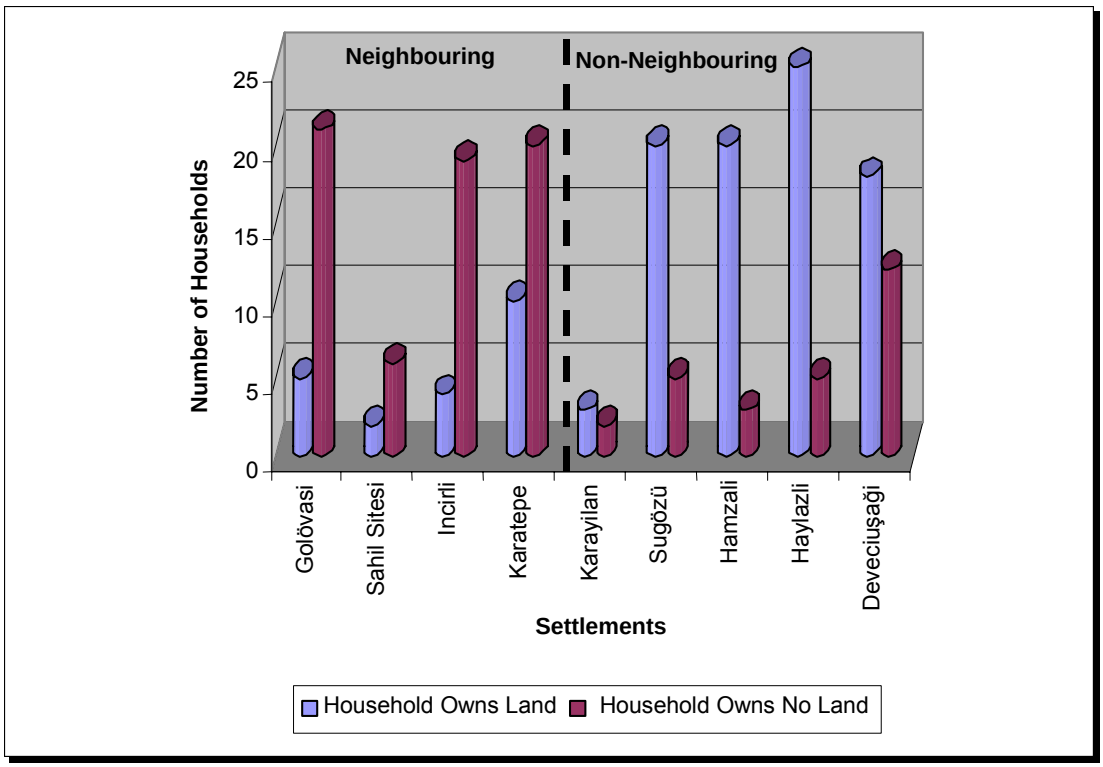
- **Household landholding:** between 1950-1980, the region was characterised by large landholdings. Subsequent division by inheritance has meant that small and medium-scale land ownership patterns are dominant[2]. Households in Haylazli and Hamzali have the largest landholdings in the survey area (243ha and 197ha respectively). This correlates with their greater dependency on agriculture and higher levels of commercialisation. Golovasi has the third largest land holding (137ha). This is most probably because it has been less affected by land expropriation in the past than settlements such as Karatepe and Incirli, and because the surrounding topography is potentially more suited to agriculture. However, the average is also elevated by a handful of big landowners.

[1] One hectare is equal to 10,000 m^2, and one decare is 1000 m^2.
[2] Source: Mayor of Yumurtalik Municipality, Adana Province

- **Average number of plots (fragmentation):** the number of agricultural plots per settlement ranges from 102 in Hamzali to 5 in Karayilan. In general, settlements dependent on agriculture as their main source of income have a larger number of agricultural plots per settlement and suffer greater land fragmentation indicative of inheritance patterns.

- **Average plot size:** the average plot size varies from 8ha in Golovasi to 0.9ha in Karatepe. The small figure for Karatepe is indicative of the large amount of land expropriated for industrial developments. The average plot size for the survey area is 2.4ha. This average (depending on land capabilities) is sufficient for commercialisation and capital-intensive farming.

- **Land titles***:* the percentage of land owned by respondents with land titles for their largest land plot within each settlement varies from 55% in Karatepe to 100% in Hamzali and Karayilan. In general, settlements more dependent on land (and earning sufficient income) have land titles for their main land plots. For many of the secondary home owners living along the coast near Sahil Sitesi, there are disputes over the legal status of the land and it is estimated that a high proportion do not have land titles.



Source: Household Survey 2001

Figure 10.19: Land Ownership by Settlement

Box 10.8 Secondary Home Owners in Sahil Sitesi

Secondary homeowners in Sahil Sitesi are tradesmen from Adana and Ceyhan or retired individual (See Plate 10.11). There are approximately 150 secondary homeowners, although exact figures are difficult to determine, notably because only a small proportion of homeowners were present during the survey. These homeowners bought land from an owner who occupied treasury lands for 19 years. This was just below the 20 years of occupancy required before obtaining rights of ownership. Thus residents are currently paying rent to the State, although some have taken the matter to court. The State has also defined the houses as illegal and has ordered their demolition, an order that is being argued in the courts. It should be noted that the State cannot destroy the houses if they are more valuable than the land itself, although because some of the houses are less than 100m from the shore they are of questionable legality. The uncertainty of the ownership of the secondary homes is a source of concern raised in the consultation meetings as well as in subsequent correspondence received from homeowners.

Source: Marine Terminal Consultation, Adana

Plate 10.11: Secondary Home Owner Properties in Sahil Sitesi, Adana

10.12.3 Land use: agricultural activities

10.12.3.1 Arable farming

The desktop research, supplemented by household surveys and discussions with community and government representatives have indicated the following pattern of arable farming.

- **Main crops:** grain crops such as wheat, barley and maize are the most widespread crops in the survey area, grown in all surveyed settlements, and by approximately 50% of surveyed households (see Figure 10.20).

- **Secondary crops:** cotton is the second major product, grown by approximately 40% of households surveyed generally correlating with the presence of irrigation facilities. Households in Golovasi also grow fruit trees and a range of other crops is grown in the non-neighbouring settlements including: watermelon (in Deveciusagi and Haylazli); nuts

and seeds (in Sugozu and Deveciusagi); wine grapes (in Hamzali); and timber (in Sugozu, Hamzali and Haylazli).

- **Crop diversity:** the settlements surveyed are generally characterised by low product diversification primarily due to reliance on rainfed agriculture, particularly in Haylazli and Golovasi. However, according to the Mayor of Yumurtalik Municipality, with irrigation the area would be suitable for green house products and tropical fruits.

- **Crop use:** *Grain* is grown mainly for household consumption in Incirli, Golovasi, Karatepe, Karayilan and Deveciusagi. However, 51% of grain produced in the survey area is produced for market – the majority of which is grown in the ore commercially orientated settlements of Sugozu, Hamzali and Haylazi. *Cotton* is produced primarily for markets outside the settlements. *Wine grapes* are produced for a mix of household consumption and markets. Fruit is produced exclusively for household consumption (see Plate 10.12 to Plate 10.16)

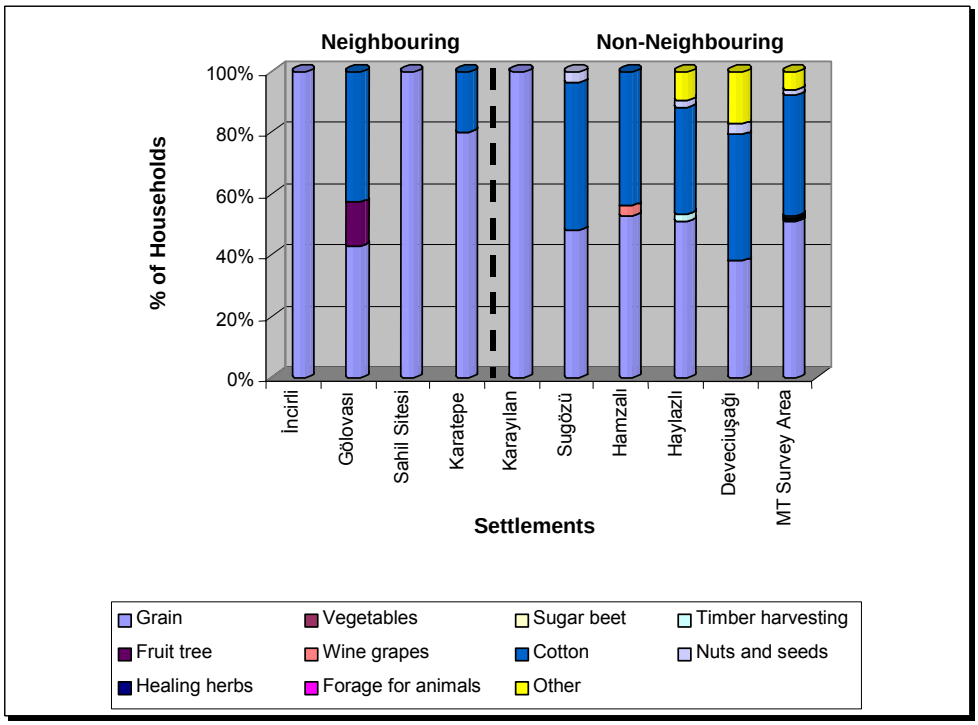
- **Cropping patterns:** one crop is grown per year by the majority of households in the neighbouring settlements although timber (from trees grown in Golovasi, Sugozu, Hamzali and Haylazli) is multi-cropped.

- **Costs of production:** crops sold in local markets are generally associated with greater investment. For example, average household input costs are highest for cotton (2,725 million TL; or 1,703 USD[1] per season per household); grain (2,195 million TL; or 1,372 USD per season, per household) and certain crops categorised as 'other' such as watermelon (2,245 million TL, or 1,403 USD per season, per household). Fruit trees (grown exclusively for household consumption) have the lowest average costs because their production is not labour intensive. Input costs are particularly high for cotton due to the high investment in irrigation and intensive seasonal labour requirements. Input costs are noticeably high for grain production in Sugozu, possibly due to investment in fertilisers and harvest machinery in this more commercialised settlement.

- **Crop yields:** grain productivity is highest in Golovasi (where average household yields are approximately 38,000kg from the last harvest in 2001, most of which was used for household consumption) and Hamzali (approximately 36,000kg, most of which was sold at markets outside the settlement). This is perhaps due to good growing conditions in Golovasi and high investment in Hamzali (eg fertiliser). High cotton yields were also reported in Golovasi (on average 20,000kg from the last harvest per household) and in Haylazli, high yields of 'other' crops – mainly watermelon (72,500kg from the last harvest in 2001).

- **Reduction in production:** approximately 80% of respondents stated that they had experienced a reduction in agricultural production over the past five years. A number of reasons were given for this overall trend including aridity (57% respondents), low agricultural prices (9%), rising input costs (9%) and the current economic crisis (8%). All respondents from Karayilan and Haylazli attributed this to aridity, correlating with the water supply problems experienced in both settlements.

[1] Currency conversions are based on January 2002 figures with a rate of 1million TL = USD 1.60



Source: Household Survey 2001

Figure 10.20: Type of Crops Grown in Neighbouring and Non-Neighbouring Settlements in the Marine Terminal (MT) Area

Plate 10.12: Vegetable Production in Adana

Plate 10.13: Wheat in Ceyhan

Plate 10.14: Greenhouses in Adana

Plate 10.15: Watermelon production in Adana

Plate 10.16 Vineyard in Adana

Box 10.9 Trends in Agriculture

Because of the division of land by inheritance, the same amount of land is now used to provide income for an increasing number of individuals. Recent agricultural policies have also adversely affected agricultural production and the lack of adequate irrigation facilities puts a barrier on product diversification into, for example, greenhouse products and tropical fruits. As part of an attempt at agricultural diversification, farmers have increased the area allocated to corn products as a second harvest in recent years. However, this initiative failed to produce benefits when, in 2001, there was a corn disease, thus discouraging farmers to diversify production. Opportunities still exist to diversify production if there is adequate investment for example in irrigation infrastructure or in manufacturing initiatives associated with agriculture.

Source: Mayor of Yumurtalik Municipality, Adana

- **Increase in production:** only 6% of all respondents stated that there had been an increase in production attributed to either good rainfall or an increase in irrigation.

In summary, the findings suggest that the non-neighbouring settlements (with the exception of Deveciusagi) are more market orientated, investing more heavily in arable agriculture and therefore reaping the benefits of higher yields. In the neighbouring settlements, arable agricultural production is more subsistence based and most households are more dependent on non-agricultural based income (eg fishing and wage income).

10.12.3.2 Livestock farming

Animal husbandry is a main source of income for 7% of surveyed households, more than half of which are from Incirli, and the remainder from Deveciusagi, Karatepe and Hamzali. More often than not, the majority of surveyed households keep livestock for their own consumption (see Figure 10.21).

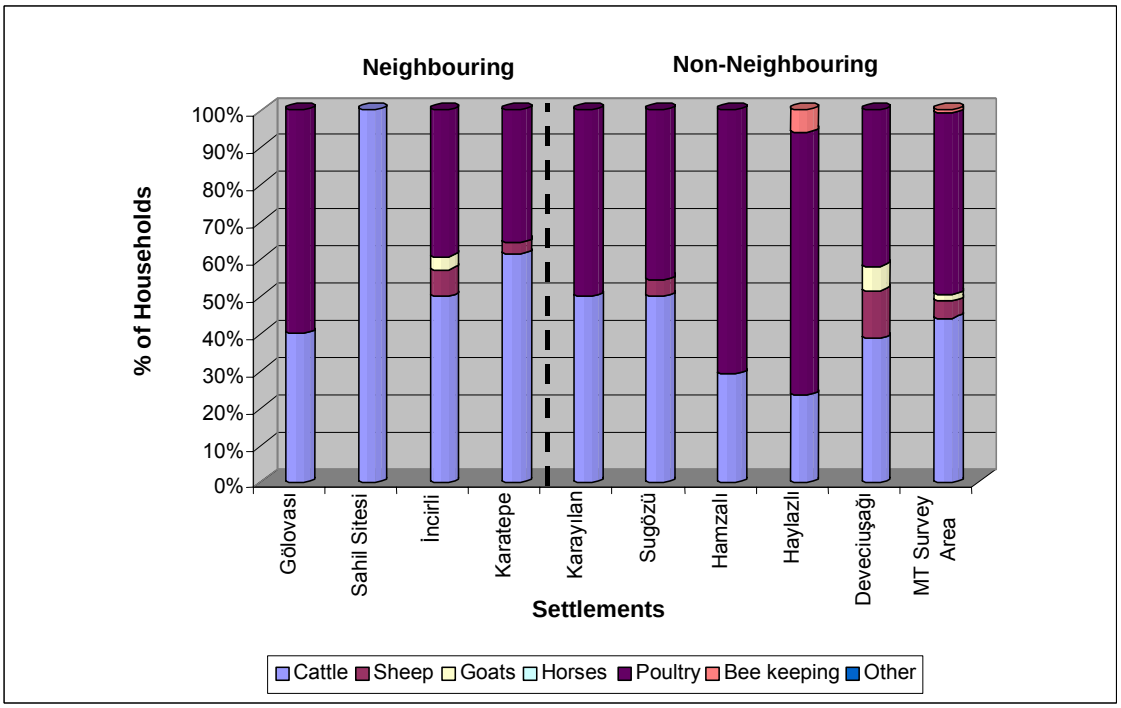
- **Poultry:** these are the most common type of livestock and are kept by 42% of households in the surveyed settlements, and in excess of 70% of households in Karayilan and Hamzali. Poultry are mainly kept for household consumption, although only a couple of households in Karatepe breed poultry to sell eggs and some meat in external markets.

- **Cattle:** these are the second most common type of livestock in the survey area and are kept by 38% of all households surveyed including 61%, 64% and 80% of households in

Incirli, Karatepe and Karayilan respectively. However, land expropriation by BOTAŞ in the 1970s has limited the availability of communal land for grazing and only Karatepe has communal land (10% of all land) where cattle can be grazed.

- **Herd size:** Incirli, Karatepe and Karayilan have the highest average herd sizes ranging from three to five cows, reflecting the average herd size for the province. This small herd size is indicative of the subsistence nature of cattle husbandry. Only a small number of cattle are sold to outside markets by households from Karatepe, Sugozu and Deveciusagi. The majority is produced for household consumption.

- **Sheep and goats:** these are relatively uncommon with only 4% and 2% of households breeding these animals respectively. Incirli and Karatepe have large average flocks of sheep (200[1] and 60 respectively). Sheep in the latter are produced solely for markets whereas the remainder of sheep and goats in the survey area are produced primarily for household consumption. Table 10.19 summaries land ownership and use for the surveyed settlements.



Source: Household Survey 2001

Figure 10.21 Percentage of Households in the Surveyed Settlements Owning Animals in the BTC Marine Terminal Area

[1] Two households in Incirli are engaged in sheep breeding. One of these households has 100 sheep and the other has 300 sheep.

Table 10.19 Summary of Land Ownership, Distribution and Use

SETTLEMENT & NO. OF HHS SURVEYED (TOTAL 200)	PRIMARY OWNER (% of HH)	OWN LAND (% of HH)	OWN > ONE PLOT (%)	TITLE DEEDS *(%)	IRRIGATION (% OF SETTLEMENT LAND)	AV. HH LAND HOLDING (HA)	AV. NO PLOTS PER HH	AV. PLOT SIZE (HA)	MAIN LAND USE (% OF HH)
Golovasi & Sahil Sitesi (34)	Private (100%)	19	80	81	36	137	8	8	Field crops (12%); cotton (12%)
Incirli (23)	State (95%) (but not used or rented)	33	42	70	33	5	12	0.44	Field crops (4%)
Karatepe (30)	State (65%) (land rented by residents)	17	40	55	0	19	20	0.93	Cotton (7%); field crops (27%)
Karayilan (5)	No data[1]	40	40	10	24	3	5	0.7	Field crops (20%)
Sugozu (25)	State (30 %) (land rented by residents); private (35%)	80	65	93	67	145	99	1.6	Cotton (52%); field crop (52%); walnut (4%)
Hamzali (23)	Private (78%); 20% rented)	87	78	10	44	197	102	1.9	Field crops (78%); cotton (65%).
Haylazli (30)	Private (80%)	83	50	91	0.2	243	78	3	Cotton (50%); field crops (73%), watermelon (13 %); walnuts (4%)
Deveciusagi (30)	State (70%) (land rented by residents)	60	30	57	19	67	43	1.6	Cotton (40%); field crops (37%); watermelon (13%); walnuts (3%); peanuts (3%)
Average for Marine Terminal Study Area		52	53	58	28	102	46	2	

* Percentage of HH with title deeds for largest land plot

(Source: Settlement and Household questionnaire (HH = Household) 2001) [Ref xx]

[1] Karayilan is a part of the municipality of Kurtpinari. It does not have its own Muhtar. As a result, no information was available from the settlement level survey on this topic.

10.13 LIVELIHOODS, EMPLOYMENT AND SKILLS

10.13.1 Overview

An understanding of livelihoods, employment and skills within the survey area fulfils the following key objectives: 1) it allows one to assess the extent to which people are dependent on various forms of livelihood and thus their ability to cope should access to these livelihoods be diminished; 2) it provides an indication of the availability of local residents for project employment; and 3) it provides an indication of the suitability of local residents for semi-skilled and skilled employment.

The findings are reported under the following headings.

- **Levels of income** describes levels of income/wealth (financial and capital assets) and changes to living conditions.
- **Sources of livelihood** describes the importance of cash and non-cash earnings (eg wage income, food production, fishing and social benefits).
- **Levels of employment** describes the levels of unemployment and availability for temporary employment (this is a proxy indicator for underemployment).
- **Sources of employment** identifies the main employment sectors in which respondents are actively engaged, including both subsistence and income-based activities (a more in-depth exploration of the fishing and tourism sector is provided).
- **Skills and experience** identifies the extent to which respondents have previous construction experience and/or skills appropriate for large-scale construction projects.

Box 10.10 provides an overview of levels and sources of livelihood and employment findings. This is followed by a more detailed review culminating in Table 10.20 summarising the findings by settlement surveyed.

Box 10.10 Overview of Livelihoods, Employment and Skills in the Survey Area

Levels of Livelihood: Sugozu is the highest-ranking settlement in terms of both income and assets whereas Karatepe (the settlement directly adjacent to the existing oil storage tanks) is the lowest. Golovasi and Incirli are ranked third and seventh respectively. Living conditions in the majority of the settlements (namely Incirli, Golovasi, Karatepe, Hamzali, Haylazli, Deveciusagi and Sahil Sitesi) appear to have deteriorated in the last five years, attributed to the rise in agricultural and fishing input costs and the fall in output prices. Only one settlement, Sugozu, reported an improvement in living conditions, relating this to the on-going construction of the Thermal Power Plant, which has provided employment opportunities.

Sources of Livelihood: wage incomes (eg from permanent, non-agricultural employment) contribute only a small proportion of income to the residents and are a main source of income for only 34 of the 200 households surveyed. Fishing is a source of livelihood for at least 60 of the 200 households surveyed, with the majority of fishermen residing within Golovasi, Deveciusagi and Haylazli.

Alternative Sources of Livelihood: alternative sources of income besides agriculture, fishing and husbandry, include trade and semi-skilled irregular jobs, such as driving and operating heavy construction machines (eg Karatepe, Karayilan, and Sugozu).

Levels of Employment (employment status)*:* unemployment levels for the survey settlements are deceptively low. In reality, only approximately 17% have salaried permanent positions. The vast majority are self-employed in natural resource based activities (farming or fishing). These activities are vulnerable to environmental and economic fluctuations (varying prices for goods produced).

Sources of Employment*:* fishing, agriculture, animal husbandry and utilities are the main activities sectors that employ people's time within the survey area. Fishing is the main employment source for 77 of 288 (27%) respondents including: 23% of respondents in Incirli; 31% of respondents in Golovasi; 44% of respondents in Haylazli; and 58% of respondents in Deveciusagi. Where fishing is a main source of income, most of the residents are self-employed and generally own or part-own fishing boats. Tourism does not appear to be an important source of employment in the area, although trade is the second most common source of employment for some residents in the settlements of Golovasi, Incirli, Sugozu, Hamzali, Haylazli and Deveciusagi.

Previous Construction Experience[1]: respondents in both the neighbouring and non-neighbouring settlements reported semi-skilled and unskilled experience on previous construction projects. The highest totals per settlement were recorded for Golovasi and Sugozu.

Acceptance Rates: more than 70% of respondents from the neighbouring settlements would accept temporary employment, although these figures vary for non-neighbouring settlements. In Karatepe, however, there is a strong preference for permanent employment partly due to its proximity to the new facility, where it is recognised that there will be some opportunities for employment.

10.13.2 Levels of income and wealth

The following conclusions can be drawn with regard to levels of financial and economic assets.

- **Income levels**: the average per capita annual household income in the marine terminal survey area is 3,184 million TL (1,990 USD)[2] (see Figure 10.22). This figure is

[1] Previous construction experience is defined as any previous construction experience, whether as skilled, semi-skilled or unskilled workers. Levels of experience are not considered in this definition.
[2] Rate of Exchange: 1million TL = 1.6 USD January 2002

marginally above the average for Adana province as a whole (2,924 million TL or 1,246 USD) and the minimum wage of 2,220 million TL for over 16 year olds and 1,1187 million TL for under 16's[1]. Residents in Sugozu have almost double the average survey area income (6,328 million TL or 3,955 USD) due to their relative dependency on wage income and pensions providing both a regular and permanent income for households. Residents from Sahil Sitesi and Haylazli also have income levels above the provincial average (3,844 m TL or 2,402 USD) and 3,722 m TL or 2,326 USD respectively). Incomes are significantly lower in Karatepe (55% less than the average for the marine terminal area), corresponding with the high unemployment levels for this settlement (18% unemployment compared to the national average for Turkey of 8.5%[2]).

- **Income distribution:** the highest inequality in income distribution[3] is found in Sahil Sitesi, potentially due to the different incomes between secondary homeowners and permanent residents. Karatepe exhibits the second highest inequality in income distribution, possibly because a high proportion of residents are unemployed. Sugozu also exhibits an unequal distribution of income substantiated by the consultation findings that suggested a small number of large farms and rich landlords[4].

- **Income fluctuations:** approximately 40% of households in all the neighbouring settlements, with the exception of Sahil Sitesi, stated that average incomes fluctuated throughout the year, peaking between June and August (corresponding to peak agricultural harvest times) and falling between December and January. The non-neighbouring settlements, particularly Deveciusagi and Haylazli, also exhibit monthly fluctuations in income, with high-income months being September and October and low-income months being December and January. Both are dependent on fishing and agriculture as their main source of activity.

- **Levels of wealth:** wealth is a measure of both income and assets such as televisions, property and cars. Levels of wealth were calculated using two indices, an Asset Index (AI) and a Composite Asset-Income Index (CAII). These are explained in greater detail in Section [10.13.2]. The settlements show a similar ranking for both indices. Karatepe is the poorest in terms of assets and Hamzali the richest. Sahil Sitesi has a slightly lower asset ranking potentially because secondary homes are less likely to have assets such as televisions because they are not occupied throughout the entire year. Sugozu (more dependent on wage income and pensions) is ranked top in terms of both assets and income.

- **Levels of debt:** approximately 54% of surveyed households in the marine terminal study area are in debt. This is attributed (by 28% of all surveyed households) to a fall in price of agricultural products and (by 15% of households) to general economic conditions (a reference to the current economic crisis in Turkey). The level of debt in the non-neighbouring settlements is higher, explained by the tendency for comparatively richer settlements to obtain credits. Of the neighbouring settlements, Incirli and Karatepe exhibit the lowest levels of debt (44% and 30% respectively), and Golovasi the highest (fishing is one of the main sources of employment) (see Box 10.11*)*. Of the non-neighbouring settlements, households in Deveciusagi have particularly high levels of debt attributed to, a fall in agricultural product prices, general economic conditions and a fall in fish stock.

[1] Argen Employment Agency (30.6.02). The minimum wage changes every 6-12 months according to a Decree operating under the Labour Law 1475. The education age in Turkey is 6 to 14 or in some cases 7 to 15.
[2] State Institute of Statistics (SIS), 2000 Census.
[3] Determined through calculation of standard deviation from the settlement mean.
[4] Although 80% of villagers stated that they own land, the average plot size is relatively low suggesting that the majority do not derive income from this land. The majority of land in Sugozu is state land and only a small proportion privately owned.

Box 10.11 Fishermen Debts

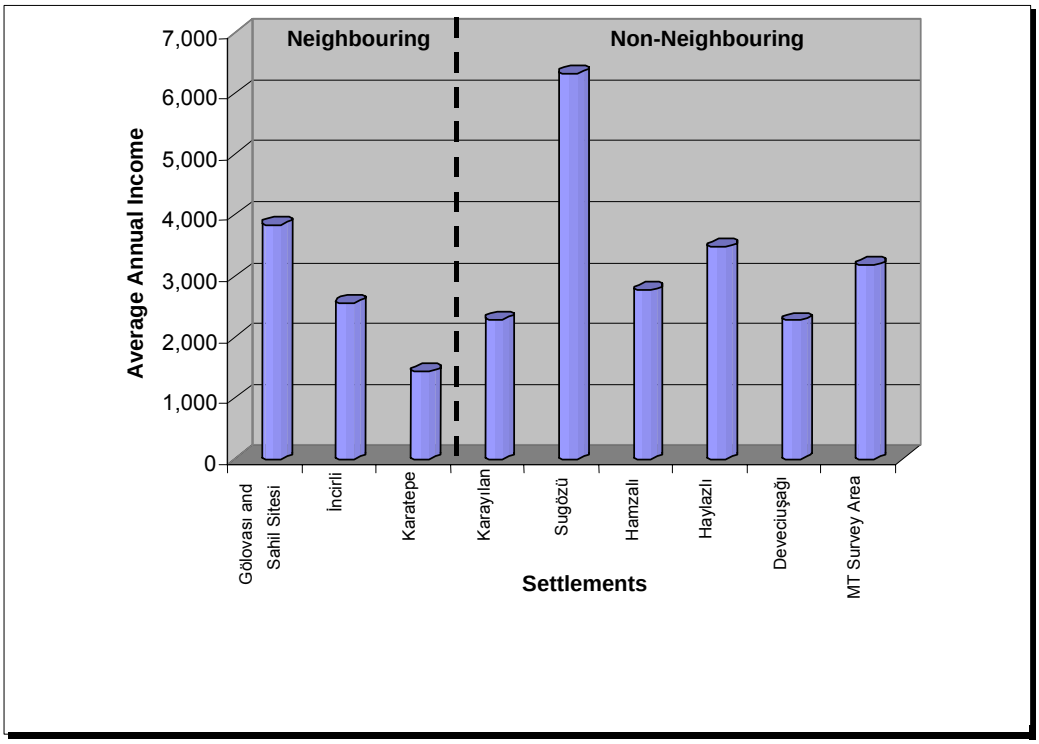
Fishing debts are attributed to the high cost of fishing equipment (by 44% of households surveyed in Golovasi), high petroleum costs in fishing (44% of households), a fall in fish stocks (22% of households) and agricultural prices (22% of households). The debt is generally owed to tradesmen. The high levels of debt among fishermen was corroborated during the settlement meetings where fishermen explained that they purchased equipment from private fishing companies (eg local traders) in the area using money borrowed from the companies and on condition that they sell their fish to these companies.

Source: Local Fishermen from Golovasi, Adana

- **Creditors:** of the total number of households surveyed, 53% reported being in debt. Of these, 53% owe money to the Ziraat Bank and 22% (largely fishermen) to tradesmen. In Golovasi, approximately 58% of indebted households owe money to tradesmen (eg the private fishing companies). The majority of households (90%) in the marine terminal survey area expect to be able to pay off their debt, including 42% of households in the next five years and 32% in the next year. The ability to pay off debt is particularly low in Golovasi where a large proportion of inhabitants are dependent on earnings from fishing - perceived to be an increasingly unreliable form of livelihood. In Incirli and Karatepe, the majority of debt is owed to relatives, as is characteristic of poorer communities.

- **Changes to quality of life:** with the exception of Sugozu, all Muhtars stated that living conditions had deteriorated in the past five years, specifically in settlements dependent on natural resource based activities (farming and fishing). Rising prices of agricultural inputs and a reduction in subsidies, in conjunction with falling agricultural product/output prices, have exacerbated the situation for farmers (and fishermen) already faced with a provincial trend of increasing industrialisation, a local trend of land expropriation and increased marine exclusion zones associated with coastal developments. For Sugozu, living conditions have improved due to job opportunities provided by the on-going construction of the Thermal Power Plant. This is substantiated by its ranking as the 'wealthiest' settlement in the survey area, both in terms of income and assets.

Potential solutions offered by Muhtars to counter this downturn include enhancement of agricultural opportunities (eg increasing levels of agricultural credit, provision of high quality seed and improvement of irrigation facilities) and investment in non-agricultural opportunities for the younger generation.



Source: Household Survey 2001

Figure 10.22 : Average Annual per Capita Household Income (million TL) by Surveyed Settlement in the Marine Terminal (MT) Area

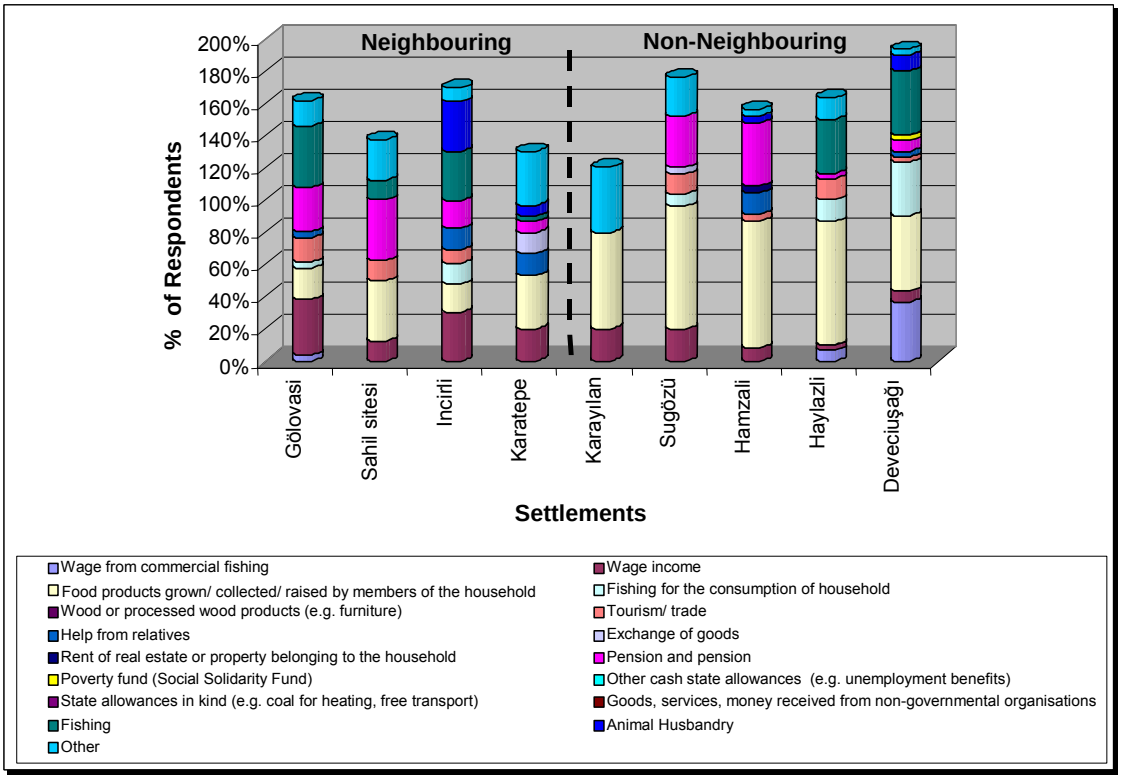
10.13.3 Sources of livelihood

Table 10.20 summarises the key sources of livelihood (both wage income and subsistence) for households surveyed in each settlement. The main findings are that wage incomes contribute only a small proportion of the total income in the survey area (this includes the small proportion of residents from Incirli and Hamzali employed with BOTAŞ). Fishing, agriculture, animal husbandry and pensions are the main sources of income, although the former three activities are also critical for subsistence in the settlements (see Figure 10.23). Traditional income generating-activities are losing their importance (see Box 10.12 and Plate 10.17).

Box 10.12 Traditional Income Generating Activities

Women in Yoruk (an ethnic group from Anatolia) settlements generally weave carpets. Iinhabitants from Karatepe were originally from Yoruk settlements. In Karatepe, women make valuable handmade carpets. And household material. Yet according to older women in Karatepe, young women do not treat this as an income-generating activity and many do not know how to weave.

Source: Women in Karatepe, Adana



Source: Household Survey 2001
NB: Multiple responses permitted, therefore percentage exceeds 100

Figure 10.23: Sources of Income for the Surveyed Settlements

Plate 10.17: Traditional Livelihoods – Residents Standing Adjacent to Home-Made Carpets

Table 10.20 Livelihood Sources (Cash Income and Subsistence Goods)

INCOME SOURCE	IMPORTANCE (AS A SOURCE OF INCOME AND SUBSISTENCE) FOR THE NINE SURVEYED SETTLEMENTS (HH = Household)				COMMENT
	High (>59% of HHs surveyed)	Medium (21-59% of HHs surveyed)	Low (< 21% of HHs surveyed)	0% of HHs surveyed	
Wage Income (permanent non agricultural)			Hm ; Ha ; D ; K ; Ky; SS		Wage income (eg from construction firms, industrial activities) varies in importance between settlements. 17% (34 of surveyed HHs) list permanent wages as a main source of income (25% of these are employed in schools and a small proportion with fishing companies). This includes nine (35%) and seven (30%) of HHs in Golovasi and Incirli respectively. Less than 10% of HHs surveyed in Deveciusagi, Haylazli, and Hamzali list wage income as a main income source.
Fishing		D; G; I; Ha	K; SS ; Su	Ky	For many of the residents, fishing is a *'way of life'* not only a source of income. Fishing is a main source of income for: 40% or 12 HHs surveyed in Deveciusagi; 38% or ten surveyed HHs in Golovasi; 30% or seven surveyed HHs surveyed in Incirli; and 37% or 11 HHs surveyed in Haylazli. Fishing for HH consumption is also important in these settlements.
Tourism/ Trade			G; I; Su; Hm; Ha; D; SS	K; Ky	The survey suggests that tourism/ trade is only a main source of income for 16 of the 200 surveyed HHs. In Golovasi and Incirli, 15% (four) and 13% (one) of surveyed HH HHs respectively reported tourism and/ or local retailing for servicing tourists, (eg local convenience stores, the camping ground on the beach front in Incirli) as a main source of income (see Plate 10.18). However, it should be noted that although tourism is not a major source of income, residents in Sahil Sitesi are primarily secondary homeowners and use the location as a retirement/ holiday retreat. There are also recreational facilities at the existing BOTAŞ terminal including a private beach, a guesthouse with approximately 50 rooms and a restaurant. These are only accessible to BOTAŞ employees, their families and guests.

INCOME SOURCE	IMPORTANCE (AS A SOURCE OF INCOME AND SUBSISTENCE) FOR THE NINE SURVEYED SETTLEMENTS (HH = Household)				COMMENT
	High (>59% of HHs surveyed)	Medium (21-59% of HHs surveyed)	Low (< 21% of HHs surveyed)	0% of HHs surveyed	
Food Products	Ky; Su; Hm; Ha	K; D; SS	I ; G		Agriculture is by far the most important source of income for the non-neighbouring settlements: Hamzali (78% or 18 surveyed HHs); Sugozu (76% or 19 HHs); Haylazli (77% or 23 HHs); Karayilan (60% or 9 HHs); and Deveciusagi (47% or 14 HHs. For the neighbouring settlements, 33% or ten surveyed HHs in Karatepe named food production as a main income source, followed by 17% (or four HHs) and 19% (or five surveyed HHs) in both Incirli and Golovasi. All settlements sell cotton in outside markets in varying proportions, but grain is grown primarily for household consumption particularly in Golovasi, Karatepe, Karayilan and Deveciusagi.
Animal Husbandry		I; □K; Hm ;	K; Hm ; D	G ; SS; Ky; Su; Ha	Of all the HHs surveyed (200), only 13 stated that animal husbandry was an important income source. Seven of these HHs were in Incirli and the remainder in Deveciusagi, Karatepe and Hamzali. This figure is low, reflecting the fact that animal husbandry is primarily a subsistence activity. Residents complained of existing shortages of pastureland in the consultation meetings in part due to previous land expropriation.
Pensions		G ; Hm ; Su ; SS	I; K; Ha; D	Ky	36 of the 200 HHs surveyed stated that pensions were a main source of income. This included Golovasi (27% or seven HHs), Sugozu (32% or eight HHs), Hamzali (39% or nine HHs) and Sahil Sitesi (38% or three HHs). The latter is a popular spot for secondary homeowners, particularly pensioners. Many of the residents in the surveyed settlements are retired farmers and depend on the social security institution BAG-KUR or are retired semi-skilled labour dependent on the SSK[1].
Assistance from relatives			I; G; K; Hm; D	Ky; Su; Ha; SS	More than 13% of HHs surveyed in Incirli, Karatepe, and Hamzali stated that help from relatives was a main source of income. No information was available on where these relatives were based or how they were earning their income.

[1] There are three pension schemes in Turkey: 1) Emekli Sandigi the retirement fund for civil servants; 2) Social Security Institutions (SSK) for primarily private and some public workers; and 3) Bagkur (Social Insurance Agency) for employers and the self employed (e.g. farmers, merchants, artisans and tradesmen).

INCOME SOURCE	IMPORTANCE (AS A SOURCE OF INCOME AND SUBSISTENCE) FOR THE NINE SURVEYED SETTLEMENTS (HH = Household)				COMMENT
	High (>59% of HHs surveyed)	Medium (21-59% of HHs surveyed)	Low (< 21% of HHs surveyed)	0% of HHs surveyed	
Rental/ Real estate income			Hm	I; Ha; G; D; K; SS; Ky	Of all the surveyed HHs, income from property rental was only important for one household in Hamzali reflective of the limited and unstructured rental market. During consultation, a handful of secondary homeowners from Sahil Sitesi stated that they would be willing to sell or rent their properties for incoming construction workers.
Social Assistance and Solidarity Encouragement Fund (*Sosyal Dayanisma Fonu*)			D	G; Su; I; Hm; K; Ha; Ky; SS	The Social Assistance and Solidarity Encouragement Fund was only found to be a main source of income for one household in Deveciusagi.

Source: Household Survey 2001

Key to settlements: G = Golovasi; SS = Sahil Sitesi; Hm = Hamzali; Ha = Haylazli; D = Deveciusagi; K = Karatepe; I = Incirli; Kv = Karayilan; Su = Sugozu.

HHs = Households

Plate 10.18: Camp site at Incirli (existing BOTAŞ Jetty in the background)

10.13.4 Levels of employment (employment status)

Table 10.21 summarises the key findings in relation to employment (see Plate B8-10.13). The findings suggest that unemployment levels are low (particularly when compared to urban areas of Adana where in-migration has resulted in high levels of unemployment). However, the vast majority of residents are self-employed, farmers and seasonal workers vulnerable to seasonal and economic fluctuations and *underemployment* [1]. High *underemployment* explains why 29% of households named unemployment, and lack of social security as the priority settlement problem and why, during consultation meetings, high expectations were recorded regarding permanent employment from the new marine terminal development. Unemployment/underemployment was particularly severe in Karatepe, notably among the educated younger generations.

10.13.5 Main sectors of employment

As summarised in Figure 10.24, respondents are primarily engaged in the natural resources (agricultural, animal husbandry, fishing) and utilities sectors. This does not entirely correspond to the main sources of income reviewed earlier in Section 10.13.2, particularly in the case of animal husbandry. For example a high proportion of respondents are engaged in animal husbandry (eg 70% and 80% of households in Karayilan have poultry and cattle) but outputs are used to meet subsistence needs rather than contributing to cash income.

- **Main employment sector:** the findings suggest that settlements can be differentiated into four groups in terms of top employment activities:
  - Fishing: 31% of respondents in Golovasi; 44% of respondents in Haylazli; 58% of respondents in Deveciusagi (See Box 13a and b);
  - Agriculture: [2] 69% of respondents in Sugozu; 82% of respondents in Hamzali; 50% of respondents in Sahil Sitesi;
  - Animal husbandry: 36% of respondents in Karatepe; and 44% of respondents in Karayilan;
  - Utilities: 26% of respondents in Incirli, (mainly at the BOTAŞ site, although this is not a main source of income for this settlement).

  The second most common source of employment is: fishing in Sahil Sitesi and Incirli; agriculture in Karayilan, Haylazli and Deveciusagi; trade (eg shops/crafts) in Golovasi; and 'other' (eg construction, working in the Sugozu Thermal Power Plant construction) in Sugozu, Hamzali and Karatepe.

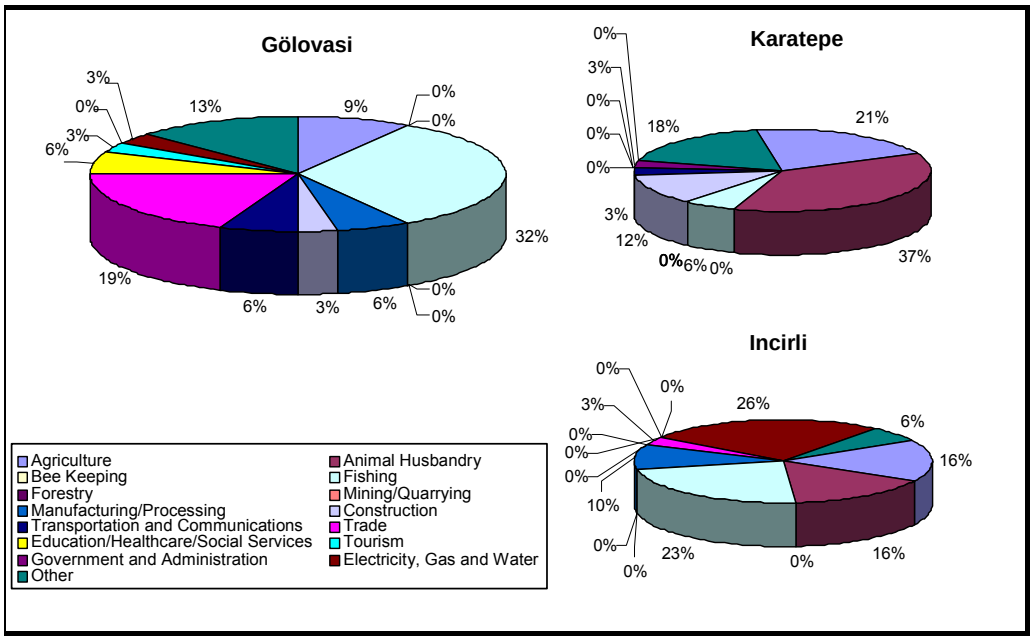
[1] Someone is classified as underemployed if they work for less than 40 hours a week due to: 1) a lack of employment or full time employment; or 2) a shortage of jobs; or 3) they are employed in an activity that does not match their skills set or potential earning capacity (State Institute of Statistics, 2001.

[2] The importance of agriculture as a main employment sector is well below the provincial average of approximately 50% with the exception of Sugozu, Hamzali and Sahil Sitesi. This suggests that the project areas have already been impacted by existing developments, but also the land (volcanic hills only occasionally interrupted by valleys) is less suitable for agriculture than the Cukurova plain, north of the area.

Table 10.21 Employment Status

EMPLOYMENT STATUS	COMMENT
Unemployment	Relatively low rates of unemployment were found in the surveyed settlements area (although still higher than the national average of 8.5% in 2001). The highest levels are found in Karatepe (18%), Golovasi (11%) and Hamzali (19%). In Karatepe, a quarter of all household heads and young adults over 14 are unemployed. It should be noted, however, that unemployment is likely to be under-reported particularly because respondents did not like to be categorised as unemployed. High levels of underemployment also characterise the project area.
Permanent Salaried Jobs (formal employment)	Regular salaried jobs are rare amongst respondents, although slightly more prevalent in the neighbouring settlements - Incirli (9% of respondents work in companies), Golovasi (9% of respondents work in education or for fishing companies) and Karatepe (7%) with main employers including BOTAŞ, fishing companies, schools and the army. It should be noted, however, that the majority of residents who reported having salaried jobs were actually doing informal or casual work and as a result can be considered underemployed.
Self Employed (non farmers)*	The levels of self-employment are 17% in Sahil Sitesi and Deveciusagi, 15% in Haylazli, 12% in Golovasi and 10% in Incirli. A number of these settlements, including Golovasi and Deveciusagi, are dependent on fishing as a source of income and employment. Self-employed fishermen are particularly vulnerable, having run up debts to purchase their own equipment (eg fishing boats).
Farmers	A significant number of respondents in Hamzali are farmers (approximately 21%), although the majority only employ one worker. In Haylazli, 8% of respondents (slightly more than for Hamzali) stated that they employed two or more workers. Both Hamzali and Haylazli are associated with commercial agriculture.
Unpaid Family Worker **	Relatively few respondents identified themselves as unpaid family workers.
Seasonal Employee	These were the highest in Karayilan (5%), Deveciusagi (5%) and Haylazli (4%), correlating with the higher levels of income fluctuation reported for these settlements (see Section 10.14.2).
Other	This group made up a large proportion of respondents and included students, retired respondents and housewives. The majority of women identified themselves as housewives although may undertake either income or subsistence family work (eg working in the fields, or tending the household garden or poultry). The main exceptions were Hamzali where 5% of women stated that they had regular jobs, Sahil Sitesi where a quarter defined themselves as self-employed, and Incirli and Karatepe where women are employed in 'other' areas (eg at BOTAŞ as cleaners/ caterers).

* 'Self employed' individuals earn a cash living from his/ her non agricultural activity
** 'Family workers' are defined as unpaid family members (excluding housewives) who participate in helping secure a living (cash and subsistence) for the household
Source: Household Survey [Ref xxx]



Source: Household Survey 2001 **[Ref xxx]**

Figure 10.24: Main Sectors of Primary Employment for Surveyed Respondents in the Neighbouring Settlements

- **Dependency:** the findings of the survey and consultation with local fishermen suggest that settlements in the project area are highly dependent on one source of livelihood and if this livelihood opportunity was disrupted there could be severe repercussions. For example, Karatepe and Karayilan are dependent on animal husbandry, and future impacts on pastureland, compounding impacts of previous developments, would have severe implications for sustaining levels of livelihood. In Golovasi, where agricultural land is held in the hands of the minority, a loss of fishing as a source of livelihood would leave residents with limited options for securing a livelihood.

Box 10.13 Fishing as a Source of Employment

Importance of Fishing: fishing is *one of two* main sources of *income* for 54 (27%) of the 200 households surveyed, a *source* of *income* for 60 of the 200 households surveyed and the main source of *employment* for 77 of 288 respondents. Golovasi[1], with a harbour approximately 700 m from the proposed marine terminal jetty, has the highest number of surveyed households in the neighbouring settlements (38% or ten households) involved in fishing as one of two main sources of income, followed by Incirli[2]. Fishing is the *main* source of *income* for 33% of households in Golovasi and one of the two main sources for 80% and 37% of households in Deveciusagi and Haylazli respectively. However, the latter two are more distant from the planned marine terminal and not expected to be substantially impacted. In addition, there is indirect employment from fishing (eg unemployed youth in Golovasi are paid to repair nets and boats). Only in the non-neighbouring settlements of Karayilan, Sugozu and Hamzali were there no surveyed households involved in fishing (see Figure 10.25).

Numbers of Boats Registered: according to the official records held in the Yumurtalik sub-governorship, 30 fishing boats are registered in Golovasi (although local fishermen state that there are 50 boats in the settlement) and eight boats are registered to Incirli Sea Security. Only those boats that are officially permitted are allowed to fish in the Incirli area.

Employment Status: of the eight households surveyed in Golovasi that fish, three work for fishing companies. The other five and all surveyed fishermen in Incirli and Karatepe are self-employed.

Use of Fish: generally, fishermen use 1-2kg of fish for their own household consumption per day. Some fishermen from Golovasi and Incirli sell their catches either within the settlement or to local traders in Yumurtalik (Plate 10.20).

Box 10.14 Fishing as a Source of Employment (Continued)

Fishing Costs and Revenues: the average fishing costs for all fishing households surveyed varies from 100 million to 667 million TL[3] (62 to 417 USD)[4]. Average monthly costs for fishing mostly comprise fuel, the cost of which was found to vary hugely between households (from 43 million to 333 million TL [27 to 208 USD] depending on the scale of household activities). Generally, new nets cost around 100 million TL (80-90 million TL for the raw material for each net and 10 million TL for the labour, most of whom are women). Boats are imported from the Black Sea region and cost between 2-8 billion TL depending on size (1,250 to 5,000 million USD). The cost of raw materials for fishing is in general regarded as expensive, with the price of the nets indexed to the USD, but sold in Turkish Lira. Interest rates for equipment are also high. Average revenue for all fishing households surveyed varies from 100 million TL (62 USD) to 272 million TL (170 USD)[5]. Local fishermen reported to earn as profit, on average only 20-25%of what they sell annually. For the three families working for fishing companies in Golovasi, monthly wages were found to range from 83 to 150 million TL (52 to 94 USD). These wages are below the minimum wage (222 million TL) (139 USD) for individuals above 16 years of age.

Fishing Regardless of Low Revenues Earned: despite the fact that revenues from fishing are

[1] Includes the settlement of Sahil Sitesi.
[2] For the purposes of this section of the baseline description, the focus will be on fishing activities in Golovasi (includes Sahil Sitesi) and Incirli, unless where information on other settlements has relevance to this assessment.
[3] Rate of Exchange: 1 million TL = USD 1.60, January 2002
[4] It should be noted that fishermen found it difficult to give exact figures for costs and revenues associated with fishing.
[5] The Mayor of Yumurtalik Municipality suggested that fishermen generally earn between 100-150 million TL per month.

reasons were given:

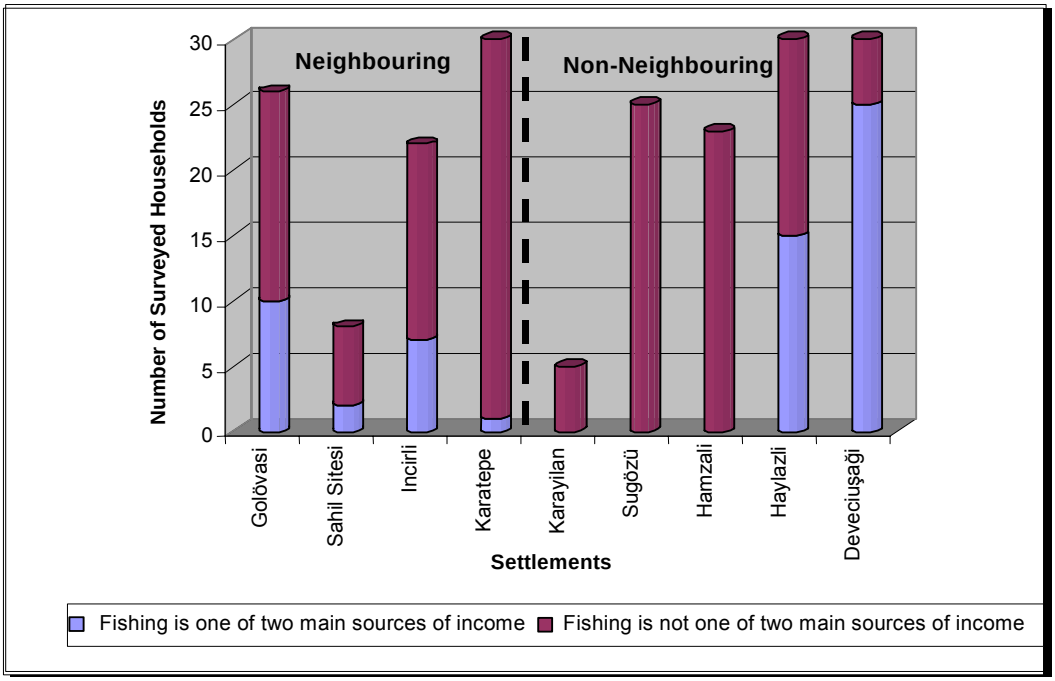
- lack of alternative livelihoods and lack of skills to undertake other activities, particularly as the majority of fishermen are middle aged;
- large debts to local traders that, according to social norms, would be undesirable to leave for their children to pay off;
- expectations that there could still be opportunities to profit from fishing in the future;
- most fishermen enjoy fishing as a way of life. It has been a family business for generations and they do not want to change their way of life.

In view of their self-employed status, debt owed to fishing companies, dependency on expensive inputs (particularly fuel) and a decline in catches, fishermen in the survey area are particularly susceptible to additional negative impacts from future developments.

Studies to investigate the importance of fishing as a form of livelihood and to assess the potential impacts of the BTC Marine Terminal, (particularly the exclusion and manoeuvring zones of the BTC Jetty) are ongoing. To date, studies have focused primarily on the collection of data in the form of questionnaires with households and Muhtars from settlements in the vicinity of the Marine Terminal. This data collection includes the soliciting of information from local fishermen, particularly those living in the settlements of Golovasi, Sahil Sitesi and Incirli.

As a result, the findings reported in this section reflect the opinions and concerns of these stakeholders. This section will thus be added to as additional information becomes available. The overall studies will be completed and the results disclosed in parallel with the end of disclosure for the BTC Project.

Alternative Livelihoods for Fishermen: As an alternative income-generating activity, some of the fishermen rent their boats to amateur fishermen – but this is usually limited to summer and approximately 8-10 times per year. Fishermen also take tourists to the ancient castle (remains of Aegea ancient city) located on an island off the coast called *Kiz Kalesi* (Plate 10.21). Finally, between 10-15 fishermen in the settlement rent approximately 10 hectares of land and produce wheat and cotton as a secondary activity.
NOTE: See Section 11 for further information on fishing patterns, catch and dependency.



Source: Household Survey 2001 **[Ref xxx]**

Figure 10.25 Number of Surveyed Households Where Fishing is One of Two Main Sources of Income

Plate 10.19 Fishing Boats Used by Fishermen in Golovasi/Sahil Sitesi

Plate 10.20: Local Fishing Traders and Catch in Yumurtalik, Adana

Plate 10.21 Kiz Kalesi Tourist Island

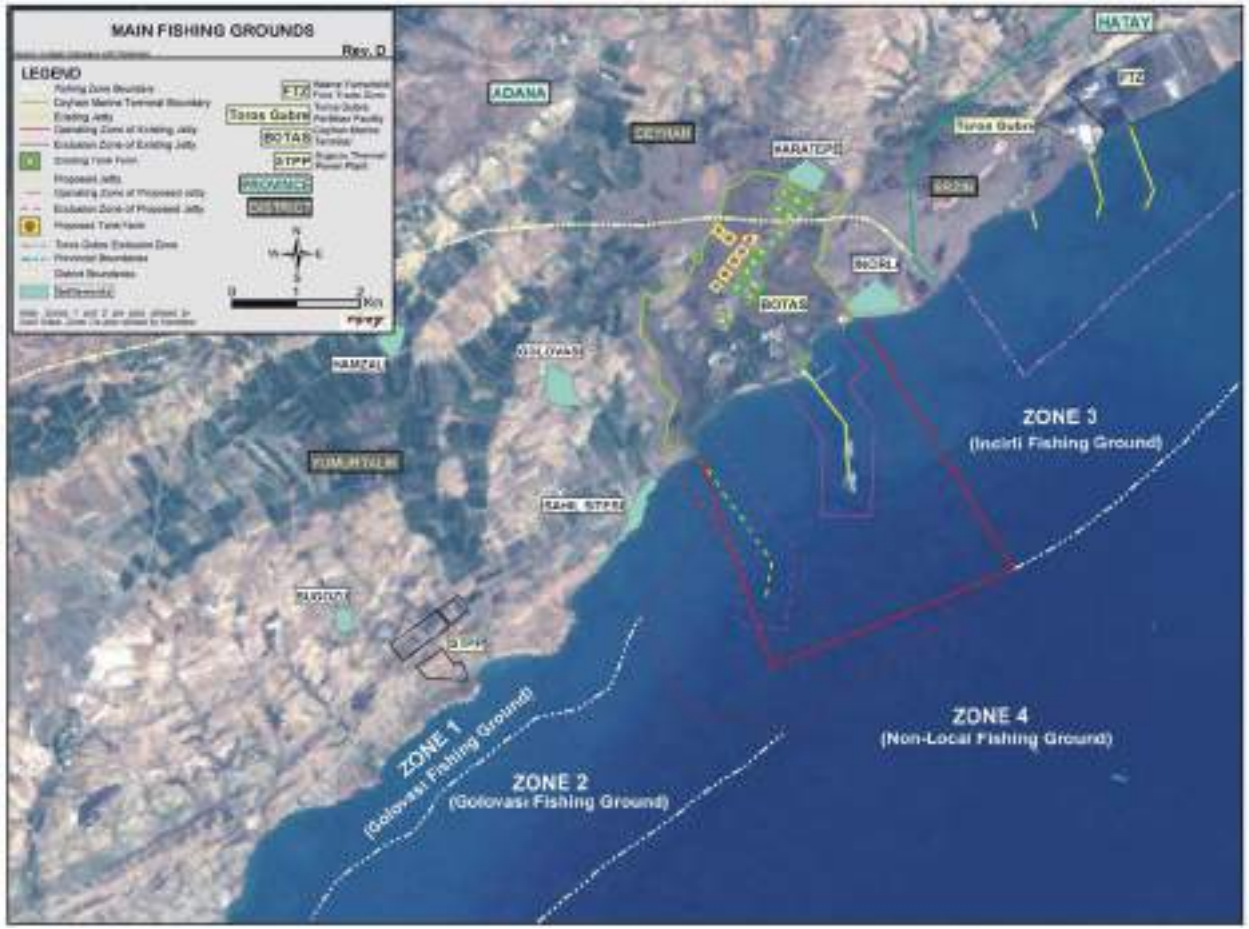


Figure 10.26 Main Fishing Grounds Map

10.13.6 Availability of construction skills and pipeline experience

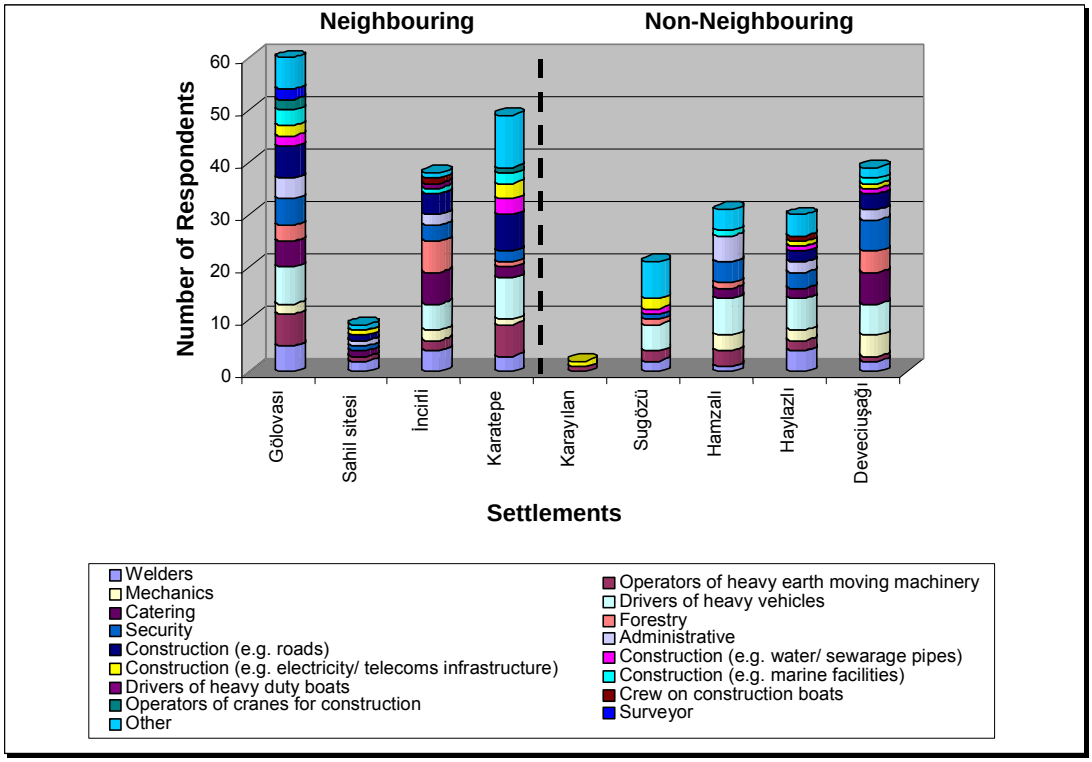
There is potential for recruitment of semi-skilled and unskilled workers primarily during construction. In order to ascertain the availability of construction skills and experience, respondents were asked to list their available skills, previous construction experience and availability for temporary employment. The findings indicate that there is an existing pool of labour with construction experience.

10.13.6.1 Neighbouring settlements

The most widely available personnel with relevant construction skills in the neighbouring settlements are: drivers of heavy vehicles (15 of 64 respondents); drivers of heavy earth moving machinery (15); road construction workers (14 of 64 respondents); catering (eight); and welders (ten) (see Figure 10.27). Golovasi recorded the largest number of surveyed respondents with previous construction experience. 46% (12 of 26 respondents) from Golovasi stated that they had previous construction experience compared with 30% (nine respondents), 22% (five respondents) and 38% (three respondents) in Karatepe, Incirli, and Sahil Sitesi respectively (see Figure 10.28).

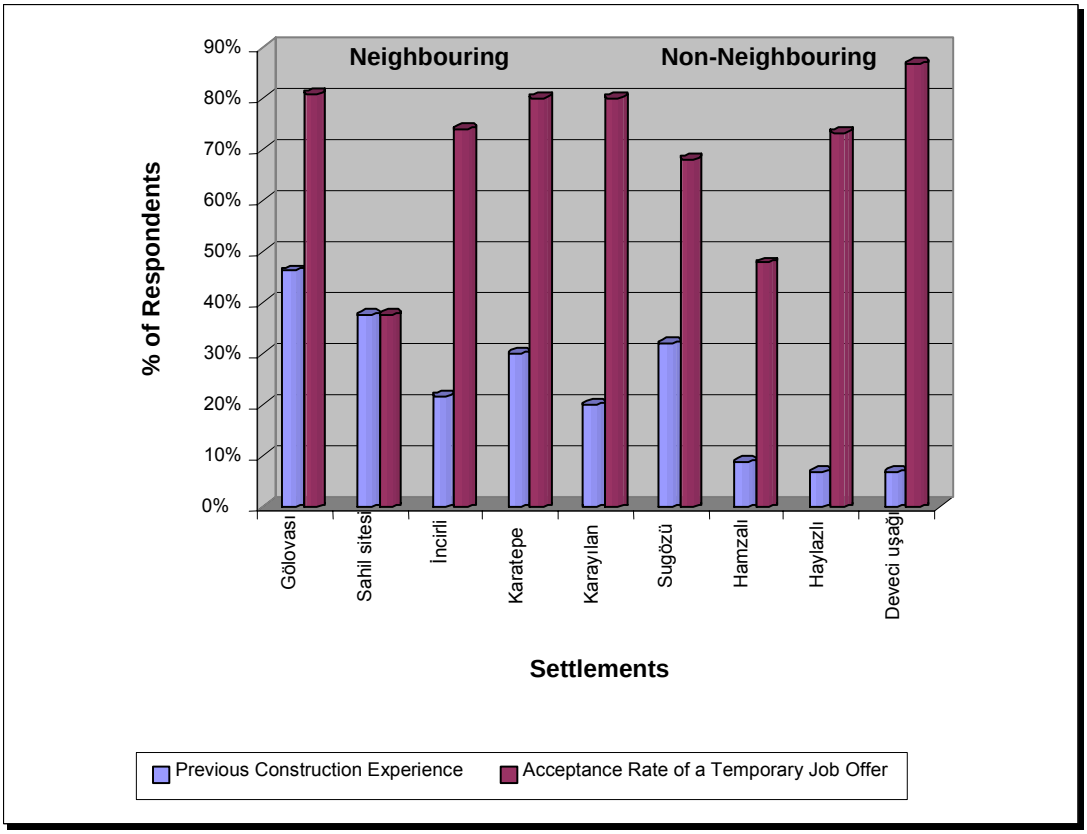
10.13.6.2 Non-neighbouring settlements

- The most widely available skills in the non-neighbouring settlements are: drivers of heavy vehicles (29 of 136 respondents); security guards (17 of 136); catering staff (16 of 136) and welders (13 of 136) (Figure 10.27). Respondents from Sugozu have significantly more construction experience than other non-neighbouring settlements, correlating with employment in the constitution of Sugozu Power Plant. 20% (five respondents) have had experience driving heavy vehicles, 8% (two respondents) experience of using earth moving heavy machinery, 8% (five) welding, 8% (five) utilities construction, and 28% (seven) a range of ‘other’ useful construction skills.



Source: Settlement Survey 2001 **[Ref xxx]**

Figure 10.27 Available Skills in Surveyed Settlements in the Marine Terminal Area



Source: Household Survey 2001

Figure 10.28 Previous Construction Experience in the Surveyed Settlements

10.13.7 Acceptance of temporary employment

Acceptance of temporary employment is a potential proxy for 'underemployment' because it indicates that respondents are not fully utilised in their current occupation. Approximately 80% of surveyed respondents in both Golovasi and Karatepe and 74% in Incirli would accept a temporary job offer. These figures are high, potentially because many of the activities carried out by residents of these settlements are seasonal freeing up respondents for additional work. Residents from Karatepe have very high expectations of permanent employment and have educated younger generations with the expectation of employment from BOTAŞ. Acceptance rates are not evenly distributed throughout the non-neighbouring settlements. The survey suggests that residents in Karayilan and Deveciusagi have significantly higher acceptance rates, possibly because dominant economic activities in these settlements are seasonal activities (animal husbandry in the former and fishing in the latter), freeing up residents for part of the year.

Table 10.22 Summary of Livelihood, Employment and Skills

SETTLEMENT	INCOME RANKING *	ASSET RANKING*	INCOME & ASSET RANKING*	MAIN LIVELIHOOD SOURCE**	WAGE INCOME (% respondents) ***	MAIN EMPLOYMENT SECTOR ****	SECOND MAIN EMPLOYMENT SECTOR ****	% UNEM-PLOYED RESPONDENTS *****	PREVIOUS CONSTRUCTION EXPERIENCE (% respondents)
Golovasi	3	4	3	Fishing & wage income	35	Fishing (31%)	Trade (19%)	11	46
Sahil Sitesi	2	6	2	Pensions & agriculture	13	Agriculture (50%)	Fishing, utilities & other (17%)	11	38
Incirli	6	7	6	Animal husbandry & fishing	30	Electricity, gas, water (26%)	Fishing (23%)	9	22
Karatepe	9	9	9	Agriculture & semi skilled (eg drivers)	20	Animal husbandry (36%)	Other eg construction / trade (18%)	18	30
Karayilan	7	8	8	Agriculture & semi-skilled	20	Animal husbandry (44%)	Agriculture (22%)	11	20
Sugozu	1	2	1	Agriculture & pension allowance	20	Agriculture (69%)	Other (13%)	7	32
Hamzali	5	1	5	Agriculture & pension allowance	9	Agriculture (82%)	Other (11%)	19	9
Haylazli	4	3	4	Agriculture & fishing	3	Fishing (44%)	Agriculture (41%)	6	7
Deveciusagi	8	5	7	Fishing & agriculture	7	Fishing (58%)	Agriculture (23%)	5	7

* Ranking of settlements: 1 denotes the highest average income and/ or asset levels and 9 the lowest levels of income and/ or assets of the surveyed settlements in the marine terminal (see Section 10.13.2 for further details).
** Main livelihood source (includes subsistence and income earning activities).
*** % of respondents earning income from permanent non-agricultural activities.
**** % of respondents. Main employment sector is the main time employing activity for the majority of respondents and second main employment sector is the second most common main activity for the respondents. Includes both wage and subsistence based activities.
*****Unemployment is defined as '*not being employed in a permanent, wage earning capacity'*. These figures should be viewed in relation to the national average of 10.5% (last quarter of 2001: SIS).
Source: Household Survey (HH = household)

10.14 INFRASTRUCTURE, UTILITIES AND SERVICES

10.14.1 Overview

Although the new development will be largely self sufficient in terms of telecommunications, energy, water supplies, sewage treatment and waste disposal (as it will utilise existing infrastructure and services in the BOTAŞ property), the Project will use local roads, access

some energy and water supplies from existing local municipal supplies (where consumption does not impact upon local needs). Gradual in-migration, as a result of industrialisation in the Iskenderun Gulf area, will also place additional pressure on existing services and infrastructure.

This section therefore reviews the availability of existing infrastructure and services, particularly in the neighbouring settlements. An understanding of the availability of services and infrastructure also allows for an analysis of the potential impacts associated with an increase in population numbers in the survey area. Background to the provision of infrastructure and services is available in Section 5 of the report.

Box 10.15 provides an overview of the availability and quality of infrastructure and services in the BTC Marine Terminal area. This is followed by a more detailed review of provision.

Box 10.15 Overview of Infrastructure and Service Availability and Quality

Overall: the settlements in the survey area can no longer be considered as traditional (ie solely subsistence based) and are in the process of changing from an agrarian to a more industrial based economy. In spite of this change, housing and infrastructure are in poor condition. In fact, 47% of households stated that infrastructure (particularly low quality roads, insufficient health, education and waste disposal systems and water supply) was the major problem in their settlement.

Infrastructure: all households surveyed (with one exception) receive electricity, although almost half of households surveyed receive irregular supply. Just over three quarters of households receive piped water, although 55% receive an irregular supply. Only 22% of households surveyed have their sewage collected by the municipality. Only 29% of households (located in Incirli, Karatepe and Karayilan) have access to a formal (ie municipality run) disposal system. However, 81% of surveyed households have a telephone, and although there is a mobile network, relatively few respondents have mobile phones. The roads linking settlements and within settlements although generally surfaced with asphalt, are on the whole considered by surveyed Muhtars to be of low quality and in poor condition.

Health: there are no health centres in any of the settlements, and although nurses and midwives visit all surveyed settlements, the health services provided were reported to be unsatisfactory by the majority of households in the neighbouring settlements. A relatively high proportion of households stated that one of their members had required hospital treatment in the past year (63% of households surveyed in Golovasi, 67% of households in Sugozu, and 60% of households from Deveciusagi).

Education: all children between the ages of 6 – 15 (the age of compulsory education) from the surveyed households currently attend school. Approximately half the surveyed adults have attained at least primary school qualifications, 12% have gained both primary and secondary education and 3% of respondents have university qualifications.

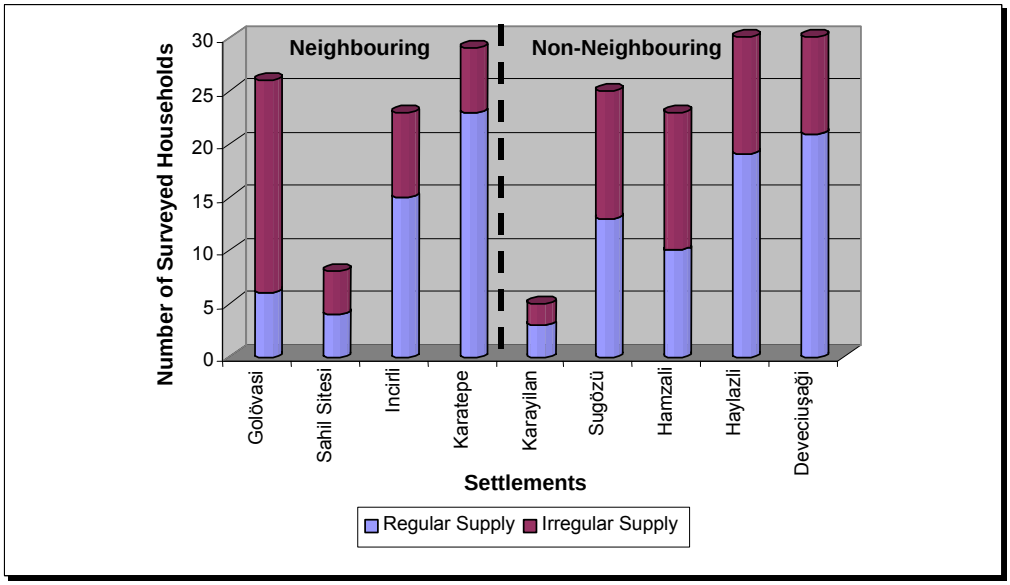
Other Services: other services are limited to coffee houses in Golovasi, Incirli, Hamzali, Haylazli, Sugozu and Deveciusagi, convenience shops and restaurants. There are no other services such as fire or police services.

10.14.2 Services, utilities and physical infrastructure

10.14.2.1 Electricity

All houses surveyed (with the exception of one house in Karatepe) receive electricity and generally use it for lighting. Of the 199 surveyed households with electricity, 43% experience an irregular power supply caused by frequent power cuts (see Plate 10.22 and Figure 10.29).

Plate 10.22 Electricity Cables in Incirli



Source: Household Survey 2001

Figure 10.29 Electricity Supply for Surveyed Households in Surveyed Settlements

10.14.2.2 Alternative energy sources

A wide range of alternative energy sources is available in the surveyed settlements including, solar energy, bottled gas, coal, wood and dung. In general: coal, bought wood and cut wood are used for heating (the former because it is widely available and effective, and wood because it is cheap); bottled gas for cooking (because it is more effective and easily available); natural solar power for heating hot water (primarily because it is cheap); and dung as a source of fuel (because it is free and easily obtained particularly for the 38% of households with cattle).

10.14.2.3 Water

In Turkey, water pipes are primarily constructed by the State (although villagers may contribute to construction) and depending on the location and source of the water, settlements will either be charged (if the State transports water from a dam or other source to the settlement) or provided with water for free. The latter circumstance arises if a settlement has a water source, and the State provides the pipe. Piped water (for drinking, cooking, bathing etc) is received by 153 (76%) of the 200 surveyed households of these, 55% experience irregular supply including all households surveyed in Haylazli, Golovasi and Karatepe.

10.14.2.4 Alternative water sources

For the 47 surveyed households without centrally distributed piped water, the following alternative sources are used: 1) private wells; 2) settlement fountains (12 households); 3) private water depots (28 households); 4) water carried by tankers from nearby settlements (44 households); and 5) in the case of Karatepe, the residents (working for the Toros Gubre Fertiliser Facility) collect tanked water from within the company zone (see Plate 10.23).

Plate 10.23 Delivery of Water to Karatepe, Adana

Box 10.16 Water Shortages

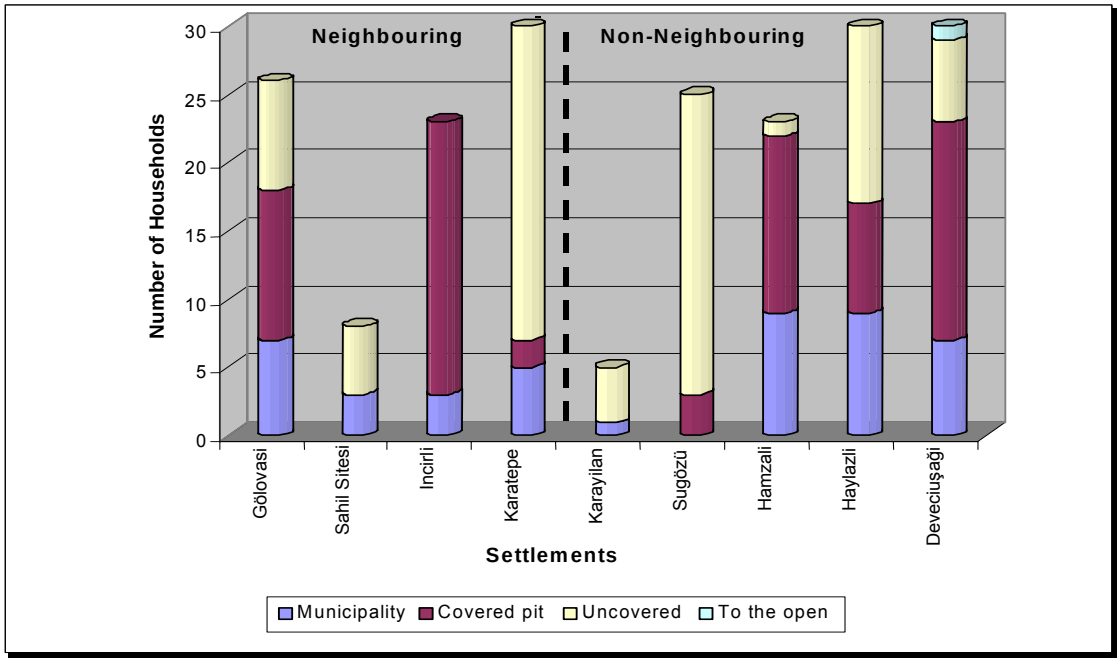
An important concern for inhabitants in the marine terminal area is the lack of water. Residents from Karatepe claimed that the water they use is unhealthy and inadequate both for drinking and engaging in greenhouse/vegetable production.

Source: Residents from Karatepe, Adana

10.14.2.5 Sewage

The disposal of sewage is a huge problem in Turkey. This is reflected in the surveyed settlements where there is no formal piped sewerage system for the surveyed settlements (see Figure 10.30). Forty four of the 200 surveyed households (22%) have their sewage collected and disposed of by their local municipality who regularly empty the pits with trucks. The remainder (including 100% of households in Sugozu) have to use their own means to dispose of household sewage, notably in covered or uncovered pits. All surveyed households in Sugozu

dispose of their sewage privately. The Mayor of Yumurtalik stated that sewage disposal was a particular problem for residents of the summer houses/ secondary homes in Sahil Sitesi.

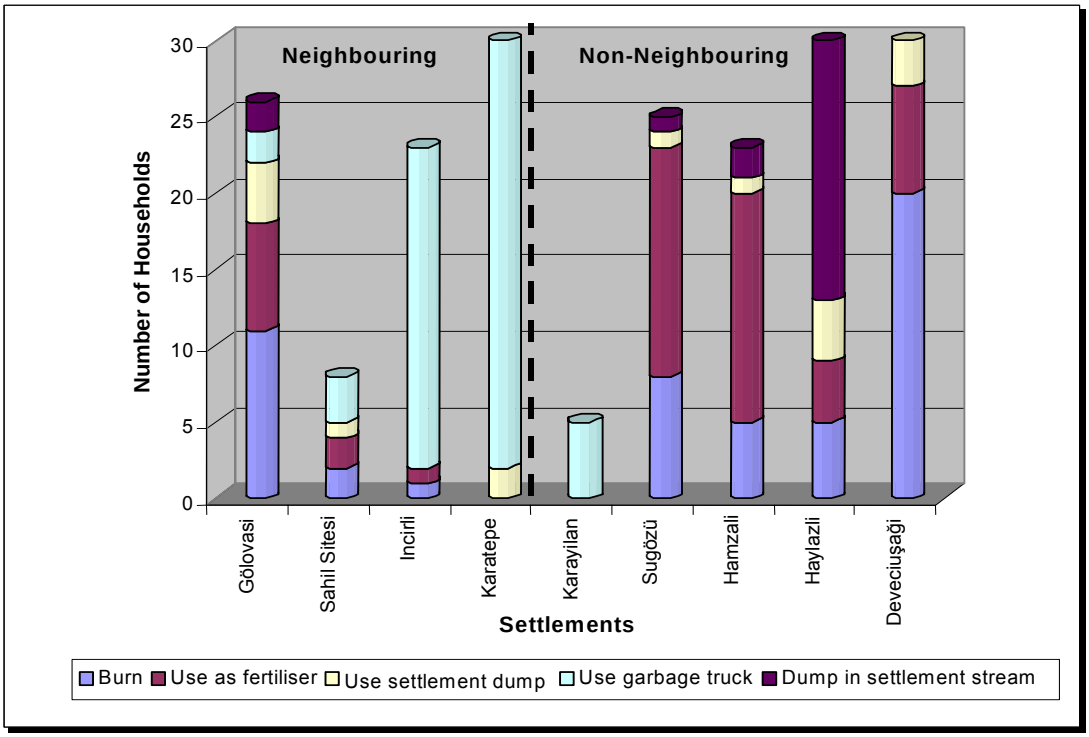


Source: Household Survey 2001

Figure 10.30: Methods of Sewage Disposal in Surveyed Settlements

10.14.2.6 Waste disposal

Of the 200 surveyed households, only 29% of households reported access to a formal (municipality run) disposal system (municipal trucks collect the waste). These households are located in Incirli, Karatepe and Karayilan. The remainder rely on private means of disposal. The household survey uncovered a number of alternative methods for waste disposal, including burning and dumping waste into a settlement dump or nearby streams (see Figure 10.31).



Source: Household Survey 2001

Figure 10.31 Methods of Waste Disposal in Surveyed Settlements

10.14.2.7 Telephones

Of the 200 households surveyed, 162 households (81%) have a telephone. Karatepe and Deveciusagi have the highest proportion of surveyed households owning telephones (77% and 70% respectively). A mobile telephone network covers all the neighbouring settlements. Only 20%, 5% and 5% of respondents from Golovasi, Incirli and Karatepe have mobile telephones – considered a luxury in Turkey.

10.14.2.8 Roads

Observations suggest that the roads in the vicinity of the terminal are in better condition than in many rural areas of Turkey. New roads both within and linking settlements have been constructed within the last five years through many settlements in the vicinity of the BTC Marine Terminal site (although not at Hamzali, Haylazli and Deveciusagi). Consultation suggests that no new roads are planned in the vicinity of the settlements of Golovasi or Incirli. All roads are narrow and the asphalt is generally of low quality and, therefore, prone to wear-and-tear. Local residents have expectations that road will shortly be improved by the government or Marine Terminal operators/contractors. There is significant local tourist trade in the summertime, with considerably increased traffic flows on local roads. This increase in traffic in the summer will coincide with the preferred period for construction activities. Other significant seasonal activities include harvesting, which occurs from May to September. There is a main coastal highway road to the BOTAŞ Dortyol Marine Terminal and the nearby LPG facility. A new highway running north-south is currently being constructed east of Karatepe and Incirli. This would potentially be a viable route to the BOTAŞ property and would remove pressure from existing roads.

10.14.3 Summary of local infrastructure

Table 10.23 below summarises infrastructure provision by surveyed settlement.

Table 10.23 Summary of Infrastructure in the Project Area

SETTLEMENT	ELECTRICITY		WATER		SEWAGE DISPOSAL		WASTE DISPOSAL		TELEPHONE	
(number of households surveyed)[1]	Reg. *	Irreg. *	Reg.	Irreg.	Municipality **	Private	Trucks ***	Private	Yes	No
Golovasi (26)	6	20	6	18	7	10	2	24	22	4
Sahil Sitesi (8)	4	4	0	6	3	0	3	5	6	2
Incirli (23)	15	8	14	8	3	20	21	2	20	4
Karatepe (30)	23	6	12	16	5	25	28	2	21	9
Karayilan (5)	3	2	2	3	1	4	5	0	4	1
Hamzali (23)	10	13	16	6	9	13	0	23	22	1
Haylazli (30)	19	11	0	23	9	21	0	30	26	4
Sugozu (25)	13	12	18	5	0	25	0	25	22	3
Deveciusagi (30)	21	9	0	6	7	23	0	30	24	6
TOTAL	**114**	**86**	**68**	**85**	**44**	**150**	**59**	**141**	**167**	**34**

* *Reg*.= regular supply; *Irreg*.= irregular supply.
** *Municipality* refers to sewage emptied and dumped by municipalities; *Private* refers to sewage emptied and dumped by households in various ways
*** *Trucks,* refers to waste collected by trucks; *Private* refers to household collection and disposal by private means eg in nearby streams.
Source: Household questionnaire

10.14.4 Health levels and services

10.14.4.1 Health Levels

Section 5 provides background information on the health situation in Turkey. The survey revealed no major contagious diseases for the surveyed settlements. However, a relatively high proportion of households stated that one of their members had required hospital treatment in the past year (63% of households surveyed in Golovasi, 67% of households in Sugozu, and 60% of households from Deveciusagi). There is a high incidence of heart and pulmonary illness, particularly in Karatepe are fishermen in Golovasi complained that fishing gave them back problems. Limited additional inferences can be made.

10.14.4.2 Causes of poor health

Causes of poor health included insufficient health care services (mentioned by respondents in four of the surveyed settlements); poor quality water (four settlements); poor diets (three settlements); poverty (two settlements); and insufficient sanitary conditions (two settlements). Old age was also raised as a common cause of poor health.

[2] Health services are provided free for State employed individuals (although occasionally a small fee is required). It is obligatory for private companies to pay for health insurance and treatment for their employees but this is not common. BAG-KUR is the main pensions/ health service covering self-employed individuals living in the rural areas.

10.14.4.3 Health services

There are no health centres in any of the settlements. This was reported as one of the priority problems faced by surveyed settlements. Nurses visit all settlements to provide health services (no details are available on numbers or regularity of visits). The shortage of midwives and overall poor health services were reported to be unsatisfactory by the majority of households in the neighbouring settlements. As a result, residents tend to use the health facilities in Ceyhan district or Kurtkulagi town.

10.14.5 Educational levels and services

10.14.5.1 Education qualifications

All education is free in Turkey and compulsory for children between six and 14. Households have to pay for uniforms (although the State may provide subsidies) and stationery. All children between these ages from the surveyed households currently attend school. Approximately half the surveyed population have attained at least primary school qualifications, 12% have gained both primary and secondary education and 3% of respondents university qualifications (see Table 10.24). Three of the five university educated respondents come from Golovasi.

10.14.5.2 Literacy levels

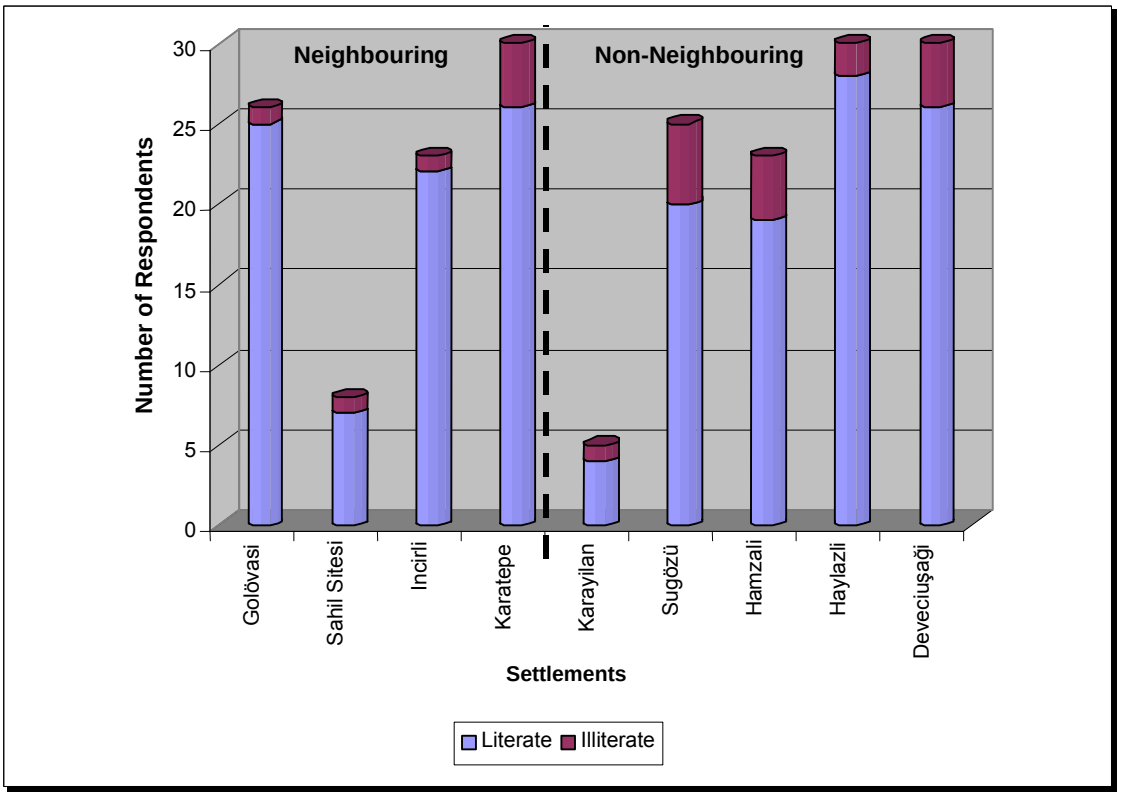
At least 80% of inhabitants in each of the surveyed settlements are literate (see Figure 10.32). There seems to be limited correlation between the availability of primary schools (and teacher/ student ratios) with literacy rates. No acute gender discrimination is evident, and the findings suggest that the inhabitants have a 'liberal' attitude particularly towards female education, a view more prevalent in the more 'developed' provinces such as Adana.

Table 10.24 Education Levels of Respondents by Settlements[1]

SETTLEMENT	NO FORMAL EDUCATION	PRIMARY SCHOOL	SECONDARY SCHOOL	HIGH SCHOOL	UNIVERSITY
Golovasi (26)	1	12	7	3	3
Sahil Sitesi (8)	2	2	1	3	0
Incirli (23)	4	12	1	6	0
Karatepe (30)	5	19	2	4	0
Karayilan	1	4	0	0	0
Hamzali (23)	4	14	2	3	0
Haylazli (30)	3	14	5	7	1
Sugozu (25)	8	9	2	5	1
Deveciusagi (30)	4	22	2	2	0
Total (195)	**32**	**108**	**22***	**33**	**5**

Note: The figures in this table are cumulative (eg 22 respondents have attained secondary *and* primary education)
Source: Household Survey 2001 [Ref xxx]

[1] Until recently, compulsory primary school education was only five years, followed by secondary education of three years and high school education of three years. Now the length of compulsory education has increased to eight years and is followed by high school (which is not compulsory).



Source: Household Survey 2001

Figure 10.32 Literacy Levels in Surveyed Settlements

10.14.5.3 Education facilities

The two largest surveyed settlements of Golovasi and Sugozu, plus Haylazli and Deveciusagi, all have a primary school (all four ranked within the top five of the surveyed settlements in terms of income levels). None of the settlements have a high school. Children go to the nearest settlement or town if there is no primary school or high school within their settlement. For Incirli, for example, the closest primary school is 10km away. For Karatepe, the closest primary and high school are 2km and 20km away respectively. The nearest high school for the students of Golovasi is 25km away[1].

10.14.5.4 Numbers of teachers

The teacher to pupil ratio varies between settlements and is highest in Deveciusagi (40 students per teacher) and lowest in Hamzali (six students per teacher). In Turkey, the average is 26 pupils to each teacher [2] although this varies depending on whether the school is located in a rural/urban or poor/affluent setting.

10.14.5.5 School facilities

On the whole school facilities, with the exception of sports facilities, were described as satisfactory by the Muhtar. In Sugozu, the structural condition of the primary school was rated as unsatisfactory by respondents and the availability of education materials/books also poor. In Deveciusagi, the number of teachers (40 students per teacher) is described as very

[1] The Deputy Director of the BOTAŞ facility noted that the BOTAŞ primary school was open to children from nearby settlements. The facility also runs a school bus to secondary schools in Ceyhan and Adana and makes this available to children from Golovasi, Incirli, Hamzali and Karatepe.
[2] Ministry of Education

unsatisfactory, as is the availability of education materials, hygiene and availability of drinking water at school buildings (the main source in the settlements is private wells).

10.14.6 Other social services

According to the surveyed Muhtar, the following conclusions can be drawn:

- The majority of services (eg fire, library, post office, financial, local government, shops, Jandarma office, local security forces, agricultural support services, sports facilities etc) are not available in the surveyed settlements. The nearest services are located in major towns such as Ceyhan.

- All surveyed settlements, with the exception of Karatepe, have coffee houses. All settlements have good market and transport facilities (eg mini-bus services), with the exception of Incirli where the transport facilities are said to be in bad condition.

- The fishing ports at Golovasi/Sahil Sitesi and Deveciusagi are in good condition (see Plate 10.24).

Plate 10.24 Golovasi / Sahil Sitesi Fishing Port, Adana

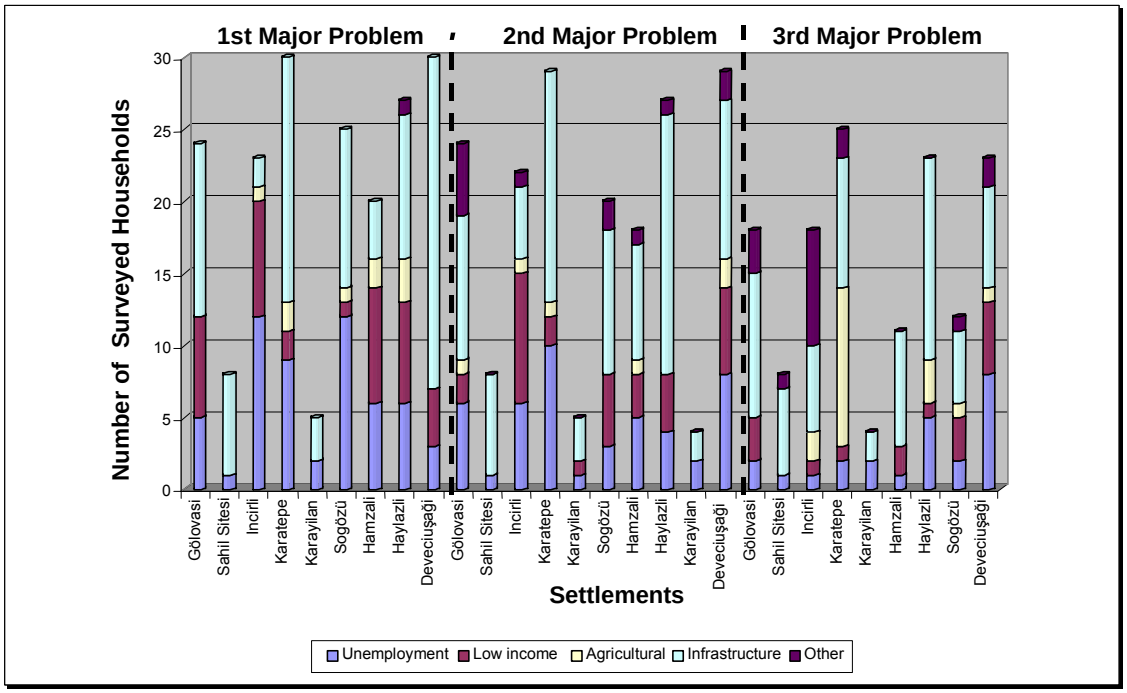
10.14.7 Information sources

Just over half the respondents had reviewed some information about the BTC Project before the consultation meetings. Respondents listed television and settlement meetings as important sources of information, suggesting that these forms of communication are considered for the dissemination of additional information on the BTC Marine Terminal Project.

10.14.8 Main settlement problems

The findings suggest that the main problem in all of the settlements is infrastructure (for 85% of households), followed by unemployment (56% of households), low income[1] (37% of households) and agriculture (9% of households) (see Figure 10.33).

[1] Eg economic hardship experienced by households with no social security net.



Source: Household Survey 2001

Figure 10.33 Top Three Problems in the Surveyed Settlements

10.14.9 Settlement summaries

Livelihoods analysis is a tool for assessing the potential impact of a project on the capital assets of affected communities. It is a valuable way of understanding the baseline conditions, enabling prediction and measurement of impacts. It takes a holistic approach to people's livelihoods and assumes that each person and group of people have a set of 'assets' of various types. These assets are: 1) natural; 2) physical; 3) human; 4) financial; and 5) social.

A new project is likely to affect the size and distribution of these assets. It is therefore useful to assess the current baseline (pre-BTC Marine Terminal) situation of the neighbouring settlements (Golovasi [including Sahil Sitesi], Karatepe and Incirli) of the Project. This helps to define their **current set of assets** so that it is possible to examine how the Project might affect them. An analysis of the livelihood assets for the settlements of Golovasi, Karatepe and Incirli is presented in the Annex B5.

The level of existing assets is summarised in (see Figure 10.34)[1] (ie there are high levels of human capital in Golovasi, but low levels of natural capital). The findings show a mismatch between existing capital levels and dependency (what people need to live) on the difference assets. For example all three neighbouring settlements are dependent on natural capital as a source of livelihood and employment. However, the availability of natural capital is low. This suggests that the neighbouring settlements are extremely vulnerable to future change and if one form of capital (eg natural capital) is reduced by the BTC Marine Terminal, it must be balanced by an increase in another (eg financial capital – employment).

[1] This level of analysis is required here as the Project is directly affecting a main income source (fishing) for a high number of households in Golovasi.

Box 10.17 Conclusions of Livelihood Analysis

- Natural capital*:* this has been recently depleted for all neighbouring settlements due to: 1) recent land expropriation (decreasing availability of agricultural and pasture land); 2) establishment of an exclusion zone for the existing BOTAS Marine Terminal; and 3) competition from non-local fishermen (decreasing fish stock). The situation is compounded by the unequal distribution of land and decreasing fish stocks, which have increased pressure on local resources.
- Human capital*:* this is relatively high in the neighbouring settlements and both male and female inhabitants exhibit high levels of literacy and education. There are also a number of available skills ranging from traditional skills through to construction, although the former (eg carpet weaving and fishing) have become depleted. Relatively low unemployment levels are not truly representative of the situation, and the high potential acceptance of temporary employment, is indicative of significant underemployment.
- Physical capital: there is a shortage of infrastructure and health facilities in the neighbouring settlements. The lack of waste disposal and sewerage systems concomitant with a lack of health facilities has had impacts upon human capital. Other forms of physical capital, including energy, water, transport and communications are relatively well developed.
- Financial capital*:* although non-agricultural permanent wage incomes have become increasingly important, they are still relatively minor. A high proportion of households are in debt (particularly fishermen) and the overall standard of living has deteriorated over the past five years. Generally, respondent earnings are above the minimum wage of 2664 million TL, with the exception of fishermen.
- Social capital*:* the findings indicate relatively tight-knit communities with strong social networks that have experienced a relatively stable demographic situation over the past five years. In-migration was potentially associated with the construction of the existing BOTAŞ marine terminal in the 1970s, but evidence suggests that the study area has experienced a relatively stable demographic composition over the past five years.

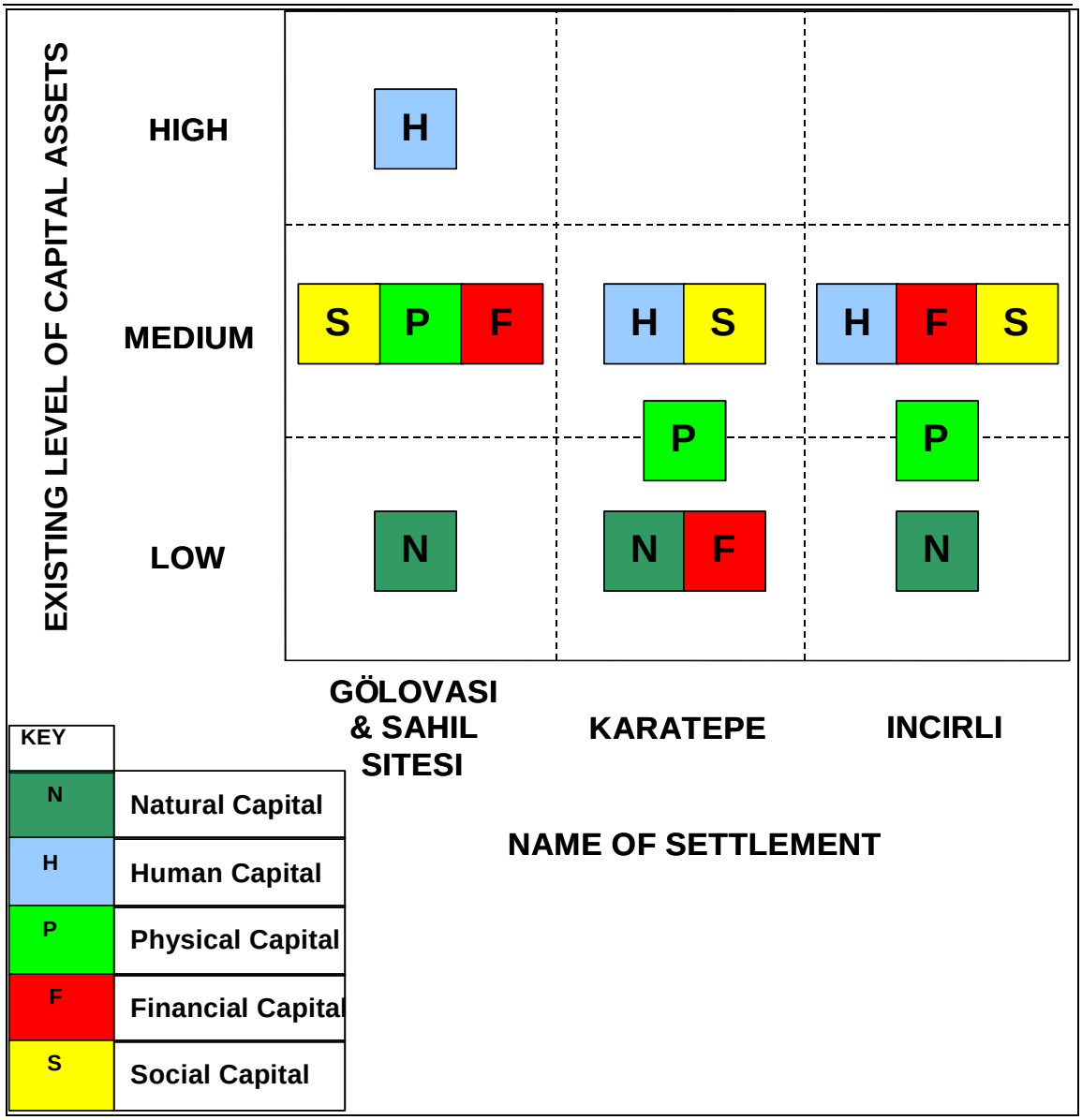


Figure 10.34: Existing Levels of 'Capital' Assets in the Settlements Neighbouring the BTC Marine Terminal Development

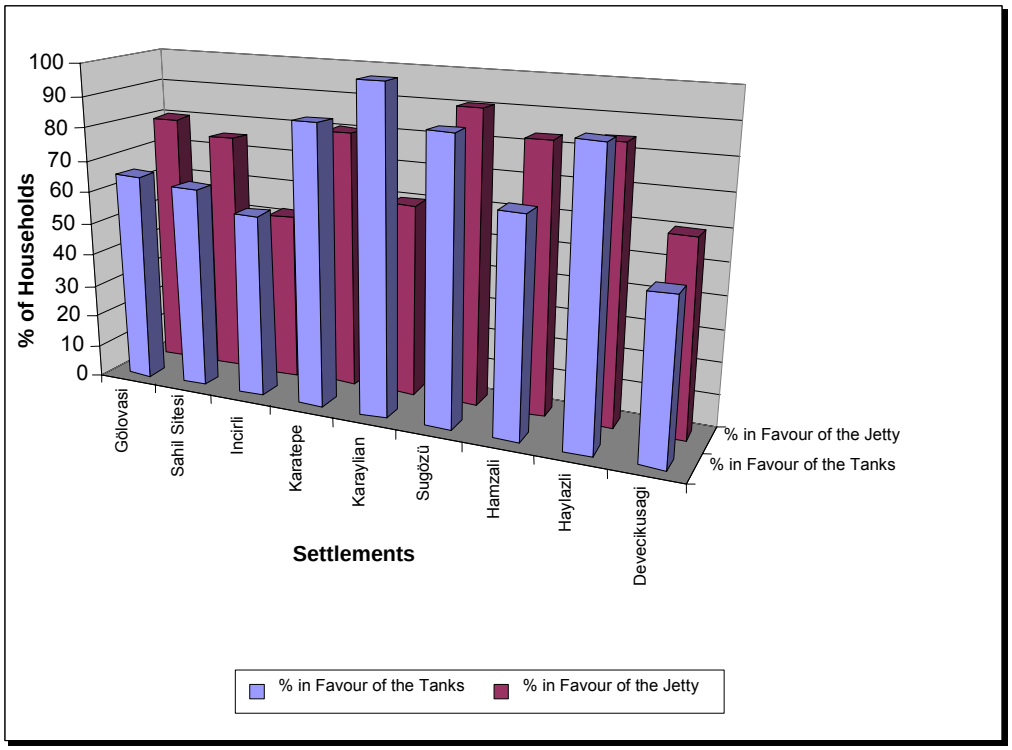
10.15 ATTITUDES AND PERCEPTIONS TOWARDS THE MARINE TERMINAL

The majority of residents surveyed are in favour of the jetty and the additional oil tanks (71% or 143 respondents and 75% or 150 respondents respectively) (see Figure 10.1535). For the jetty, this ranges from 91% of respondents in Hamzali (a non fishing settlement) to 52% of residents in Incirli (a fishing settlement). For the oil tanks, this ranges from 100% in Karayilan to 56% of respondents in Incirli. Surprisingly, 97% of respondents from Karatepe (already impacted by the existing tanks) are in favour of the tanks – although this is most likely explained by their high expectations of permanent employment.

Thirty-four respondents had no idea how the Project might impact them negatively. The remaining respondents identified both potential benefits and negative impacts.

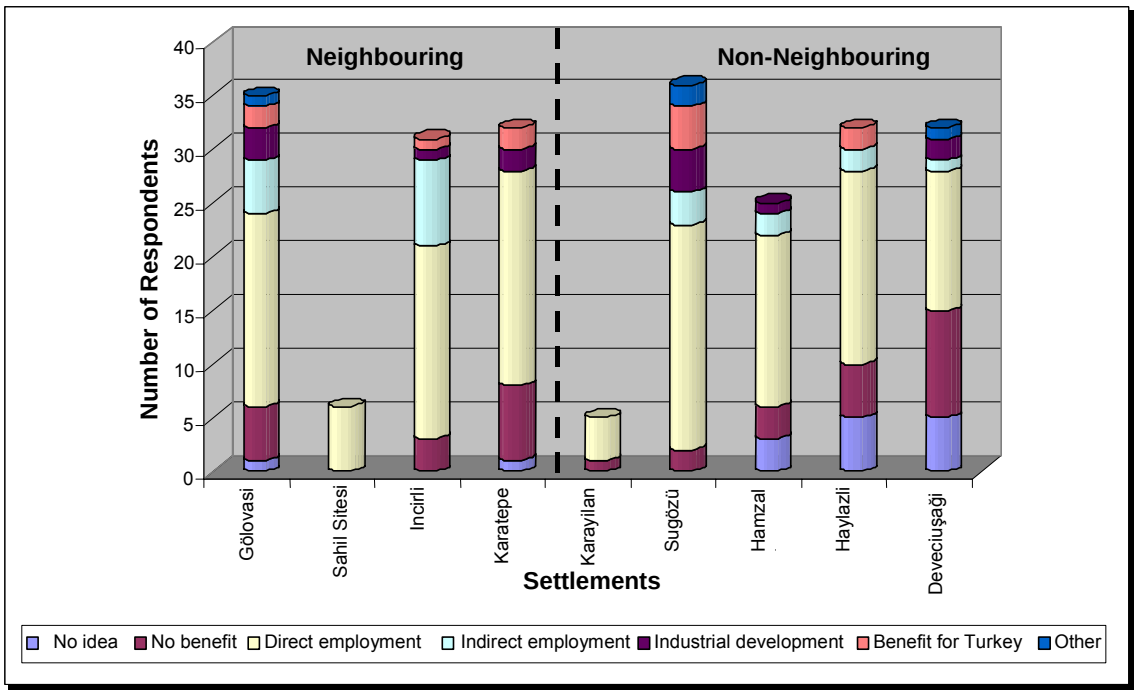
- **Perceived benefits of proposed BTC Marine Terminal:** direct employment was raised as the most likely positive benefit by approximately 130 respondents (65%), 20 of whom came from Karatepe and 20 from Sugozu (Figure 10.). In addition, during the consultation meetings, expectations of employment were continually voiced, particularly among the neighbouring settlements. This widespread expectation regarding employment is reflected in the low number of respondents (only 18%) that do not expect any benefit from the proposed project (including 29% of respondents from Deveciusagi).

- **Perceived negative impacts of proposed BTC Marine Terminal:** 45% percent of respondents think that there will be no negative impacts associated with the proposed development (39 responses from neighbouring settlements and 53 from non-neighbouring settlements). However, a number of potential concerns were raised in all settlements (see Figure 10.35 and Figure 10.36). Many of these concerns are based on experiences associated with the existing developments in the area, including the BOTAŞ Marine Terminal.



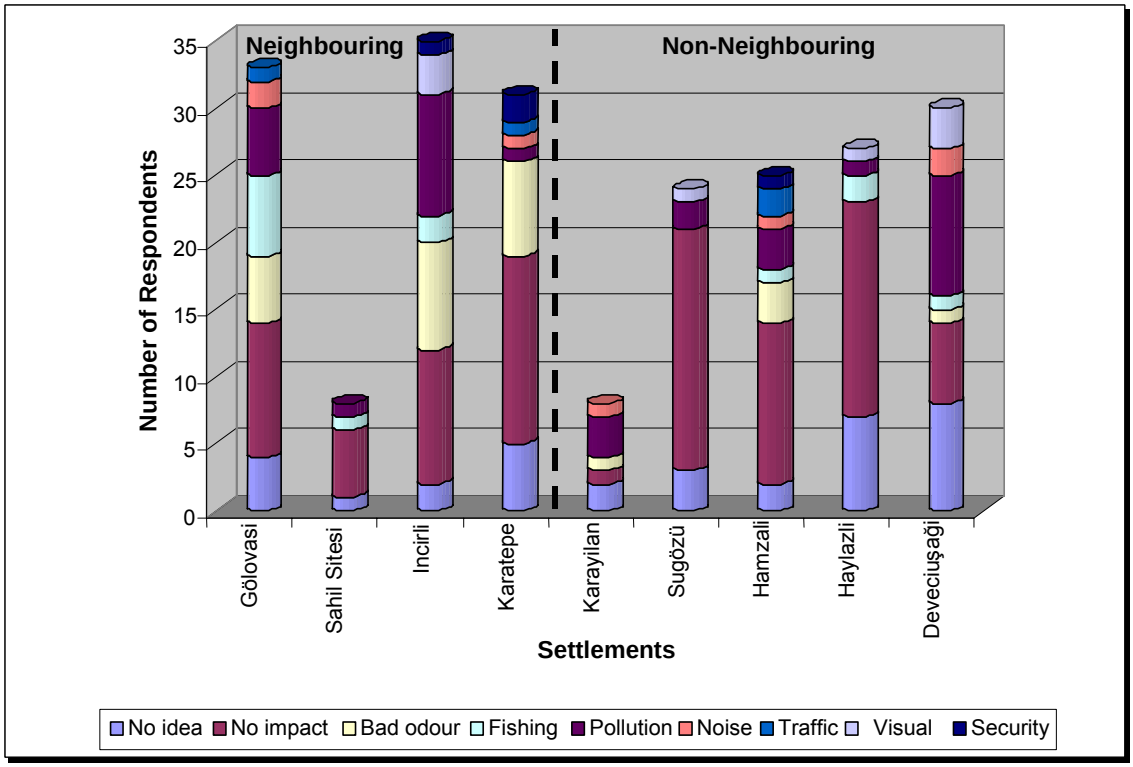
Source: Household Survey 2001

Figure 10.15 Overall Opinion of the Marine Terminal Development



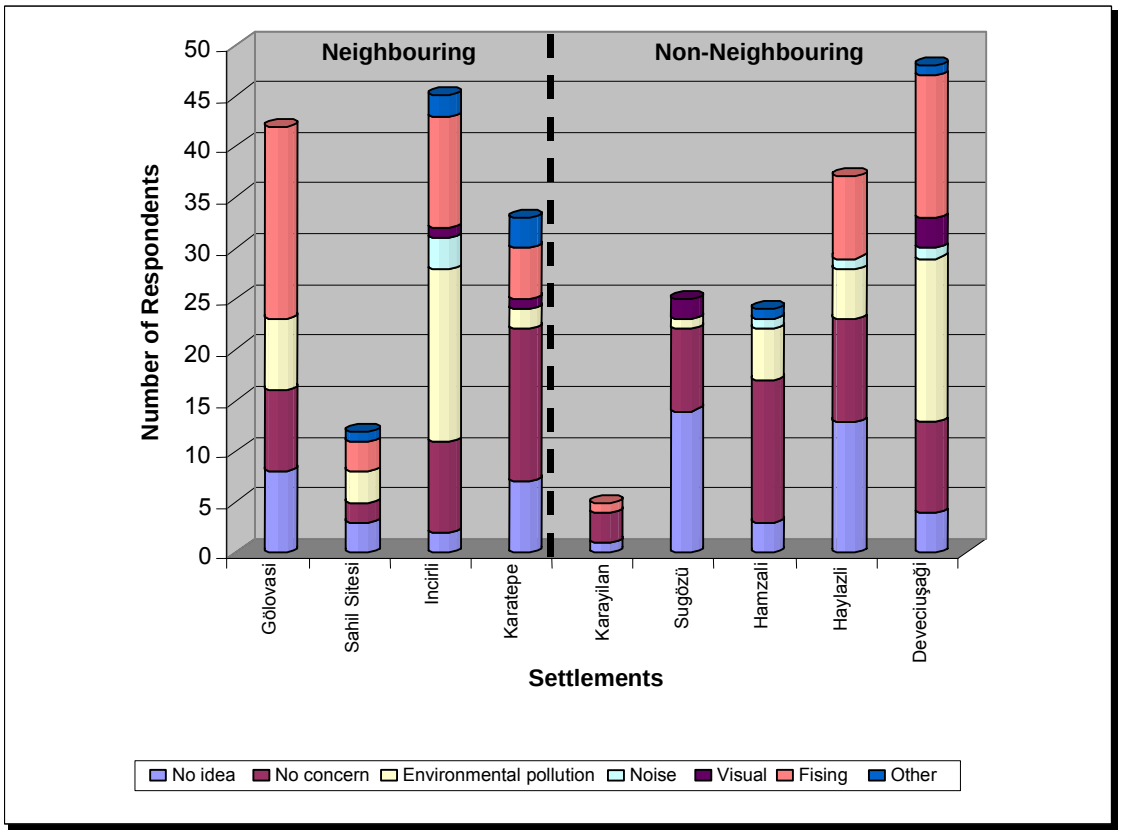
Source: Household Survey 2001

Figure 10.36: Expected Benefits from the Jetty and the Oil Tanks



Source: Household Survey 2001

Figure 10.37: Expected Negative Impacts Associated with the Oil Tanks



Source: Household Survey 2001

Figure 10.38: Expected Negative Impacts Associated with the Jetty

Further detail on expected benefits and negative impacts raised during the community consultation meetings and questionnaires are provided in Box 10.18 below.

Box 10.18 Perceived Benefits and Problems of the BTC Marine Terminal Development

PERCEIVED BENEFITS

- **Employment:** many respondents expect the BTC Marine Terminal development to result in new opportunities in the region, and bring about indirect employment.
- **Regional development:** a number of respondents expect the BTC Marine Terminal to contribute to industrial development and result in general economic benefits. In general, it was felt that a construction camp would increase commercial activities in the region. Regional and international publicity (as a result of the marine terminal) is also expected to attract development to the region.
- **Infrastructure:** a number of respondents raised the hope that the Project would solve infrastructure problems. For example, respondents mentioned trying to get construction companies to use equipment to improve local infrastructure.
- **Security Services:** a number of respondents commented that the Marine Terminal Project would increase the level of regional security services.

PERCEIVED NEGATIVE IMPACTS

- **Natural Resources:** respondents feel that the BTC Marine Terminal development would increase pressure on existing natural resources.
- **Traffic:** respondents from Golovasi, Karatepe and Hamzali perceived traffic congestion during construction as an impact primarily because their roads are most likely to be impacted.
- **Pollution:** perceived pollution impacts raised by respondents included: increased odour problems in the area; increased sea pollution; increased risk of oil spills and impacts on marine species, along with adverse impacts on drinking water quality.
- **Health and safety:** respondents feel that the marine development could result in an increased risk of fire and oil explosions, which could cause material and human losses.
- **Fishing:** respondents are concerned that the increased exclusion zone would decrease access to fishing ground as well as prevent access to, and use of the fishing port at Sahil Sitesi.
- **Target:** a number of respondents feel that the region could become a target in a possible war
- **Agriculture:** some respondents commented that additional agricultural land might be expropriated as a result of the development.
- **Construction camps and workers:** a number of respondents commented that construction camps could disturb residents (eg through the establishment of relationships between local women and construction workers, through lack of respect for the local values) and as a result of possible hostility or security problems.
- **Employment:** concern was raised that the Project may not employ local people.
- **Migration:** a number of respondents commented that the BTC Marine Terminal would attract in-migration by those seeking jobs, with resultant pressure on, or competition for scarce resources, including employment.
- **Decision making:** some respondents feel that important decisions would be taken by foreign states, and not by Turkey.

urce: Marine Terminal Household and Settlement Questionnaire and Consultation eetings 2001

BIBLIOGRAPHY

Ref 1 PLE and Parmas (1999). Baku Tblisi Ceyhan Crude Oil Pipeline Feasibility Study and Ceyhan Marine Terminal: Volume I.

Ref 2 PLE-REP-LHS-GEN-002. Baseline Report (including Contaminated Land), Rev 1. ENVY and PLE (2001).

Ref 3 PLE-REP-EPR-PLG-003. Terrain Evaluation Report, Rev 0. (21 April 2001).

Ref 4 ILF-REP-EMT-TRG-009. Geotechnical Report for Tank Farm of Ceyhan Marine Terminal. ILF (2001).

Ref 5 ILF-REP-EMT-TRG-007. Geotechnical Report for General Facility Area of Ceyhan Marine Terminal. ILF (2001).

Ref 6 ENV-REP-EPS-TRG-001. A qualified Geohazard Risk Assessment of the Existing BOTAŞ Marine Terminal.

Ref 7 PLE-REP-EPR-PLG-010. Report for Chemical Analysis of Tank Farm Soil Samples (Attachment II of the Baseline Report), Rev A. ENVY and PLE (2001).

Ref 8 ILF (2001). Description of Geology and Geomorphology of Ceyhan Marine Terminal.

Ref 9 ILF-TNO-EMT-TRG-002. Geohazard Study for Ceyhan Marine Terminal. ILF (2001).

Ref 10 International Disaster Database (2000). http://www.cred.be/emdat/intro.html.

Ref 11 Celebi, M. (1999). Relevations from a Single Strong-Motion Record Retrieved during the 27 June 1998 Adana (Turkey) Earthquake. International Conference on Soil Dynamics and Earthquake Engineering, Bergen, Norway.

Ref 12 ILF-REP-EPL-PLG-018. Fault Investigation Report, Rev B, Vol. Geo 05 (4 November 2001).

Ref 13 ILF-REP-EMT-TRG-01. Landslide hazard report for south west corner of tank farm at Ceyhan Marine Terminal.

Ref 14 ILF-REP-EMT-TRG-009. Geotechnical Report.

Ref 15 ENV-REP-ENS-GEN-001. Bird Survey Report Rev 0. ENVY (2001).

Ref 16 ENV-REP-ENS-GEN-002. Phase II Habitat Survey Report, Rev 0. ENVY (2002).

Ref 17 ENVY. 2002. Air Quality Survey Report, Rev 0 (Doc. ENV – REP – ENS – GEN – 0004)

Ref 18 PARMAS (1999). Sugozu Power Plant Air Monitoring Study. August 1999.

Ref 19 Mott McDonald (2000). Sugozu Power Plant Diffusion Tube Monitoring Final Report, October 2000.

Ref 20 ENVY. 2002. Noise Survey Report, Rev 0 (Doc. ENV – REP – ENS – GEN – 005)

Ref 21 Library of Congress (1995). Turkey – A Country Study. Federal Research Division, the Library of Congress Country Studies. http://lcweb2.loc.gov/cgi-bin/query/r?frd/cstdy:@field (DOCID+tr0036.

Ref 22 TACDAM (2001). Archaeological Research and Assessment for Baku-Tbilsi-Ceyhan Crude Oil Pipeline Project.

Ref 23 UNEP-WCMC (2001). Mediterranean Interactive Maps. http://nene.unep-wcmc.org/imaps/ipieca/mediterranean/viewer.htm?Title=Mediterranean.

Ref 24 www.gap.gov.tr

Ref 25 ENVY. 2001. Wet Season Air Quality Survey at Ceyhan Marine Terminal Rev. A (Doc.# ENV-TNO-ENS-TRG-002).

Ref 26 http://www.ymm.net/TaxGuide/free_trade_zones.htm

11 MARINE TERMINAL - MARINE BASELINE CONDITIONS

11.1 INTRODUCTION

11.1.1 Geographical context

The proposed BTC Marine Terminal is situated in southeast Turkey on the north eastern coast of the Gulf of Iskenderun (see Figure 10.1).

The BTC Marine Terminal development consists of both onshore and offshore facilities. This section describes the offshore environmental and social baseline; the onshore (terrestrial) baseline is dealt with separately in Section 10.

The objectives of baseline data collection are described in Section 10.

11.1.2 Sources of information and methodology

This baseline description is based on a variety of information sources, including desktop studies, consultation with fishermen and fishing organisations and a number of marine surveys undertaken either for the proposed BTC Marine Terminal or for other EIA studies of recent nearby coastal developments. These information sources and surveys include the following:

- existing BOTAŞ Marine Terminal Feasibility Study [Ref 3];
- Marine Surveys I and II – carried out during the winter and spring [Ref 5, Ref 6] comprising chemical and biological sampling at two locations and benthos surveys at six sampling stations near the location of the proposed BTC Jetty;
- Sea Turtle Survey Report [Ref 23];
- Geology and Geomorphology Study for the Existing BOTAŞ Marine Terminal [Ref 8];
- Geohazard Study for the Existing BOTAŞ Marine Terminal [Ref 7];
- winter Benthic Survey [Ref 30].

Data have also been used from oceanographic monitoring and sediment chemical analyses carried out during an EIA for the Sugozu Power Plant in July 1999 and October 2000 in the Gulf of Iskenderun. The power plant is located approximately 4-5km south west of the proposed BTC Marine Terminal site and oceanographic monitoring was undertaken approximately 1,000m offshore. Information from these studies is intended to supplement site-specific data and is considered indicative of the general conditions within the wider BTC Project area.

In addition to the environmental surveys and data sources listed above, social information, particularly on fishing activities, was obtained using the methods and approaches (questionnaires etc) outlined previously in Section 10.1 and detailed in Appendix A5.

11.1.3 Study area

The study area is defined as:

- for planned activities during construction and operation: the permanent and temporary footprint of the offshore components of the terminal (jetty and exclusion zone) and fishing communities involved in using the areas;

- for reasonably foreseeable accidental events during operation: the Gulf of Iskenderun, ie the zone of potential impact of an oil spill, which could occur with a reasonable probability as predicted in Section 14.

11.1.4 Section contents

The baseline information and relevant environmental characteristics of the marine environment in the BTC Marine Terminal study area are described under the following headings:

- Oceanography (currents, waves, tides, temperature, salinity and marine chemistry);
- Coastal and Seabed Characteristics (coastal morphology, sediments);
- Marine Ecology (plankton, benthos, fish, mammals, turtles, seabirds, intertidal habitats, protected areas and seasonal sensitivities);
- Marine archaeology;
- Human Activities (navigation and shipping, recreation and amenity, fishing).

11.2 OCEANOGRAPHY

11.2.1 Physical oceanography

11.2.1.1 General

The Gulf of Iskenderun is a mass of water in the north east of the Mediterranean Sea with an approximate area of 1,250km^2 and a volume of 95km^3, which may be considered a semi-enclosed area. The average depth is 70 to 80m, and the depth of the southern area where the bay is connected with the Mediterranean reaches 90m [Ref 1].

11.2.1.2 Currents

Surface currents within the eastern Mediterranean are generally weak with an anticlockwise gyre. The inshore current direction is variable and influenced by local wind patterns, whereby easterly currents dominate in summer and westerly currents occur in winter. Currents in the Gulf of Iskenderun lead to the formation of various micro-scale cells. These currents are caused by the wind and the extensions of the general current system of the Eastern Mediterranean entering the Gulf [Ref 2]. At the mouth of the Gulf, fluctuations caused by occasional variations in the current system and in the surface wind intensity can give rise to upwelling of the deepwater mass that enters the Gulf. Additionally, local upwelling of nutrient rich deep waters in the inner section of the Gulf may occur due to the clockwise rotating current cell [Ref 2].

Current measurements were taken, during the feasibility study for the proposed BTC Marine Terminal, at various locations and depths. Average surface currents in the Gulf of Iskenderun varied from 3.7 to 20cm s^{-1}. These currents were predominantly westerly, between 221 - 333º. Mid-water currents showed little variation in velocity of between 7.3 - 7.68cm s^{-1} and were from the southwest. Deeper currents, (at 20m), were shown to be highly variable from 6.78 to 41.09cms^{-1} indicating strong currents close to the seabed on occasion [Ref 3]. As with the shallower subsurface currents, these were from the southwest.

Modelling studies carried out during the feasibility study in order to determine the hydrodynamics of the Gulf of Iskenderun indicated that in summer, there is a clockwise gyre in the north and an anti-clockwise one in the south [Ref 3]. These give rise to currents flowing northeast along the coast near the proposed BTC Marine Terminal and southwest further offshore. The gyres (and consequently the direction of the currents) reverse in winter. These two vortices meet at the western coast of the Gulf, creating local disturbances.

Results of the survey undertaken for the Sugozu Power Plant indicate that the prevalent direction of current flow is from the southwest, however, during the autumn, the predominant current flows from the north easterly direction [Ref 4]. This is consistent with the seasonally reversing pattern predicted by the modelling studies carried out for the present work. Surface current flows were found to be higher during the winter period than compared with the rest of the year. Furthermore, the highest flow speeds were noted to be in the 200º and 40º directions, ie from the southwest and northeast.

11.2.1.3 Wave Patterns

The wave climate of the Gulf of Iskenderun was determined using wind data (both long term and extreme) from the two major meteorological stations in the region at Yumurtalik and Iskenderun. Near-shore characteristics were determined through wave transformation modelling, taking into account the effects of refraction and shoaling due to varying depths, local wind generation and energy dissipation due to bottom friction and wave breaking. Numerical model studies were carried out during the proposed BTC Marine Terminal Feasibility Study using two nested model areas (as design input to the proposed jetty) [Ref 3].

Wind generated waves arise at the entrance to the Gulf from the southwest. The island of Cyprus significantly reduces the fetch from the southwest and limits wave development. Results from hindcasting, which drew upon long-term wave statistics of the region, indicated that wave heights of the order of 3 – 4m occur every year and that waves from the southwest are predominant in the Gulf [Ref 3]. Results using extreme wave height statistics also indicate that wave heights greater than 3m occur almost annually at the entrance to the Gulf. From this analysis, wave heights of 4.15m (± 0.34m) - 5.10m (± 0.60m) are predicted for return periods of 10 - 50 years [Ref 3]. Hindcasting estimates suggest that the longest waves have periods of 7.7 - 8.5s with return periods of 10 - 50 years.

Near-shore wave characteristics (approximately 15m depth) at the proposed BTC Marine Terminal and Jetty location were determined through wave transformation studies of waves from deep waters. The studies showed that a wave height of 1.5m will be exceeded for 305 hours (5.4 days) in one year and that the most critical wave direction is SSW [Ref 3].

11.2.1.4 Tides

The maximum tidal range in the Gulf of Iskenderun is particularly low and estimated to be between 0.4 m and 0.6m [Ref 3]. However, fluctuations (unrelated to tides) of up to 1.5m are sometimes observed (probably related to meteorological factors), causing waters in the Gulf to recede and rise occasionally, giving rise to localised inundation [Ref 3]. During the proposed terminal feasibility studies, the maximum measured tidal range was 0.4m, which is consistent with previously observed tides.

11.2.1.5 Temperature

Winter water temperature within the Gulf of Iskenderun ranges between 13 - 15ºC and rises to between 27 and 29ºC in summer [Ref 5]. A thermocline develops in the Gulf between April and May, breaking down between November and February.

Seawater temperature measured near the proposed jetty location was relatively constant during winter from 17.4ºC at the surface to 17.6ºC at the seabed (25 – 40m depth) [Ref 3]. This is slightly higher than surface water temperatures previously recorded.

During spring, surface water temperatures varied from 20.5 - 20.9ºC, decreasing with depth to 19.6ºC close to the seabed [Ref 6]. A relatively weak seasonal thermocline was observed at 15m.

Surface water temperatures during the summer of between 27.7 - 28.2ºC were measured during the proposed terminal feasibility studies. A steep thermocline at approximately 5m was detected during the summer at the Sugozu Power Plant, below which changes in temperature were relatively small [Ref 6].

11.2.1.6 Salinity

Salinity throughout the wider area is fairly constant through the year at 39 parts per thousand (‰) [Ref 3]. Surface water salinity measured at the proposed jetty location varied from 37.9 - 39.3‰, fluctuating with season as well as with depth [Ref 6]. Both salinity and density were observed to increase with depth; this is possibly due to the influence of rainfall and freshwater drainage off the land. The most important freshwater input into the Gulf of Iskenderun is from the Ceyhan River (average output of $180m^3 s^{-1}$), particularly during April when the snow of the Taurus Mountains melts [Ref 3]. During spring, the sea surface salinity was slightly lower than winter values.

During winter, vertical profiles at the two stations sampled showed that the entire water column in this coastal region was well mixed due to the cooling and sinking of surface waters [Ref 3].

11.2.2 Marine Chemistry

11.2.2.1 Introduction

Chemical parameters were measured at two of the seven sampling stations during the winter season marine ecology survey carried out in February 2001, and at two of the eight stations during the spring season survey undertaken during May 2001. Additional data from the EIA for the Sugozu Power Plant have also been used as an information source. Although the survey was site-specific to the Sugozu Power Plant, the results provide an indication of the general water quality of the wider area. Sampling locations for all marine surveys undertaken in the vicinity of the proposed BTC Marine Terminal are marked on Figure 11.1.

The following parameters were measured during the winter season survey: salinity, temperature, dissolved oxygen, turbidity, dissolved inorganic nutrients (nitrate, phosphate and silicate), Total Suspended Solids (TSS) and total chlorophyll-a. These parameters, with the addition of pH, were also measured during the spring season survey. During the Sugozu Power Plant survey, ammonia concentrations were also measured and TSS and total chlorophyll-a were omitted. Data from these three studies are summarised in Table 11.1.

Table 11.1 Summary of Physical and Biochemical Parameters

Determinant	FEBRUARY (WINTER)		MAY (SPRING)		JULY (SUMMER)	
	Surface	Bottom	Surface	Bottom	Surface	Bottom
DO (mg l^{-1})	7.7	7.9	7.7	7.7	6.5	6.2
TSS (mg l^{-1})	4.7	7.6	8.3	11.9	-	-
chlorophyll-a (µg l^{-1})	0.1	0.4	0.3	0.1	-	-
PH	-	-	8.3	8.3	8.3	-
NO_3 (µg l^{-1})	806	50.2	3.7	44.0	18.6	17.2
PO_4 (µg l^{-1})	1.6	4.3	1.6	4.8	0.8	0.8
SiO_3 (µg l^{-1})	<76	<76	50.9	54.7	82.1	114

Source: [Ref 6]

11.2.2.2 General water quality parameters

Dissolved oxygen.

Winter and spring dissolved oxygen (DO) concentrations indicated that the water column was uniformly saturated with oxygen. Minor spatial variations in DO levels may be the result of local changes in photosynthesis, respiration, water temperature, salinity and surface film formation, which control the net accumulation and solubility of DO in the surface water as well as air-sea interactions [Ref 6].

Summer DO concentrations were slightly reduced, probably due to higher surface water temperatures experienced during summer as well as low numbers of phytoplankton. Surface waters were, nonetheless, close to saturated with oxygen down to 15m. However, the observed decrease in DO concentration from 6.45mg l^{-1} at the surface to 6.15mg l^{-1} in deeper waters is indicative of the presence of a thermocline/pycnocline in summer months, with photosynthesis largely confined to surface waters [Ref 5].

Small spatial variations in DO observed during marine surveys may have been due to biotic factors (photosynthesis and respiration) and/or abiotic factors (ie temperature, salinity, ocean-atmosphere interactions, mixing processes etc).

Suspended solids and transparency

Total Suspended Solids (TSS) concentrations measured during the winter survey increased by a relatively small amount with depth. However, spatial variations were evident with water column concentrations of between 3.8 - 4.8mg l^{-1} at the shallower station and 4.7 - 7.6mg l^{-1} at the deeper station [Ref 5]. Peak chlorophyll-a values of 0.36 µg l^{-1} were also observed near the seabed, concurrent with higher nitrate and phosphate concentrations. This suggests that much of the suspended material is algal cells (either phytoplankton or suspended epipelon[1]).

1 Epipelon is a term used to describe algae associated with the surface of the sediment.

Relatively small variations of TSS concentrations were observed during spring, ranging between 8.3 - 11.9mg l^{-1} [Ref 6]. The increase in TSS concentrations below the surface mixed layer is consistent with variations in chlorophyll-a levels. Chlorophyll-a concentrations were higher in the surface waters (0.26µg l^{-1}), decreasing to 0.11µg l^{-1} at 20m depth. This may simply be a function of light penetration into the water column.

pH

There was relatively little variation between pH values in the study area, ranging from 8.28 at the surface to 8.25 at the seabed, consistent with values for the northeast Mediterranean Sea. The relatively high pH suggests that algal production and respiration in surface waters within the study area is relatively low, with very little influence on surface water pH values [Ref 6].

Nutrients

Nutrient concentrations during both winter and spring surveys were relatively low. Nitrate (NO_3), phosphate (PO_4) and silicate (SiO_3) concentrations increased with depth, possibly as a function of reduced uptake by phytoplankton in deeper water [Ref 6].

Winter nitrate and phosphate concentrations varied between 50.2 – 806 µg l^{-1} and 1.6-4.3µg l^{-1} respectively. These relatively low concentrations and the low nitrate/phosphate ratio indicated that both nutrients may be limiting factors for algal production in the Gulf. Reactive silicate concentrations were <76µg l^{-1} throughout the water column, which is consistent with levels in the open Mediterranean Sea.

During spring, nitrate and phosphate levels in the water column and surface waters were low, with concentrations of 3.72µg l^{-1} and 1.6µg l^{-1} recorded respectively [Ref 6]. A slight increase of both phosphate and nitrate was recorded close to the seabed, probably due to a small influx from disturbance of the sediment layer. The low nitrate/phosphate ratio suggests that algal production in the surface waters of the Gulf may be limited by these nutrients. Silicate concentrations in the study area were also relatively low, suggesting that much of this is taken up by diatoms.

Again during summer, nutrient concentrations in the study area were low, similar to those in the open waters of the northeast Mediterranean, ranging from 0.8µg l^{-1} phosphate to <18.6µg l^{-1} nitrate. However, high concentrations of nutrients (8.7µg l^{-1} phosphate, 1,240µg l^{-1} nitrate and 988µg l^{-1} silicate) were found at the margin of the Gulf of Iskenderun, mainly due to freshwater inputs.

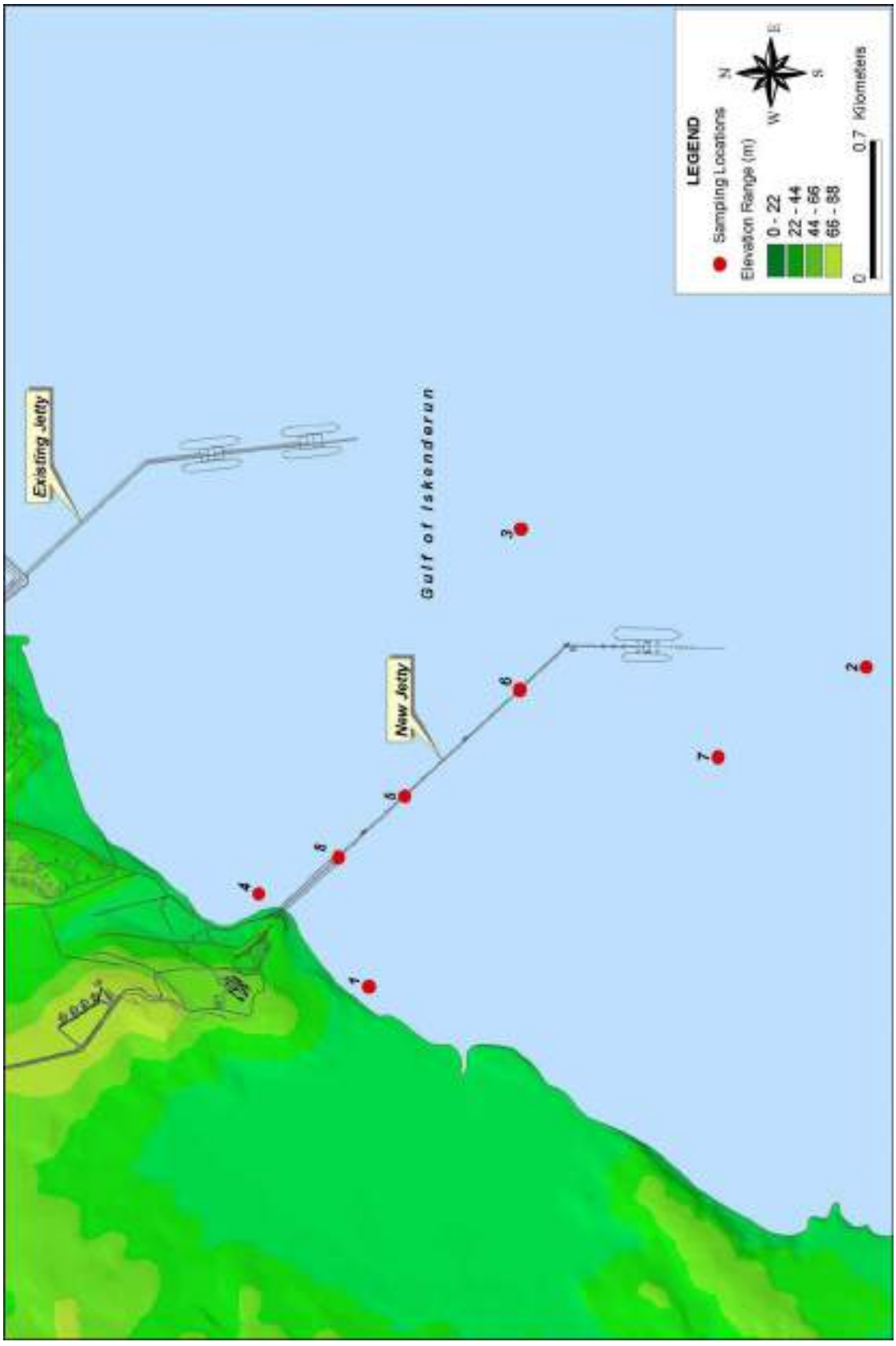


Figure 11.1 Marine Ecology Survey Sampling Locations (Winter and Spring 2001)

11.3 COASTAL AND SEABED CHARACTERISTICS

11.3.1 Beach morphology

The coast of Gulf of Iskenderun varies considerably, although it generally comprises level plains behind which lie the Taurus Mountains (see Figure 11.2).

The coast south west of the existing BOTAŞ Terminal, which encompasses the site of the proposed BTC Marine Terminal and Jetty, (and lies approximately 8km northeast of Yumurtalik), consists of undulating hills 120 – 180m high, interspersed with rocky and sandy bays. Beach widths along this stretch were estimated from aerial photographs taken in 2001 and appear to be relatively narrow, varying between 7 and 41m.

To the northeast, near the head of the Gulf, a sand and shingle beach borders a wetland stretching approximately from the Toros Gubre Fertilizer Facility site to the existing BOTAŞ Terminal.

11.3.2 Coastal processes

11.3.2.1 Coastal erosion

The Geohazard study for the proposed BTC Marine Terminal identified that the risk of coastal erosion is minor as the seabed is predominantly flat (approximately 1º slope). This suggests that net sediment transport will be relatively minimal [Ref 7]. Aerial photographs taken of the site in 2001 also suggest that there is no evidence of coastal retreat, however, beach morphology indicates a net northward transport of sediment.

11.3.2.2 Seabed stability

Direct examination of the seabed during the marine ecology surveys indicates that it is subject to movement under prevailing natural conditions from the shore down to 10 – 15m depth on the sandy bottom. This is indicated by ripples on the seabed [Ref 5]. The seabed becomes more stable with increasing depth and the transition from sand to silt. This is a reflection not only of hydrodynamic changes, but also of the more cohesive nature of the muddy deposits.

11.3.3 Bathymetry and seabed morphology

11.3.3.1 Bathymetry

The Gulf of Iskenderun is located on Turkey's south eastern Mediterranean coast in the region where the continental shelf is at its widest. The Gulf and the open sea adjacent to it are the most extensive shallow areas in the north eastern Mediterranean Sea. The average depth in the Gulf is between 70 – 80m and the bottom of the inner Gulf is extremely flat. The depth increases up to 90m in the southern section where the Gulf opens into the wider Mediterranean Sea. The seabed of the southern side of the Gulf generally slopes more steeply; the 50m isobath lies approximately 9km off the north shore and 4km off the south shore.

The shallow slope necessitates a long jetty at the BTC Marine Terminal, rather than a dredged approach to a quay.

Isobaths of the area surveyed during the proposed BTC Marine Terminal feasibility study are generally parallel to the coastline. A bathymetric map of the area is shown in Figure 11.3.

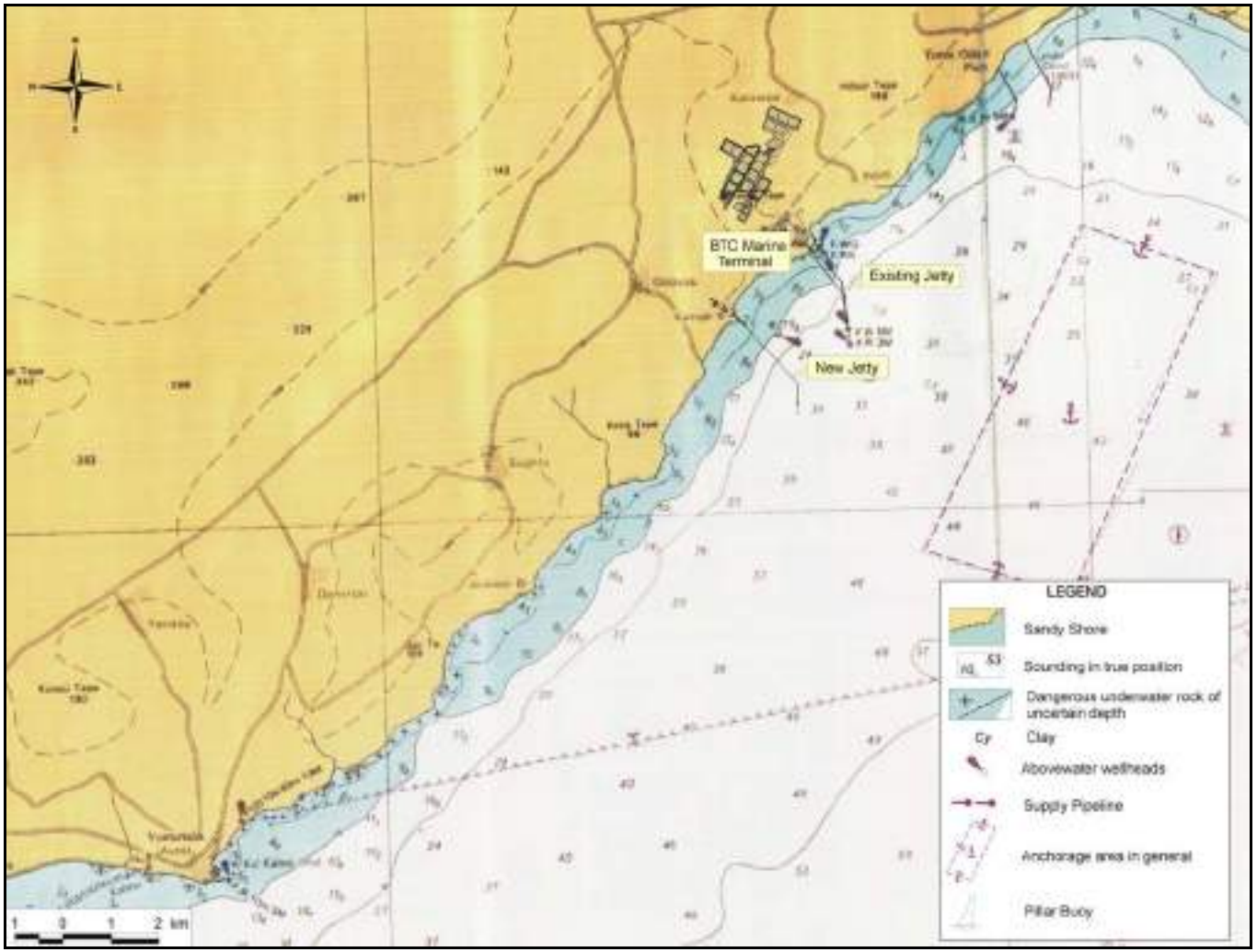


Figure 11.2 General Coastal Morphology

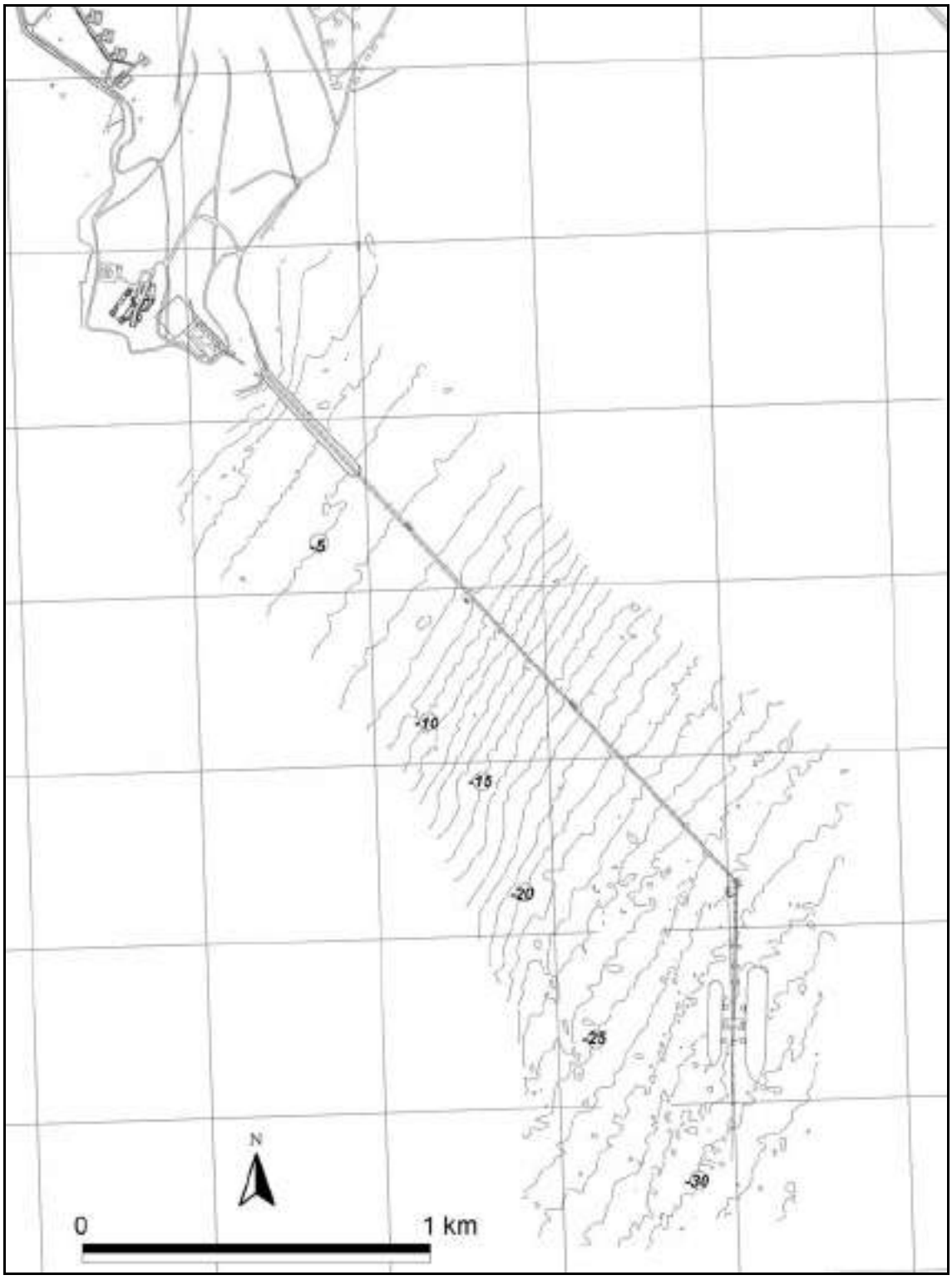


Figure 11.3 Bathymetry in the Vicinity of the Proposed Jetty

11.3.3.2 Seabed Substrates

Offshore boreholes drilled at water depths ranging from 21 - 44m and offshore seismic studies both confirm the presence of three main sediment layers beneath the seabed [Ref 8].

The profile of the seabed comprises marine alluvium overlying quaternary basalt, which in turn overlies Miocene flysch. The marine alluvium consists of clay and sand, with clay predominating. The clay unit is greenish grey, very soft, silty and of low plasticity, with a thickness of approximately 30m. Currently the sand unit is of medium density, silty and poorly graded, with a thickness of approximately 38m. Below this, the basalt unit appears to be a flat rock mass approximately 7m thick. The flysch unit extends into the sea and comprises alternating layers of sandstone, siltstone and claystone [Ref 8].

Sediment samples taken at 25 locations during the proposed BTC Marine Terminal Feasibility Study indicate that the surficial sediments comprise sand and silt in varying proportions, increasing in silt content with distance from shore (see Figure 11.4). The sediments appear to be lithogenous (ie derived from rock as opposed to sediments derived from biological processes), with silicaceous material being dominant.

The transition from sand to silty sand occurs at depths of 10 – 15m. At depths of >20m, a transition to a silt formation is apparent. This material is highly cohesive.

Grain size analysis of sediment samples taken during the Contamination Baseline Survey in February 2002 (see Table 11.2) indicates that the majority of the material is in the less than 150 µm size fraction comprising fine, very fine sand and silt.

Table 11.2 Grain Size Analysis of Sediments within the Area of the Proposed BTC Jetty

	Total Weight (g)	SIEVE SIZE			
		1.7mm	1.0mm	500µm	150µm
		Weight Retained in Sieve (g)			
Sieve 1	200	0.14 (0.07)	0.08 (0.04)	0.34 (0.17)	1.19 (0.60)
Sieve 2	138	- (-)	- (-)	0.04 (0.03)	1.42 (1.03)
Sieve 3	138	- (-)	- (-)	0.02 (0.01)	1.24 (0.90)
Sieve 4	146	- (-)	0.01 (0.05)	0.34 (0.23)	1.38 (0.95)
Sieve 5	150	- (-)	- (-)	- (-)	1.46 (0.95)
Sieve 6	200	0.09 (0.05)	0.07 (0.04)	0.35 (0.18)	3.69 (1.85)

11.3.3.3 Liquefaction

A geohazard study carried out at the BTC Marine Terminal site identified that although the risk of liquefaction in the vicinity of the new tank farm site is low, the potential for liquefaction to occur along the alignment of the proposed jetty will require investigation prior to the commencement of construction activities [Ref 7].

The sediment profile near the coast comprises a dense to medium sand layer over the bedrock, which is replaced by soft clay further away from the coast [Ref 8]. A subsequent study for the new jetty determined that there is no risk of liquefaction of soft clay and investigated the potential for liquefaction for the dense to medium dense sand layer. Soils with more than approximately 10% clay fines and a Liquid Limit of >32% are judged as unlikely to be susceptible to liquefaction [Ref **7**]. At the beginning of the new jetty alignment the value of fines in the ‘sand layer’ will be greater than 30% and it is expected that the material will not be susceptible to liquefaction (other than in the upper part of the sand layer) [Ref 7]. Furthermore,

this risk of liquefaction in the upper part of the sand layer will be manageable through design considerations such as reduced or no horizontal bedding. The study concludes that the risk of liquefaction along the alignment of the new jetty is minor due to the high content of fines and the high Liquid Limit in this area [Ref 8].

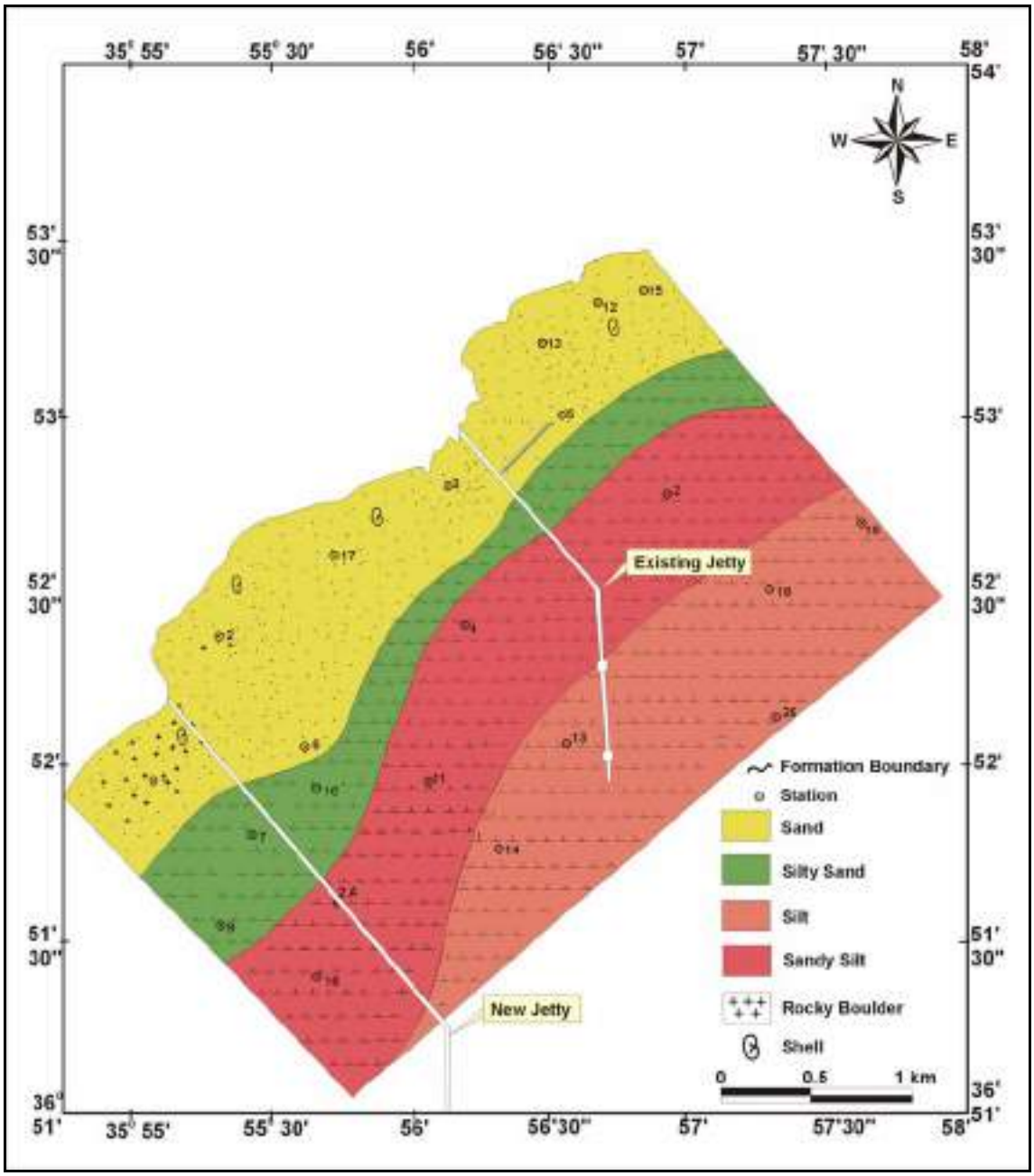


Figure 11.4 Sediment Distribution Map

11.3.4 Sediment quality

The Mediterranean is a semi-closed sea and exposed to pollution by virtue of it being surrounded by countries with high population densities and rapidly expanding industry.

Annual river and sewage canal discharge to the Mediterranean Sea is approximately 36.3 billion m^3 per annum, of which <1% of this is industrial wastewater discharge, containing toxic substances such as mercury, lead, chromium and zinc [Ref 9]. Agricultural activities constitute the largest source of pollutants via rivers and streams, with urbanisation, industrialisation, trade and tourism giving rise to increasing levels and varieties of pollutants.

The majority of terrigenous pollutants (ie those originating from terrestrial activities) entering the north-eastern Mediterranean originate from Turkey. Regional sea pollution has been particularly noted within the Gulf of Iskenderun and in the wider area along south west coast of Turkey, where a wide variety of manufacturing industries as well as mining activities and the hydrocarbons industry all contribute to marine pollution. Critical coastal and near-shore areas along Turkey's Mediterranean coastline include the Gulf of Iskenderun, as a result of its special hydrological features and an inflow of domestic and industrial wastewater [Ref 9].

11.3.4.1 Total Petroleum Hydrocarbons (TPH)

Previous studies have recorded the presence of high oil residues in areas such as the Gulf of Iskenderun. This has been attributed to the high levels of shipping. TPH biodegrades naturally in warm waters, hence any TPH found in sediments is likely to be derived from recent pollution events in the majority of circumstances, and in the absence of natural inputs (seeps, etc). It is likely that the numerous coastal industries (eg existing oil terminals at Ceyhan and Dortyol, the Toros Gubre Fertiliser Facility, Iskenderun steel works, etc) also contribute to the pollution load of the Gulf. The Gulf is therefore subject to high impacting pollution loads.

Sediment samples were taken during the Contamination Baseline Survey in February 2002 at seven different locations along the alignment of the proposed BTC Jetty (see Figure 11.5).

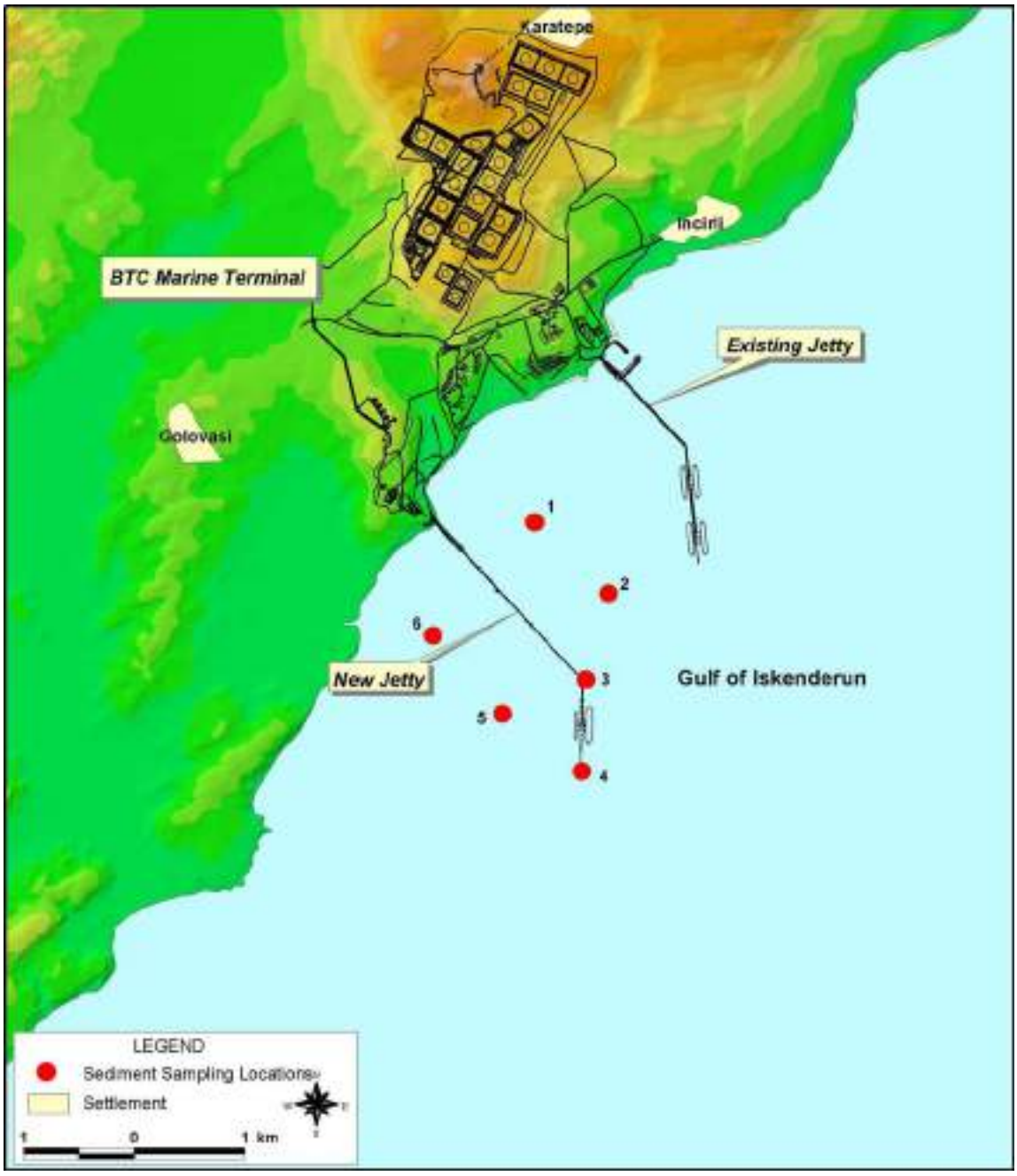


Figure 11.5 Locations of Sampling Sites for the Contamination Baseline and Winter Benthic Surveys, 2002

Table 11.3 shows TPH levels at each sampling site. The levels vary between less than 10 and nearly 100 mg/kg. Cairns reports that between these concentrations, TPH in sediments can begin to have an effect on biodiversity, so although not grossly polluted by any means there is some evidence of contamination [Ref 11]. However, the grain size analysis (see Section 11.3.3) also notes that sediment character varies from very fine sand to silt and back to very fine sand from sample 1 through to 6. The TPH levels observed indicate that contamination could be associated with finer material.

Table 11.3 Total Petroleum Hydrocarbon Analysis Results

	Lower Detection Limit (mg/kg)	Sample-1 (mg/kg)	Sample-2 (mg/kg)	Sample-3 (mg/kg)	Sample-4 (mg/kg)	Sample-5 (mg/kg)	Sample-6 (mg/kg)	Sample-7 (mg/kg)
Purgeable Hydrocarbons Total Hydrocarbons (C5-C10)	1	<1	<1	<1	<1	<1	<1	<1
Extractable Hydrocarbons Total Hydrocarbons (C11-C40)	10	26	73	83	58	96	<10	<10

11.3.4.2 Metal concentrations in sediment at the proposed jetty location

Heavy metals and persistent environmental contaminants tend to accumulate in soils and sediments. The main anthropogenic sources of heavy metals are:

1 the various industrial point sources around the Gulf of Iskenderun, such as present and former mining activities, foundries and smelters;

2 diffuse sources, including piping of products, combustion by-products, traffic etc.

The main heavy metals of concern in the Mediterranean Sea are cadmium (Cd), mercury (Hg), lead (Pb), chromium (Cr), copper (CU) and zinc (Zn).

Sediment samples were taken during February 2002 at six different locations along the alignment of the proposed BTC Jetty (see Figure 11.2).

Table 11.4 and Figure 11.4 give trace metal concentrations for mercury, aluminium, cadmium, copper, lead, tin and zinc and metal/aluminium ratios.

Table 11.4 Concentration of Trace Metals in Sediment Samples

	Lower Detection Limit (µg/g)	Sample 1 (µg/g)	Sample 2 (µg/g)	Sample 3 (µg/g)	Sample 4 (µg/g)	Sample 5 (µg/g)	Sample 6 (µg/g)
Mercury (Hg)	0.01	0.02	0.034	0.037	0.049	0.033	0.015
Aluminium (Al)	0.8	10400	23600	25000	26400	19000	10100
Cadmium (Cd)	0.05	0.1	0.16	0.18	0.14	0.13	0.09
Cupper (Cu)	0.1	7.5	26.2	28.2	29.2	19.7	6.94
Lead (Pb)	0.2	4.91	10.7	11.5	12.6	8.61	4.42
Tin (Sn)	0.3	1.5	1.4	1.6	1.6	1.5	1.8
Zinc (Zn)	0.06	25.3	61.2	64	67.2	46.6	24.1

Table 11.5 Metal/Aluminium Ratios in Sediment Samples

Metal/Al	Sample-1	Sample-2	Sample-3)	Sample-4	Sample-5	Sample-6
Hg/Al	$1.92x10^{-6}$	$1.44x10^{-6}$	$1.48x10^{-6}$	$1.86x10^{-6}$	$1.74x10^{-6}$	$1.49x10^{-6}$
Cd/Al	$9.62x10^{-6}$	$6.78x10^{-6}$	$7.20x10^{-6}$	$5.30x10^{-6}$	$6.84x10^{-6}$	$8.91x10^{-6}$
Cu/Al	$0.72x10^{-3}$	$1.11x10^{-3}$	$1.13x10^{-3}$	$1.11x10^{-3}$	$1.04x10^{-3}$	$0.69x10^{-3}$
Pb/Al	$4.75x10^{-4}$	$4.53x10^{-4}$	$4.60x10^{-4}$	$4.77x10^{-4}$	$4.53x10^{-4}$	$4.38x10^{-4}$
Sn/Al	$1.44x10^{-4}$	$0.59x10^{-4}$	$0.64x10^{-4}$	$0.61x10^{-4}$	$0.79x10^{-4}$	$1.78x10^{-4}$
Zn/Al	$2.43x10^{-3}$	$2.59x10^{-3}$	$2.56x10^{-3}$	$2.54x10^{-3}$	$2.45x10^{-3}$	$2.39x10^{-3}$

Aluminium is taken as a reference metal since it is naturally present in marine sediments in high concentrations and its concentrations is unlikely to be influenced by pollutant inputs. The ratio of measured metal to measured aluminium concentrations as shown in Table 11.5 can be compared to reference ratios. An order of magnitude difference between the ratios would indicate possible contamination.

Comparison of metal/aluminium ratios with OSPAR background ratios, (see Table 11.6), indicates that the sediments in the proposed BTC Marine Terminal area are slightly elevated above typical background concentrations with respect to copper (for some samples with fine material) and zinc [Ref 12].

Table 11.6 Background Metal/Aluminium Ratios Range in Fine Sediments or Fine Fraction of Sediments

Metal/Al	Range	Factor
Hg/Al	0.0034-0.0066	$*10^{-4}$
Cd/Al	0.007-0.03	$*10^{-4}$
Cu/Al	2.2-5.7	$*10^{-4}$
Pb/Al	1.8-4.0	$*10^{-4}$
Zn/Al	8.8-18	$*10^{-4}$

Note: The Range has to be multiplied with the Factor.

11.3.4.3 Metal concentrations in sediments in the area

The concentration of heavy metals within marine sediments was determined during a survey carried out for the Sugozu Power Plant using data representative of the wider project area. Sediments were sampled at 16 locations and analysed for zinc, lead, cadmium, nickel, vanadium, chromium, antimony and copper [Ref 13]. Comparisons of heavy metal concentrations in sediment samples have been made with published data.

- Cadmium concentrations were 0.36 ± 0.33 µg g^{-1} dry weight. In comparison with the typical range of values for cadmium in Mediterranean sediments (0.02 – 64 µg g^{-1} dry weight), this measured value is towards the lower end of the range.

- Lead concentrations were 63 ± 53 µg g^{-1} dry weight, which is at the lower end of the range found in Mediterranean sediments of 3 - 3,300 µg g^{-1} dry weight.

- The concentration of copper measured in the sediments of the Gulf was 37 ± 30 µg/g dry weight, which again is towards the lower end of the range for Mediterranean sediments (0.6 - 1,890 µg g^{-1} dry weight).

- The concentration of zinc within the sediments was measured as 126 ± 44 µg g^{-1} dry weight. This value is again within the range of typical Mediterranean sediments of 1.7 - 6,200 µg g^{-1} dry weight.

The metal concentrations measured in the Gulf of Iskenderun sediments are typical of those reported elsewhere. By comparison with reference values developed in the Netherlands (see Table 11.7), the concentrations of metals indicate no contamination. Although the sampled concentration for copper slightly exceeds the reference value, this concentration is typical of coastal areas, particularly those receiving run-off from land, and does not therefore indicate any significant contamination.

Table 11.7 Dutch Standards for Sediments (µg g^{-1})

Pollutant	Reference Value	Testing Value	Signalling Value
Cd	0.8	7.5	30
Cr	100	480	1000
Pb	85	530	1000
Hg	0.3	1.6	15
Cu	36	90	400
Ni	35	45	200
Zn	140	1000	2500

Explanatory notes:
Sediments containing metals in concentrations below the 'reference value' are considered uncontaminated, and are suitable for general disposal if present in dredged material at these concentrations.

Contaminant concentrations between the 'reference value' and the 'testing value' are considered moderately contaminated, and can be disposed of in open water under suitable conditions.

Sediments containing chemical concentrations between the testing value and the 'signalling value' are heavily contaminated, and can only be disposed of under controlled conditions.

If the 'signalling value' is exceeded, then the material is considered toxic waste, and is not suitable for marine disposal.

11.4 MARINE ECOLOGY

11.4.1 Plankton and pelagic systems

11.4.1.1 Phytoplankton

Marine ecology surveys identified a total of 53 species of phytoplankton during the winter season and 50 species during spring. In the winter surveys, 40 diatom, 11 dinoflagellate, one Chrysophyte and one Cyanophyte species were identified. Diatoms were present in almost all samples taken. During spring, 37 diatom and 12 dinoflagellate species were identified, with diatoms again the most abundant, comprising approximately 99% of the total phytoplankton [Ref 6].

The relative species composition and abundance of dominant groups for both winter and spring surveys were similar. Plate 11.1 illustrates plankton sampling techniques during the marine ecology surveys.

Plate 11.1 Plankton Sampling in the Gulf of Iskenderun

Results obtained during a summer survey near the Sugozu Power Plant identified that diatoms were also the most abundant algae at all sites. The algal species, *Leptocylindrus minimus*, *Leptocylindrus danicus* and *Chaetoceros* sp. were the most dominant species and present in all samples. Analysis based on the Bray-Curtis measure and multi-dimensional scaling showed that coastal samples differed significantly from those further offshore in terms of species composition and abundance.

This pattern is typical of temperate coastal areas.

11.4.1.2 Zooplankton

During both the winter and spring, marine ecology surveys, copepods were identified as the dominant and most abundant zooplankton, with *Oithona* sp. dominant at both sampling sites [Ref 6]. Copepods are generally widespread in distribution and dominate the zooplankton in many seas around the world, including the Mediterranean Sea.

The summer survey carried out at Sugozu Power Plant identified two dominant zooplankton groups; namely copepods and cladocerans. By contrast with copepods, cladocerans (water fleas) are less well represented in the sea, being a predominantly freshwater group. The genera *Evadne* and *Penilia* identified during these surveys, can nevertheless be an important component of the zooplankton in coastal waters, particularly in summer months.

11.4.2 Benthos

11.4.2.1 General

Benthos is a term used to describe organisms associated with the seabed. They comprise sessile and motile forms, as well as species living on the sediment (epibenthos) and animals living in the sediment (infauna). Only macrofaunal communities were surveyed as indicators of environmental quality and characterisation of benthic biotopes.

11.4.2.2 Epibenthos

Results from the marine ecology surveys showed that from 0.3 - 1.0m depth, a typical Mediterranean assemblage known as 'coralligène' is present, comprising mainly the red alga *Jania rubens*, barnacles and bivalves [Ref 6]. Epifauna observed within this assemblage included an abundance of fish species, including white seabream (*Diplodus sargus*) and common two-banded sea bream (*Diplodus vulgaris*), with few sponges (*Petrosia, Ircinia*) and anemones (*Cerianthus membranaceus*).

During spring and summer, high plant species diversity was noted, with algal species such as *Caulerpa prolifera, Codium* sp., *Dictyola cervicornis, Halopteris scoparia, Stypopodium schimperii* and *Padina pavonia* present [Ref 6]. The most abundant organism identified during visual surveys was the seaweed *Caulerpa prolifera*, which covered up to 45% of the seabed, decreasing during spring probably due to increased turbidity.

Below 10m, species diversity was low. Dredge samples taken at two depths of between 13–17m and 10m concurred with the dominant abundance of the green algae *Caulerpa prolifera* [Ref 6]. Other organisms identified included: seaweeds; fish, eg scald fish (*Arnoglosus laterna*); molluscs, eg the sea hare (*Aplysia depilans*) and *Strombus decorus*; crustaceans, eg the shrimp (*Alpheus glaber*) and the crab (*Thalamita poissonii*); and tunicates, eg *Phallosia mammillata*. The diversity of these groups increased during the spring survey.

The data suggest that the diversity of epibenthos within the immediate project area (ie the footprint of the proposed BTC Jetty and the associated exclusion zone) is low.

11.4.2.3 Benthic infauna

Infaunal organisms are divided into categories based on size. Macrofauna consists of those organisms that are >0.5mm in size; meiofauna are those within the size range of 0.5 - 0.062mm and microfauna are those organisms <0.062mm in size.

Results from grab samples taken during both the winter and spring marine ecology surveys identified a total of 51 macrofaunal species recorded during winter and 85 species during spring [Ref 6]. These comprised: molluscs; crustacea; polychaetes (bristle worms); one echinoderm and one nemertean (ribbon worm).

Species diversity varied between sampling locations, whereby deeper sites had higher species diversity than shallower ones. A seasonal variation between species identified was observed, with species such as the snail *Nassarius mutuabilisi*, the shrimp *Callinassa tyrrhena* and the worm *Glycera rouxi* found in winter and the shrimp *Allinassa subterrenea* and the worm *Megalone papillocornis* observed in spring [Ref 6].

No rare or protected species or assemblages were identified during the surveys.

Winter Benthic Survey 2002Sediment samples were taken during February 2002 at six different locations along the alignment of the proposed BTC Jetty (Figure 11.2). Triplicate samples were obtained at each sampling locations. Organisms were identified at the lowest taxonomic level possible. A computer program Multi Variate Statistical Package (MVSP) was used to provide an indication of species diversity although for a true statistical analysis a greater number of samples would be required.

The majority of species sampled were in larval form, which are very difficult to reliably identify. However, species were differentiated, thus allowing an assessment of diversity , and in turn an indication of the number of species present in the area. This therefore provided an indicator of habitat value and sensitivity at a level adequate for impact assessment. Organisms such as *Foraminifera* and *Radiolaria* are known to inhabit sandy bottoms and were observed at sampling sites 1 and 6. The greatest abundance of benthic organisms was found at sites 1 and 6. Polychaetes were observed in abundance at sampling sites 2 to 5, along with crustacea, gastropods, the decapod, *Crangon crangon* and the bivalve, *Tellina tenius*.

Table 11.8 shows typical species assemblages for sandy and silty communities. According to the Shannon-Weaver index, diversity of the sampled benthic population ranges from 0.5 to 2.158. Although a larger set of sampling data would provide greater statistical certainty, the data indicate a relatively high diversity of organisms. The lowest species diversity and number of species were observed at sampling sites 2 and 3, whilst the highest diversity and number were observed at sampling site 6. Hence, the trend in species diversity increases from a silty to sandy sediment composition.

Table 11.8 indicates the presence of two separate populations – one inhabiting sampling sites 1 and 6 (sandy sediment) and the second inhabiting sampling sites 2, 3, 4 and 5, which have a silty sediment composition. Conceivably the distribution could have other explanations, for example a correlation with the TPH levels measured during the survey in the same sediments (see Table 11.3). However, since gross pollution was not evident, the physical character of the sediment substrate is the most likely explanation for the observed distribution of benthos.

Table 11.8 Diversity Index and Sediment Composition at Sampling Sites

	Diversity Index	Number of Species	Sediment Structure (Visual Inspection)
1A	1.838	10	Very Fine Sandy
1B	1.849	10	Very Fine Sandy
1C	1.699	10	Very Fine Sandy
2A	1.475	5	Silt
2B	0.500	2	Silt
2C	1.099	3	Silt
3A	0.500	2	Silt
3B	0.693	2	Silt
3C	0.950	3	Silt
4A	1.055	3	Silt
4B	1.213	4	Silt
4C	1.330	4	Silt
5A	0.956	3	Sand/Silt
5B	1.242	4	Sand/Silt
5C	0.693	2	Sand/Silt
6A	2.158	14	Very Fine Sandy
6B	2.033	14	Very Fine Sandy
6C	2.125	14	Very Fine Sandy

11.4.3 Fish

A total of 650 fish species have been recorded in the Mediterranean Sea. Of these species, 90 species (representing 56 families) are relatively recent arrivals from distant seas. For the past 130 years, the main route of exotic fish species to the Mediterranean has been from the Red Sea through the Suez Canal (termed Lessepsian migration). The colonisation of Red Sea (Erythrean) fishes has had a major impact on Levantine waters where more than a dozen of these Lessepsian migrants have become important components of commercial fisheries (CIESM). Fish species (including Lessepsian fish species) present in Iskenderun Bay are identified below.

During the marine ecology surveys, *in situ* visual observations, bottom trawls and midwater trawls were undertaken to identify key fish species in the vicinity of the proposed BTC Jetty. The visual investigation undertaken during the winter survey identified a dense accumulation of fish at 7 m depth within an area of scattered stones and rocks. The giltheads *Diplodus sargus, Diplodus vulgaris* and the pandora *Pagellus erythrinus* were the most abundant species.

Trawl surveys revealed an abundance of five fish species during the winter survey; brushtail lizardfish (*Saurida undosquamis*) red mullet (*Mullus barbatus*), barracuda (*Sphyraena sphyraena*), pandora (*Pagellus erthrynus*) and the sennet (*Sphyraena chrysotaenia*), which are all noted for their high commercial value. The lizardfish and sennet are both Lessepsian migrants.

The species composition in spring shifted to the near absence of commercially important fish. The most common fish in spring were the rainbow sardine (*Dussumeria elopsoides*) (identified as *D.acuta*; another Lessepsian migrant), brushtail lizardfish, annular bream (*Diplodus annularis*), golden grey mullet (*Liza aurata*) and striped mullet (*Mugil cephalus*) [Ref 6]. However, catch per unit effort (CPUE)[1] increased during the spring from 8–20kg, indicating an overall increase in total fish abundance. Furthermore, during both the winter and spring surveys, a significant concentration of fish larvae were caught both during day and night trawls, comprising species such as bass (*Dicentrachus labrax*), the goby (*Oxyurichthys petersi*) and barracuda or sennets (*Sphyraena* sp) [Ref 6]. This indicates the potential presence of nursery grounds for these species within the Gulf of Iskenderun.

Data from the Sugozu Power Plant marine ecological survey carried out during the summer also provide an indication of the fish species found in the vicinity of the proposed BTC Jetty and its exclusion zone. The major species caught during trawl surveys was the silverbelly (*Leiognathus klunzingeri*), which is a Lessepsian migrant. Although this species is not important economically, it is an important prey item for larger piscivorous fish. Additionally, the commercially important red mullet and pandora were also caught during trawls, although their average size was very small, suggesting that this area is a nursery ground for these species. Of particular note was the disappearance of the previously dominant brushtail lizardfish indicating the over exploitation of this fish within the Gulf of Iskenderun.

Fisheries and important fishing grounds are discussed in Section 11.6.5 and shown on Figure 11.9.

[1] CPUE is used as a relative measure of fish "catchability", both in commercial fishery assessments and when comparing data from surveys collected using different methods.

11.4.4 Marine Mammals

11.4.4.1 Mediterranean Monk Seal

The Mediterranean monk seal (*Monachus monachus*) is the only seal occurring in the Mediterranean Sea and is described as 'critically endangered' in the IUCN Red List of Threatened Species [Ref 14]. The monk seal is protected under Appendix I of CITES, Appendix II of the Bonn Convention, Appendix II of the Berne Convention and Annex II and IV of the EU Habitats Directive. Although the EU Directive does not apply in Turkey, the monk seal is protected by Turkish national legislation under Article 2 of the Terrestrial Hunting Law (dated 05.05.1937, number 3167), which is updated annually by the Central Hunting Commission. The monk seal is currently protected for the 2001/2002 hunting season.

The monk seal has a world population of less than 400-500 individuals divided into two populations – the Mediterranean Population (Greece, Turkey and the East Mediterranean) and the Atlantic Population (Mauritanian Islands, Madeira Islands and Morocco). The Aegean Sea and the area between the south coast of Turkey and the north coast of Cyprus are the most important for this species. Research indicates that the previously recorded Black Sea monk seal is now extinct [Ref 25].

It is estimated that at least 50 monk seals presently live on the shores of Turkey. The primary habitat type is remote and undeveloped rocky shores and caves. Monk seals are diurnal mammals, live in groups of up to 20 individuals, occupy a limited home range and do not migrate. The reproductive period is mainly between May and November. Mating usually occurs between October and November with females giving birth after an 11-month gestation period.

The presence of monk seals has been recorded along much of the Mediterranean coast of Turkey to the Syrian Border, with the exception of the coastline from Mersin to Iskenderun. Interviews with local fishermen in the Gulf indicate that monk seals have been seen along the coast at Yumurtalik and Sugozu (Mustafa Sen, *pers. comm.*). Additional available data suggest that the seal population in the Gulf of Iskenderun is restricted to the south coast and that it is unlikely that seals are present in the vicinity of the proposed BTC Marine Terminal. It is probable that the existing level of disturbance due to industrial activity along the north coast of the Gulf renders this area unattractive to seals [Ref 15, Ref 16].

11.4.4.2 Cetaceans

Information on the distribution of cetacean species in the eastern Mediterranean Sea is patchy, however, many species have been recorded in the Mediterranean as a whole. Table 11.9 identifies cetacean species recorded off the south coast of Turkey. Although there are no specific records relating to sightings of cetaceans in the Gulf of Iskenderun, cetaceans may stray into the Gulf on occasion. More detailed information on each species recorded may be found in the Mammal Species Dossier (Appendix B1).

Table 11.9 Cetacean Species off the South Turkish Coast

NAME	DISTRIBUTION IN TURKEY	STATUS IN INTERNATIONAL LEGISLATION	STATUS IN TURKISH LEGISLATION
Bottlenose dolphin *Tursiops truncates*	Widespread in Turkish waters	Data Deficient – IUCN Red List 2000. Appendix II of CITES; Appendix II of Bonn and Bern Conventions; Annex II and IV of EU Habitats Directive	Protected
Common dolphin *Delphinus delphis*	Population believed to be declining sharply	Not globally threatened Appendix II of CITES; Appendix II of Bonn and Bern Conventions; Annex IV of EU Habitats Directive	Protected
Risso's dolphin *Grampus griseus*	Population believed to be declining sharply	Data Deficient – IUCN Red List 2000.Appendix II of Bonn and Bern Conventions; Annex IV of EU Habitats Directive	Protected
White beaked dolphin *Lagenorhynchus albirostris*	Rare in Turkish waters	Data Deficient – IUCN Red List 2000.Appendix II of CITES; Appendix II of Bonn and Bern Conventions; Annex IV of EU Habitats Directive	Protected
Harbour porpoise *Phocoena phocoena*	Currently under risk of extinction in Turkish coastal waters	Vulnerable – IUCN Red List 2000. Appendix II of CITES; Appendix II of Bonn and Bern Conventions; Annex II and IV of EU Habitats Directive	Protected
Sperm whale *Physeter macrocephalus*	Rare in Turkish waters	Vulnerable – IUCN Red List 2000. Appendix II of CITES; Appendix II of Bern Convention; Annex IV of EU Habitats Directive	Protected
Note: Turkey is a signatory to the Bern Convention, although no specific protective provisions have been introduced in law.			

Source: Mammal Species Dossier (Appendix B1)

11.4.5 Turtles

11.4.5.1 General

Of the seven oceanic turtle species, two are known to breed in the Mediterranean: the Loggerhead (*Caretta caretta)* and the Green turtle (*Chelonia mydas*). Although the Leatherback (*Dermochelys coriacea*) regularly occurs in small numbers, the species does not nest in the Mediterranean. The Nile Soft-shelled turtle (*Trionyx triunguis*) also occurs in the Mediterranean

Sea, with the main populations in Turkey and Israel. All marine turtles are classified globally as threatened species and are protected by most Mediterranean countries; the status of the four turtle species found in Turkish waters is summarised in Table 11.10 below [Ref 19].

Table 11.10 Turtle Species off the South Turkish Coast

NAME	DISTRIBUTION IN TURKEY	STATUS IN INTERNATIONAL LEGISLATION	STATUS IN TURKISH LEGISLATION
Green Turtle *Chelonia mydas*	Widespread in Turkish waters	Mediterranean population is Critically Endangered (CR) on IUCN Red List 2000. Appendix II of the Bern Convention and Appendix I of the Bonn Convention. Annex II and IV of the EU Habitats Directive	Protected
Loggerhead Turtle *Caretta caretta*	Most common turtle in Mediterranean waters	Endangered (EN) on the IUCN 2000 Red List Appendix II of the Bern Convention and Appendix I of the Bonn Convention Annex IV of the EU Habitats Directive	Protected
Nile Soft–shelled Turtle *Trionyx triunguis*	Total population is not believed to exceed 500 adults in Mediterranean waters.	Mediterranean population is Critically Endangered (CR) on the IUCN 2000 Red List Appendix II of the Bern Convention	Protected
Leatherback Turtle *Dermochelys coriacea*	Population believed to be widespread across the worlds major oceans	Critically Endangered (CR) on the IUCN 2000 Red List Appendix II of the Bern Convention and Appendix I of the Bonn Convention Appendix I of CITES Annex IV of the EU Habitats Directive	Protected
Note: Turkey is a signatory to the Bern Convention, although no specific protective provisions have been introduced in law.			

Source: IUCN 2000 Red List; Appendices& Annexes to Bern & Bonn Conventions and relevant EU Directives.

11.4.5.2 Green Turtle (*Chelonia mydas*)

Green turtles are rare in temperate waters, but are distributed widely through the tropics near continental coasts and around islands. There are important nesting and feeding grounds around the whole coast of Africa, India and South East Asia and along the entire coastline of Australia. They are found in the Mediterranean Sea and occasionally as far north as the coastal waters of

Great Britain. The Mediterranean population is regarded as Critically Endangered on the IUCN 2000 Red List.

Sea turtle numbers are almost impossible to estimate because of their migratory lifestyle. Estimates of numbers of nesting females are possible but data are not available from all beaches and numbers may be confused due to the uncertainty of how many times an individual nests in a season.

11.4.5.3 Loggerhead Turtle (*Caretta caretta*)

Loggerheads are widely distributed in coastal waters, mainly in subtropical and temperate regions. Nesting beaches are distributed in more temperate latitudes than those of other sea turtles. Loggerheads are the most common turtle in the Mediterranean, with nesting reported along many coastal beaches, notably in Greece, Turkey, Cyprus and Libya. The species is categorised as Endangered on the IUCN 2000 Red List (see Plate 11.2).

Worldwide numbers are almost impossible to calculate because of the wide range of these migratory animals. It is possible to estimate numbers of adult females on nesting beaches, however not all of these sites have been surveyed, and numbers may be confused due to uncertainty about how many times a female nests in a season [Ref 18].

Plate 11.2 Loggerhead Turtle

11.4.5.4 Nile Soft-shelled Turtle (*Trionyx triunguis*)

The Nile Soft-shelled turtle is distributed throughout the eastern Mediterranean, although it has been estimated that the total Mediterranean population does not exceed 500 adults. The main populations are found in Turkey and Israel, with a few smaller populations in Egypt, the Lebanon and Syria. The species is protected under Appendix II of the "Convention on the Conservation of European Wildlife and Natural Habitats" and has Critically Endangered status on the IUCN 2000 Red List [Ref 20].

11.4.5.5 Leatherback Turtle (*Dermochelys coriacea*)

The Leatherback turtle is a wide-ranging species with individuals being tracked across the world's major oceans. It has been described as having a temperate range with tropical nesting habits indicating its wide distribution range. It is thus found in the Atlantic, Pacific and Indian

Oceans, as well as being recorded from within the Mediterranean. It has Critically Endangered status on the IUCN 2000 Red List.

11.4.5.6 Turtle species within the vicinity of the Gulf of Iskenderun

The coast between the Turkish border with Syria and the Goksu Delta has been previously studied for evidence of sea turtle activity and four important nesting beaches were recorded – the Goksu Delta, Kazanli, Akyatan and Samandag (see Figure 11.6). It has been estimated that this area accounts for over 70% of the Green Turtle nesting sites in the entire Mediterranean region; this equates to less than 500 nest sites.

These sites are all outside of the Gulf of Iskenderun, but might be at risk from a major oil spill (see Section 14).

The Loggerhead turtle is one of the most widely distributed and numerous turtle species in the Mediterranean, with an estimated 2000 nesting females. However, the status of the species remains critical and it is classified as an endangered species on the IUCN 2000 Red List. Unlike Green turtles, however, the Mersin Bay and Gulf of Iskenderun coasts have a secondary importance as nesting sites for this species.

The Nile Soft-shelled turtle is thought to number as few as 500 adults throughout the entire Mediterranean basin although information about distribution is scarce. The Turkish population represents a globally significant resource, most of which is concentrated in the Cukurova delta. The Goksu River, Kazanli, Seyhan River, Adana-Akyatan, Gulf of Iskenderun and Asi River represent important habitats for this species.

The Leatherback turtle is a sporadic visitor to the coastal area between Mersin Bay and the Gulf of Iskenderun.

Generally, nesting activity amongst each of the sea turtles species starts in early June and lasts until late August, with a peak around mid-July, although Loggerhead turtles start nesting slightly earlier than the Green turtle. Depending on the species and temperature, hatching takes from 40 to 60 days after the eggs are laid and, therefore, the hatching season ranges from July to September [Ref 21, Ref 22].

11.4.5.7 Turtle species in the vicinity of the Marine Terminal

During July 2001, a preliminary sea turtle survey was carried out for the proposed BTC Marine Terminal along the coastline between the Hurma Strait to the west and Dortyol to the east of the proposed terminal (see Figure 11.7). The study area is believed to include the major over-wintering location for Green turtles in the Mediterranean Sea and may therefore be an important area for sea turtles all year round (see attached case study).

High levels of turtle activity (including nesting) were observed over approximately 20% of the study area in the areas of Uzunkelli to Golovasi/Sahil Sitesi, the existing BOTAŞ facilities (Section No. 10 on Figure 11.7.) and the short area of beach between Kaplan Creek and the BOTAŞ Dortyol oil terminal (see Figure 11.7). The survey indicated the presence of two nests on the small beaches within the boundaries of the existing BOTAŞ Terminal facilities. Turtles were less evident in the areas between Hurma and the Ceyhan Strait and the Liman Cape to Yumurtalik.

However, the coastline in the immediate vicinity of the proposed BTC Marine Terminal is considered as unsuitable nesting grounds for the only two species of marine turtle observed

during the survey, the Loggerhead turtle and Green turtle due to the rocky coastline and lack of suitable sheltered sandy beaches. Table 11.11 gives distances from surveyed sections where turtle activity (including sightings of live/dead turtles, nests and tracks) was observed to the new jetty location.

Table 11.11 Distances of Observed Turtle Activity to the Proposed BTC Jetty

Section Number*	Average Distance from New Jetty (km)
1	40
2	30
5	18
7	7
8	2.6
10	3
13	18

A substantial number of dead turtles were recorded during the survey and is indicative of the level of pressure already experienced by these species within the Gulf of Iskenderun area. Discussions with members of the local communities suggest that numerous turtles are drowned every year in fishing nets, as well as being deliberately killed by fishermen who consider them a threat to fish traps.

In light of the findings of the July 2001 survey, a month long survey was conducted in the area between Sugozu and Uzunkelli within an area in which turtle nesting and hatching had been previously reported [Ref: 23]. Undertaken between early July and early August (a key period of nesting/hatching activity), the survey comprised routine nesting patrols and hatchling observations on Sugozu and Akkum beaches, which had been identified during pre-survey field investigations as being key nesting sites (see Figure 11.7). The results of the survey are presented in Table 11.12 below.

Table 11.12 Nest and Track Data (Between 08.07.2002 and 08.08.2002)

	Nests		Non-nesting emergences	
Sugozu:	*Chelonia mydas*	*Caretta caretta*	*Chelonia mydas*	*Caretta caretta*
Directly observed:	9	6		
Recorded by tracks:	19	10		
Sugozu Total:	28	16	7	4
Akkum:				
Directly observed:	2	0		
Recorded by tracks:	12	2		
Akkum Total:	14	2	13	2
TOTAL	70	34	20	6

In should be noted that the survey was undertaken in the middle of the peak period and that the survey results do not reflect the complete nesting activity for this season. It is estimated that for the complete nesting period, the number of nests would be at least two times more than those observed in this survey.

On Sugozu Beach, it was observed that the eggs and hatchlings were heavily predated by crabs (*Ocypode cu*rsor) and the intensive predation is considered to significantly affect the number of hatchlings reaching the sea.

On Akkum Beach, eggs and hatchlings were also predated by foxes (*Vulpes vulpes*), with a total of six raided nests encountered during morning patrols. As at Sugozu Beach, high crab (*Ocypode cursor*) predation was also observed and contributed to a level of overall predation pressure that resulted in the low numbers of hatchlings reaching the sea.

The Action Plan for the Conservation of Mediterranean Marine Turtles, adopted in 1989, sets out a number of recommended actions to be taken at a national level within Turkey. Particular attention is required regarding the Green turtle and the legal protection of its nesting sites.

The Gulf of Iskenderun is specified within the Action Plan as requiring measures for the reduction of fishery-related mortality in the turtles' benthic feeding grounds [Ref 24]. High sea temperatures all year round and strong nutrient inputs from land increase primary productivity within the Gulf, providing one of the few locations in the Mediterranean used by Green turtles to nest, feed and overwinter.

The findings of the surveys undertaken as part of the BTC Pipeline EIA process indicate that the reproduction success of Green and Loggerhead Turtles is significantly affected by high levels of egg and hatchling predation and that locationally specific conservation measures may be required to protect turtle nests and to maximise the numbers of hatchlings reaching the sea.

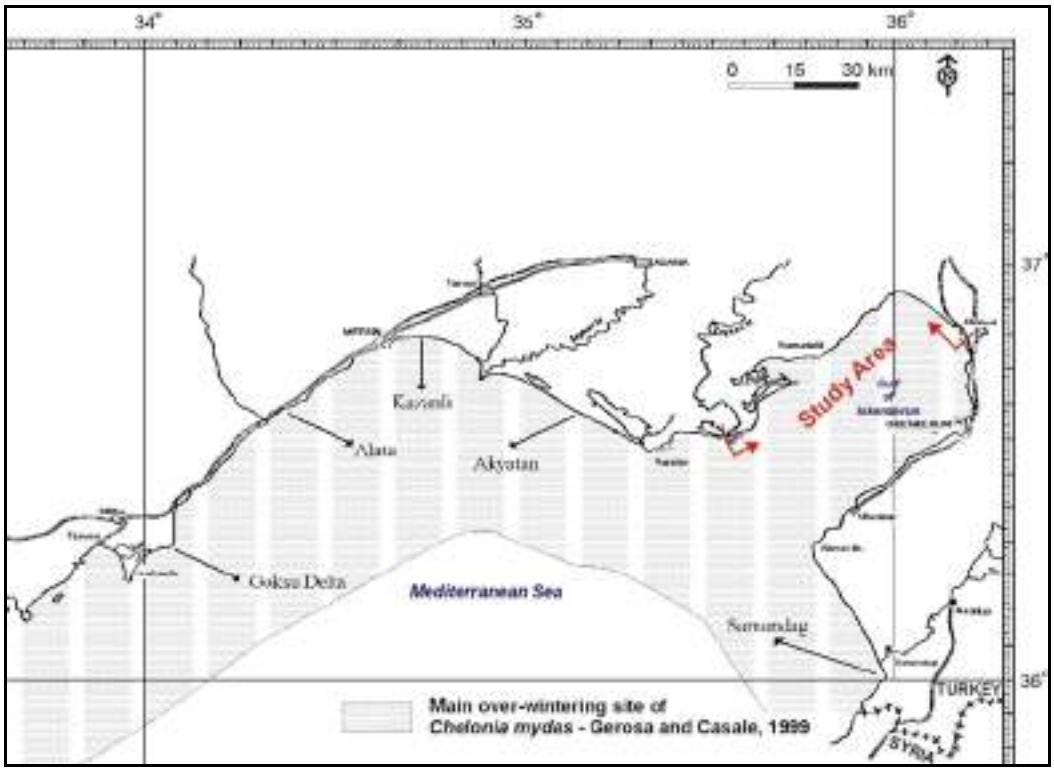


Figure 11.6 Map of Known Turtle Nesting Beaches

2002
BTC MARINE TERMINAL SEA TURTLE STUDY
The BTC Marine Terminal is located within the Gulf of Iskenderun, an area within which four turtle species have been recorded of which two are known to nest.
- Green Turtle (Chelonia mydas) is listed as Critically Endangered on the 2000 IUCN Red List of Threatened Species and it is estimated that only 300 to 400 Chelonia mydas females nest annually in the Mediterranean. Green Turtles nest in the Gulf of Iskenderun, where they are considered the most numerous of the turtle species.
- Loggerhead Turtle (Caretta caretta) is listed as Endangered in the 2000 IUCN Red List of Threatened Species and, although this is the most abundant species in the Mediterranean, the Gulf of Iskenderun has a secondary importance for the nesting of this species.
During July 2001, a preliminary sea turtle survey established that, although the coastline in the immediate vicinity of the BTC Marine Terminal was unsuitable for turtle nesting, two important nesting beaches, Sugoru and Akkum are located approximately 2km and 4 km west of the proposed jetty respectively. In addition, two nest sites were identified on the small beach within the existing Ceyhan Marine Terminal.
In July-August 2002, a detailed follow-up survey was undertaken to establish the level of nesting activity and the critical pressures that influenced hatching success, with a view to developing proactive measures that might safeguard turtle nesting in the area.
Sugoru Beach
Akkum Beach
Turtle Conservation Measures:
The BTC Project has committed to implement an Environmental Investment Programme (EIP). Measures to protect and preserve turtle nesting activity and to maximise hatching viability in the vicinity of the existing and proposed Marine Terminals are currently being considered. Within the provisions of the Action Plan for the Conservation of Mediterranean Marine Turtles (endorsed by each of the Mediterranean Coastal States under the Barcelona Convention), the measures to safeguard turtle nesting on the SOTAS beach and on the nearby beaches, including the collection of laid eggs for transferral to a protected hatchery area, in-situ protection and the management of releasing hatchlings.
Survey Findings:
Turtles of the gulf of Iskenderun nest between June - August, with hatching emergence from mid-late July to mid September. The surveyed beaches are heavily used by nesting females of both species with an estimated minimum of 250 nestings occurring within one season. However, hatchlings and eggs on the surveyed beaches are heavily predated by foxes and crabs, such that relatively small numbers of hatchlings reach the sea.
btc

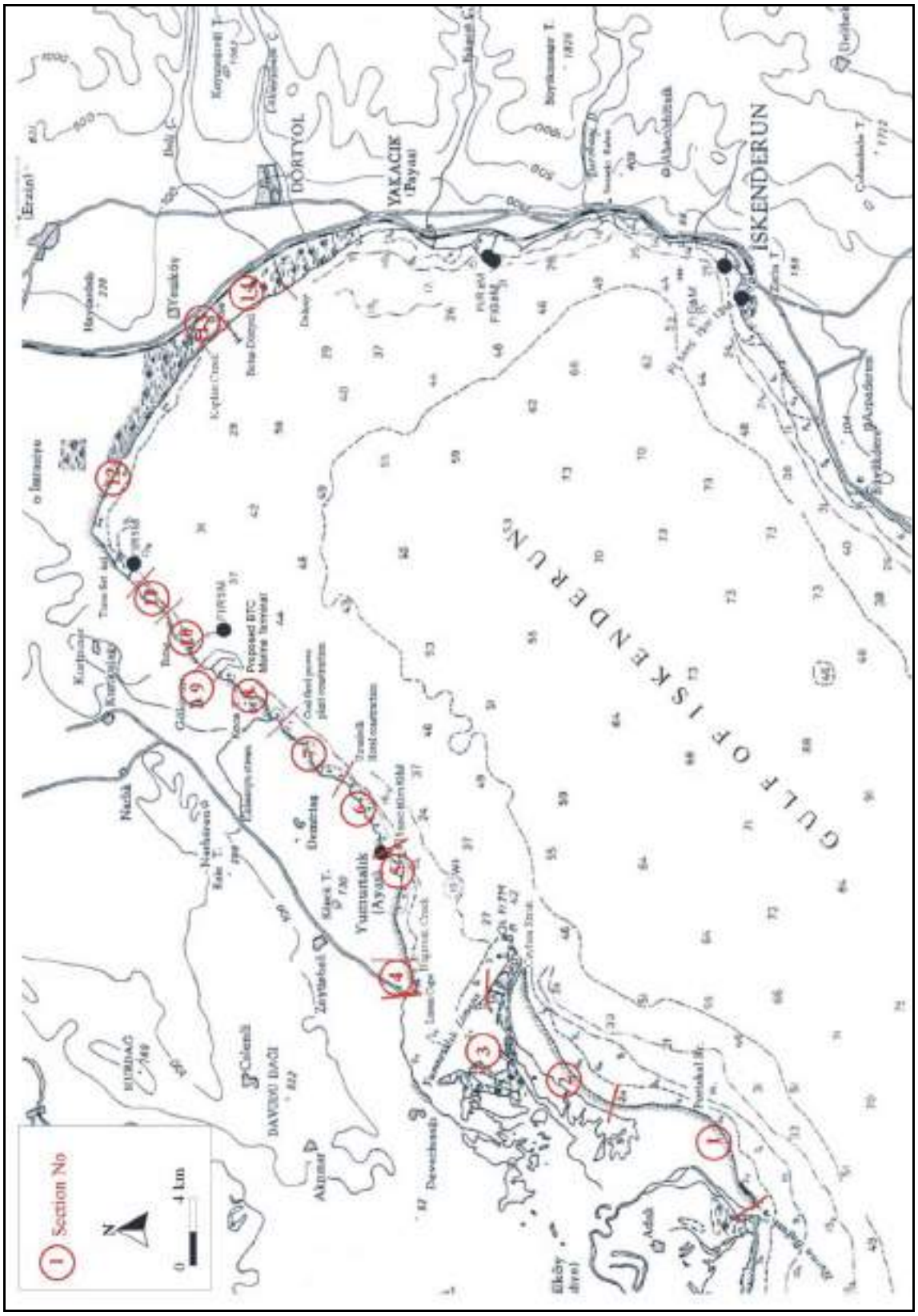


Figure 11.7 Turtle Survey Sites

Figure 11.8 Sites of the 2002 Turtle Survey

11.4.6 Seabirds

11.4.6.1 General

Both the population sizes and diversity of seabirds are relatively low in the Mediterranean, partly because of the low biological productivity and nutrient scarcity. Upwellings, shallow waters and river outlets are the most important feeding sites for seabirds. Sandy or rocky beaches and sea cliffs are important nesting sites.

Audouin's gull and the Mediterranean shearwater both breed solely in the Mediterranean. The Mediterranean gull is almost confined to the region for breeding. In addition, the European populations of the great black-backed gull and the slender-billed gull breed only in the Mediterranean and Black Seas [Ref 27].

11.4.6.2 Birds on the Mediterranean Coast

There is a diverse range of habitats along the Mediterranean coast that attract a large number of birds. Wetland areas contain the highest concentrations, and of these, deltas and lagoons support the most diverse community of bird species.

The globally threatened birds that have a strong dependence on Mediterranean coastal wetlands for breeding are the Dalmatian pelican, marbled teal and ferruginous duck. A significant part of the world population of the Dalmatian pelican breeds and winters in the Mediterranean coastal wetlands, especially lagoons and deltas. Populations are fragmented and found mainly in Albania, Greece and Turkey. The marbled teal breeds and also winters in lagoons and other wetlands in Spain, Morocco, Algeria, Tunisia, Egypt, Israel and Turkey. Several populations in other Mediterranean countries became extinct in the course of the twentieth century. Most of the world population of ferruginous ducks breed in large river deltas and other wetlands in Morocco, Spain, Italy, Albania, Slovenia, Croatia, Yugoslavia, Bosnia-Herzegovina, Greece, Turkey and Israel. The species migrates through or winters in lagoons and coastal marshes in France, Malta, Libya, Tunisia, Algeria, Egypt, Cyprus and the Lebanon.

Millions of birds cross the Mediterranean Sea twice a year during migration, usually at the narrowest point over the Straits of Gibraltar or via Sicily, but also via other islands such as the Balearic Islands, Corsica, Sardinia, Crete and Cyprus. The coastal wetlands become vital refuelling stops during this time, when birds are at their most exhausted and vulnerable. A number of globally threatened birds are known to migrate through the Mediterranean region. These include the critically endangered slender-billed curlew, the lesser kestrel and the lesser white-fronted goose. The slender-billed curlew has been recorded mainly in wetland sites in Greece, Turkey and Italy but also in Albania, France, Malta, Spain and Tunisia. Wintering curlews may occur on the coast of Tunisia, Algeria and Morocco. The Lesser Kestrel migrates through Malta, Cyprus, Egypt and Lebanon and the lesser white-fronted goose passes through the Evros Delta in Greece.

There are several other threatened species, which can occur in wetland areas quite close to or even on the coast, but are generally associated with habitats further inland. These include the white-headed duck, corncrake, Spanish imperial eagle, aquatic warbler and the greater spotted eagle.

Other species are of particular conservation concern because they are:

1 either close to qualifying as threatened, for example the delta-dwelling Pygmy Cormorant and white-tailed eagle; or

2 because their entire world population is confined to Mediterranean coastlines, for example Eleanora's falcon is found on rocky coasts. Six passerine birds, the Corsican nuthatch, the Algerian nuthatch, the Syrian serin, Marmara's warbler, the Cyprus pied wheatear and the Cyprus warbler, are confined to islands or inland areas in the Mediterranean region. Cyprus has been designated an Endemic Bird Area (EBA) by Birdlife International, a designation which illustrates conservation importance rather than any form of official status or protection [Ref 28].

11.4.6.3 Seabirds in the vicinity of the BTC Marine Terminal

There are no seabird colonies in the immediate vicinity of the proposed BTC Marine Terminal and Jetty. The nearest significant populations of seabirds are found on the shores of Yumurtalik Bay and the Cukurova delta, to the southwest of Yumurtalik (approximately 80km from the proposed BTC Marine Terminal). These are described in Section 11.4.8 below [Ref 29].

11.4.7 The intertidal zone

11.4.7.1 Rocky shores

Observations made in the supralittoral (ie splash) zone during winter and spring marine ecology surveys, [Ref 6] identified a high species diversity comprising: cyanophytes (*Clothrix* sp, *Microcoleus sp*); lichen (*Verrucaria amphibia*); gastropods (the snail (*Melaraphe (Littorina) neritoides*), the periwinkle (*Littorina punctata*), the limpet (*Patella sp*)) and crustaceans (the barnacle (*Chthamalus depressus*), the sea louse *(Ligia italica*). No seasonal variation was observed within this zone.

Plate 11.3 Example of Supra- and Midlittoral Stone

This midlittoral zone (ie the lower beach) consisted of highly adaptive species, resistant to desiccation, with the limpet *Patella caerulea* and the worm-shell *Vermetus* sp. as the most abundant organisms observed in this zone [Ref 6]. Again relatively little seasonal variation existed, though the alga *Enteromorpha* sp. was absent in winter.

Plate 11.4 Photophylic Algae on the Medilittoral Zone

11.4.7.2 Sandy shores

Aerial photographs taken of the proposed BTC Marine Terminal site and coastal area indicate that there is no evidence of significant coastal retreat. In addition, beach morphology suggests that there is a net northward transport of sediment. Two types of bottom structure were found on the sandy shores [Ref 6]:

- sand without vegetation and with scattered debris – no macrofauna were observed;
- sand with dry wracks – dead/decaying deposits of the red algae (*Jania rubens*) and *Caulerpa prolifera* providing a habitat for a variety of gammarid amphipods (fairy shrimp) and the sandhopper *Talitrus saltator*.

11.4.8 Protected Areas

11.4.8.1 General

Coastal habitats are increasingly being afforded protection in Turkey. Between 1989 and 1995, approximately 774km of coastline was identified for protection in Turkey. During 1995 alone, a total of 25% (1,332km) of the total Turkish Mediterranean coastline was declared under protection.

The only protected area within the vicinity of the proposed BTC Marine Terminal is the Yumurtalik Lagoons, which is designated as a Nature Reserve and protected under the Law on National Parks, number 2873. This law administers the designation of proposed Nature Reserves, prohibited activities within these areas and sets permission and penalty procedures.

The National Parks Regulations, number 19309, was published on 12th December 1986 and details the principle requirements set out in the Law on National Parks.

11.4.8.2 Yumurtalik Lagoons

Overview

This wetland complex, which is designated as a 1st Degree Natural Site, covers an area of 16,430ha and is situated between the mouth of the Ceyhan River and Yumurtalik Bay (see Figure 11.9). The site qualifies as an Important Bird Area (IBA) under the following Global and Regional (European) criteria.

- A4i (global criteria - congregations): the site is known or thought to hold, on a regular basis, >1% of a biogeographic population of a congregatory waterbird species;

- A4iii (global criteria - congregations): the site is known or thought to hold, on a regular basis, >20,000 waterbirds or >10,000 pairs of seabird of one or more species;

- B1i (regional criteria - congregations): the site is known or thought to hold less than or equal to 1% of a flyway or other distinct population of a waterbird species;

- B2 (regional criteria – species with an unfavourable conservation status in Europe): the site is one of the most important in the country for a species with an unfavourable conservation status in Europe (SPEC 2, 3) and for which the site-protection approach is thought to be appropriate.

The site comprises a complex of brackish and saline lagoons, salt and freshwater marshes, tidal mudflats, pastures, reedbeds (*Phragmites*), sand dunes and pine forest. Several large inlets connect the site to the sea. Saltmarsh areas have been converted to arable land in places and cattle graze on the extensive meadows to the west.

The Aleppo pine forest (*Pinus halepensis*) contains the Cretan date palm (*Phoenix theophrasti*), which is a lower risk – near threatened species on the IUCN 2000 Red List (Plate 11.5). There are only four known populations of this latter species in Turkey and it is considered endangered nationally, as it was previously found growing only in the vicinity of Marmaris. It is the only naturally occurring palm tree in Turkey. A number of other species found within this pine forest include, red pine (*Pinus brutia*), mastic tree (*Pistacia lentiscus*), common myrtle (*Myrtus communis*), Syrian privet (*Fontanesia phillaroides*), Broom heater (*Erica manupuliflora*).

Habitat cover is approximately 10% arable land, 5% forest and 85% wetland (which consists of coastal lagoons, mud and sand flats, salt marshes, sand dunes and beaches and water fringe vegetation). Existing land use activities include agriculture, fisheries/aquaculture, hunting, and tourism [Ref 26, 28, 30].

The full citation for the Yumurtalik Lagoons IBA is provided in Appendix B3.

Plate 11.5 Cretan Date Palm (*Phoenix theophrasti*) Growing near Aleppo Pine Forest at Yumurtalik

Yelkoma Lake

Yelkoma Lake is one of the many lakes within Yumurtalik lagoons and is connected to the sea by a narrow channel (see Plate 11.6). Although it is relatively deep, it almost completely dries out during summer. Marshland vegetation is well established at the southern end of the lake, comprising halophytic vegetation (salt tolerant), where glasswort (*Arthrocenmum fruticosum*) is dominant. Ecological surveys identified high biodiversity within the lake, with gilthead (*Sparus aurata*) and sea bass (*Dicentrarchus labrax*) the main fish species. The European pond turtle (*Emys orbicularis*), which is a lower risk – near threatened species on the IUCN Red List, was observed during survey work. Yelkoma Lake is also located adjacent to a site identified as a nesting site for both the Loggerhead turtle (*Caretta caretta*) and Green turtle (*Chelonia mydas*).

Plate 11.6 Yelkoma Lake in High Summer showing Sparse Halophytic (salt tolerant) Vegetation

Birds

Yumurtalik Lagoons are important for breeding waders and terns and large numbers of wintering waterfowl, although the area has reportedly poor feeding conditions.

Table 11.13 provides information concerning the main species that utilise the site and their importance criteria for which the site was designated an IBA.

Table 11.13 Birds Utilising Yumurtalik Lagoons

SPECIES	SCIENTIFIC NAME	STATUS	CRITERIA
Greylag goose	*(Anser anser)*	Winter	B1i
Wigeon	*(Anas penelope)*	Winter	A4i, B1i
Black francolin	*(Francolinus francolinus)*	Breeding	B2
Kentish plover	*(Charadrius alexandrinus)*	Winter / Breeding	B1i, B2
Little stint	*(Calidris minuta)*	Winter	A4i, B1i
Avocet	*(Recurvirostra avosetta)*	Winter	B1i, B2
Little tern	*(Sterna albifrons)*	Breeding	B2

A number of migrant waterbirds and passage migrants were observed during the Bird Survey, which included the IBA. Six nationally threatened species (Great egret, White pelican, Black stork, Glossy ibis, Garganey, Marsh harrier and White-tailed plover) and three species considered endangered in a European context (Spur-winged plover, collared pratincote and gull-billed tern) were recorded during this survey.

Conservation Issues and Threats

Threats from industrialisation and urbanisation are high and land to the east is already heavily industrialised. Although aquaculture/fisheries and agricultural intensification/expansion are considered as medium threats to the IBA site, there has been a dramatic decline in fish stocks as a result of unsustainable fishing practices.

Additionally, the use of large amounts of fertiliser and pesticide in agricultural areas, such as at Cukurova, poses significant problems to the site. Other threats include overgrazing, drainage, tourist development and hunting. Two large irrigation projects have been proposed, (the Asagi Seyhan Irrigation Project and the Irrigation Project for Yumurtalik and its Vicinity), which include provisions to prevent drainage water entering the lagoons. It is not expected that the Yumurtalik lagoons will be affected by the latter project, as the drainage channels to be constructed will not reach the lagoons (*Director of Ceyhan Branch of DSI, Adana Regional Directorate, pers comm.*). Furthermore, a management plan, passed in 1996, regulates all land-use in the delta and places restrictions on the construction of holiday homes.

11.4.9 Seasonal Sensitivities

11.4.9.1 Overview

Table 11.14 summarises the key seasonal sensitivities, which are further discussed below.

Table 11.14 Seasonal Sensitivities

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fish and Fisheries												
Spawning												
Turtles												
Nesting												
Hatching												
Overwintering												
Shorebirds												
Breeding												
Overwintering												
Seals												
Breeding												

11.4.9.2 Fish and Fisheries

There are an estimated 500 species of fish in the Mediterranean and the Gulf of Iskenderun is an important fisheries resource with extended spawning seasons due to its warm temperatures and a high primary productivity [Ref 6]. The majority of fish spawn 2-3 times a year in the Gulf, with Lessepsian migrants spawning 1-2 times a year. Yumurtalik lagoons is a particularly important area providing good habitat for spawning due to its shallow waters and lagoons and at certain times of the year, bans on bottom trawling and fishing are declared in this region by the Ministry of Agriculture and Rural Affairs [Ref 6].

There were no protected species found within the vicinity of the proposed BTC Marine Terminal and so only commercially important species are considered [Ref 6]. The spawning period extends between March and October for the majority of fish species and between April and September for Lessepsian migrants [Ref 6].

11.4.9.3 Turtles

Turtles represent a seasonal sensitivity, both in terms of nesting as well as overwintering.

The Green turtle (*Chelonia mydas*) is known to overwinter in the Gulf of Iskenderun, as well as nesting in the summer months. The nesting season of Green turtles is poorly defined and is very dependent on locality. It may extend from late spring to early autumn in the Mediterranean, though the peak nesting months in Turkish waters are not known.

The Mediterranean population of Loggerhead turtles (*Caretta caretta*) mate in late March-early June and nest throughout the summer (end of May to September), with a peak around mid July. Green turtles start nesting about two weeks later. Variations in the nesting season, due to weather conditions, have been observed in both species. Hatching is dependent on both species and temperature and occurs between 40 to 60 days after eggs are laid.

11.4.9.4 Birds

Although there are no seabird colonies in the immediate vicinity of the proposed BTC Marine Terminal and Jetty (see Section 11.4.6), Yumurtalik Lagoons are important for a number of breeding waders and terns, wintering waterfowl and a variety of passage migrants.

11.4.9.5 Marine Mammals

Although, there is relatively little information concerning the seasonal activities and distribution of marine mammals on the south coast of Turkey, (as described in Section 11.4.4), it is not anticipated that key activities such as cetacean calving occur in the Project area.

The monk seal is non-migratory and spends most of its time within a limited home range. The reproductive period is mainly between May and November and young are born, generally in September and October.

The presence of monk seals was not observed during ecological surveys and it is unlikely that they are present in the vicinity of the proposed terminal due to already high pressure from industry in the Gulf. However, the Mediterranean Gap Analysis undertaken by WWF identified the south coast in Turkey (ie the Cilician coast) as an important area for monk seal populations and one of thirteen key areas to protect [Ref 10].

11.5 MARINE ARCHAEOLOGY

Desk studies and preliminary consultations with the Ministry of Culture and the Adana Provincial Directorate on the Protection of Cultural and Natural Entities were undertaken during the Basic Engineering stage and the Scoping stage of the EIA process. Side scan sonar studies carried out during the Ceyhan Marine Terminal Feasibility Study indicated that there were no features on the seabed within the area studied that could be interpreted as archaeological features.

Furthermore, public consultation was carried out with local communities on areas and features of cultural value. This exercise include those identified as fishing communities, such as Golovasi, Sahil Sitesi and Incirli, as these would be most familiar with the seabed and the possibility of artefacts or structures present on it.

Consultations and survey work carried out in the area indicate that there are no known marine archaeological features.

11.6 HUMAN ACTIVITIES

11.6.1 General

Turkey's coastal areas are developing rapidly through urbanisation, industrialisation, tourism and shipping (see Figure 11.9). The Gulf of Iskenderun is already a heavily industrialised area, including the following types of industry:

- Toros Gubre Fertiliser Facility north east of the existing BOTAŞ Marine Terminal. Two jetties are located here – one extending out to approximately the 14m isobath and the other to the 13m isobath;
- BOTAŞ Dortyol Marine Terminal with a jetty extending to the 14m isobath;
- Delta Oil Terminal;
- Aygaz LPG Terminal;
- Iskenderun iron and steel works at Isdemir;

- Iskenderun coastline (several jetties and other industries present including the settlement of Iskenderun);
- NATO Pier;
- Yumurtalik NATO Port;
- Sugozu Power Plant: currently under construction and planned for commissioning November to December 2003. Approximately 615m of the jetty has been constructed.

In this subsection, an overview of current industrial activity in the vicinity of the proposed BTC Marine Terminal is provided.

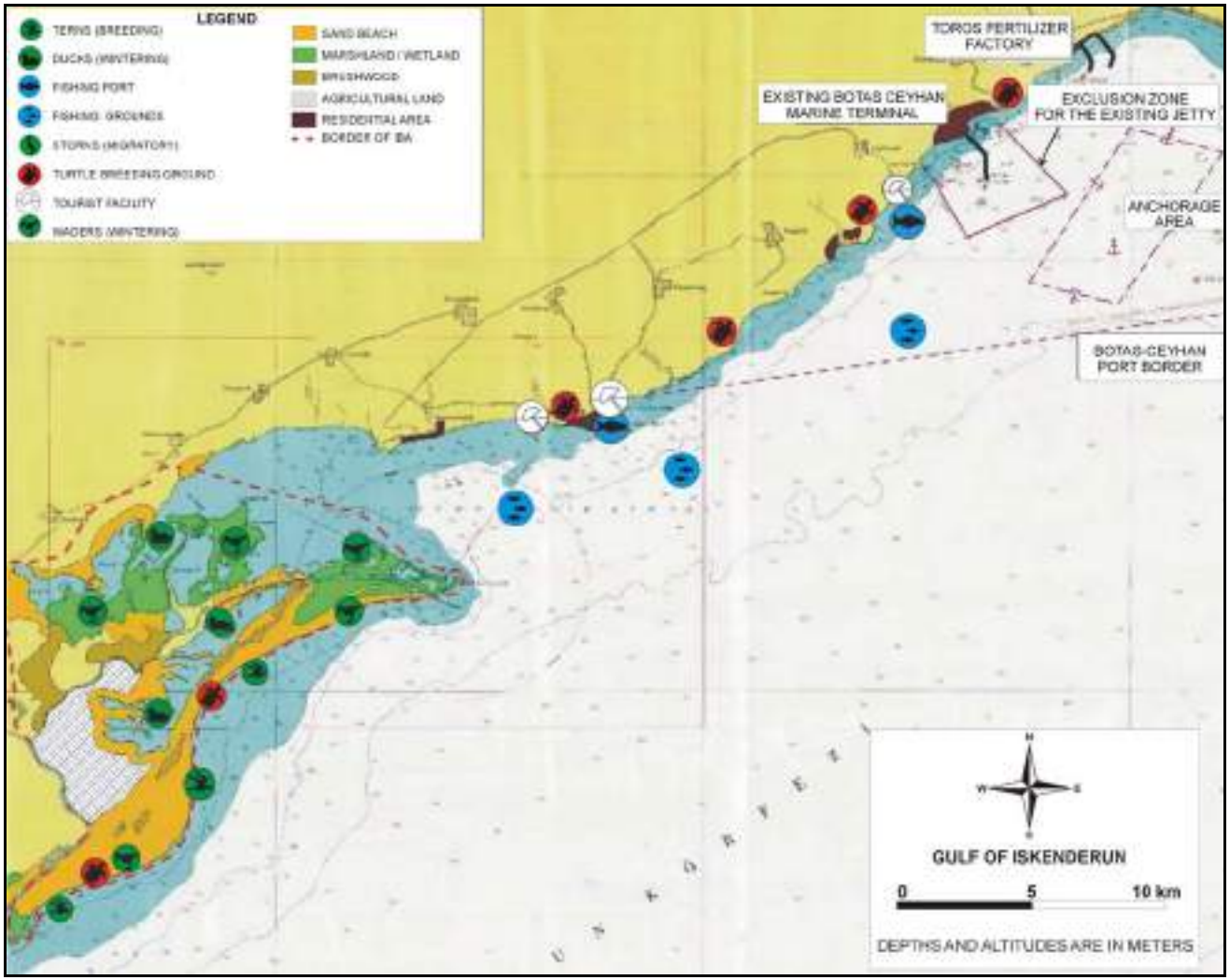


Figure 11.9 Coastal Sensitivity Map for the South West Coast of the Gulf of Iskenderun

11.6.2 Navigation and Shipping

11.6.2.1 Ceyhan Port

The Gulf of Iskenderun is a semi-enclosed body of water about 40km wide and 70km long, extending north eastward from the Mediterranean Sea. Ceyhan Port is situated at the north of the Gulf. The entrance to the outer harbour is located through an 820m opening and between a 1,300m long, north-south oriented breakwater and a jetty that extends westward from the shore at the north end of the port. Charted depths at the entrance are approximately 10 to 15m. A pilot is required for ships entering the harbour.

Anchorage for vessels is located west of the breakwater system that defines the limits of the inner and outer harbours. Access is unrestricted, with depths ranging from 10m to 25m and good holding on a mud bottom. Vessels waiting to berth at the existing BOTAŞ Marine Terminal, the Toros Gubre Fertiliser Facility or the BOTAŞ Dortyol Marine Terminal, anchor approximately 5.5km offshore. There is prohibited anchorage north of the BOTAŞ (Ceyhan) Harbour Limit, except within a designated anchorage area shown in Figure 11.10.

11.6.2.2 Tanker traffic

Tanker traffic at the existing BOTAŞ Marine Terminal was estimated in 1987 at 582 vessels with an average dead weight tonnage (dwt) of 113,718 tonnes. The number of vessels docking at the existing terminal in 2000 was recorded as 300 to 400 per year, with a maximum capacity of 1,000 tankers per year (*pers. comm.*). Tankers berthing at the Toros Gubre Fertiliser Facility and BOTAŞ Dortyol Marine Terminal were also estimated in 1987 at 165 vessels with an average dwt of 17,440 tonnes and 223 vessels with an average dwt of 23,816 tonnes respectively.

At the proposed BTC Marine Terminal, tankers will dock at a Jetty with two berths able to accommodate vessels of between 80,000 dwt and 300,000 dwt.

11.6.3 Recreation and amenity

Small pleasure craft are not permitted within the anchoring prohibited area around the existing BOTAŞ Marine Terminal. However, boat harbours lie on the north-east and south-west sides of the existing jetty. Furthermore, the rise of international and domestic tourism has led to an increase in tourist related vessel movements within the harbour area. The role of local fishermen in this activity and a key site of tourist interest are outlined in Section 10.

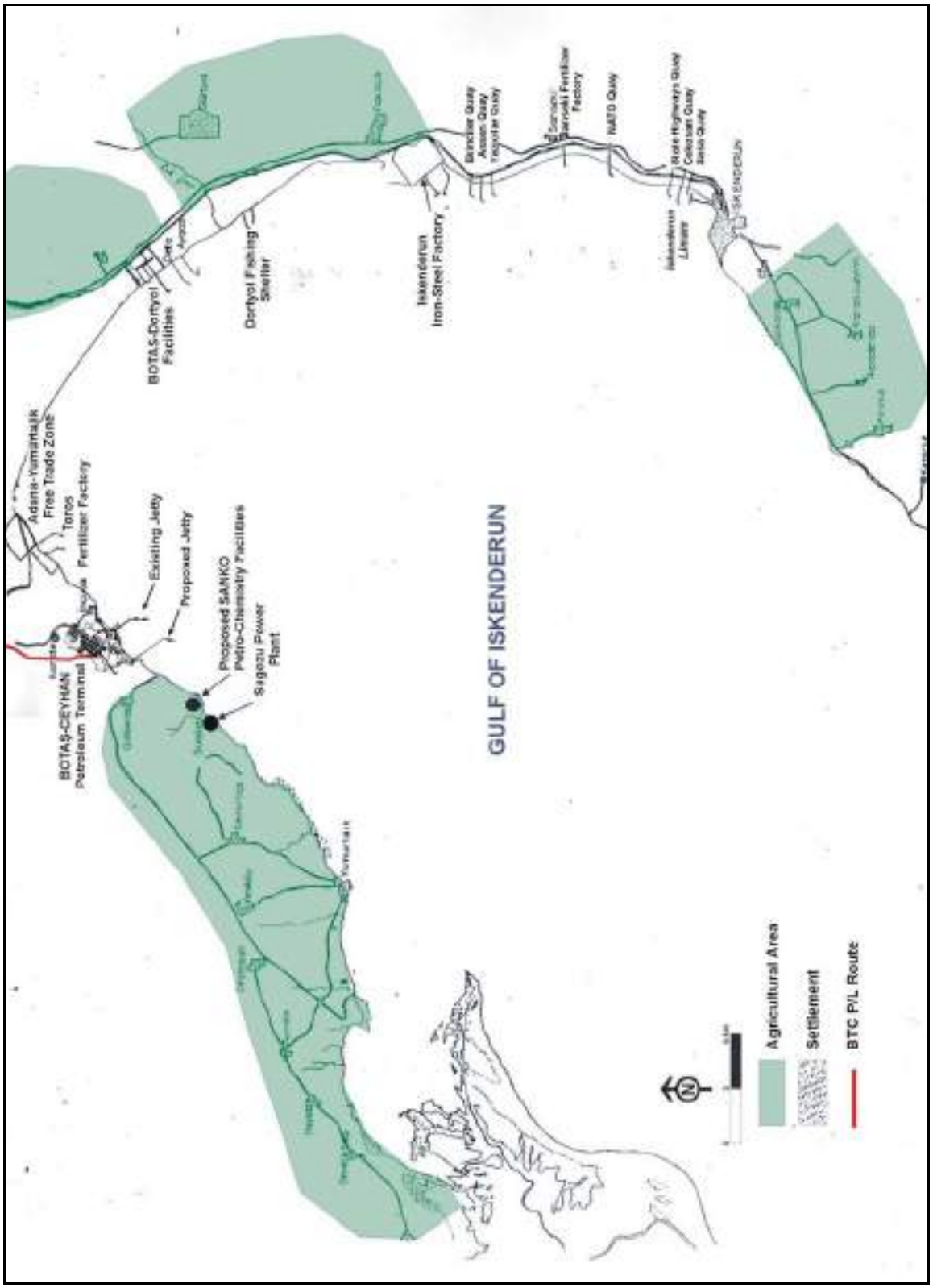


Figure 11.10 Existing Industrial Areas on the Coast of the Gulf of Iskenderun

11.6.4 Oil and gas activities

11.6.4.1 Existing BOTAŞ Marine Terminal

The proposed BTC Marine Terminal will be located adjacent to existing facilities on the coast of the Gulf of Iskenderun (see Figure 11.10) in Ceyhan. The existing terminal comprises a long steel jetty of approximately 2km with two loading platforms on the outer part of the jetty, providing four tanker berths. Tankers of up to 300,000 dwt and 22m draught can be accommodated.

The existing BOTAŞ Marine Terminal exports crude oil transported by pipeline from Iraq. The terminal also imports crude in smaller tankers from Dortyol, which is transhipped for refining offsite.

11.6.4.2 BOTAŞ Dortyol Terminal

The BOTAŞ Dortyol Terminal is situated approximately 20km northeast of Iskenderun and exports crude oil to the existing BOTAŞ Marine Terminal by tanker (see Figure 11.9). The terminal includes a T-headed jetty projecting from the shore of approximately 1.2km with a single berth.

11.6.5 Fisheries

11.6.5.1 General

Primary productivity in the Mediterranean is generally low compared to other seas, but can be locally elevated where conditions permit. In the Gulf of Iskenderun, primary productivity is 2-4 times higher than the adjacent sea area, averaging 115mg C (as carbon) $m^{-2}d^{-1}$. The Gulf is therefore an important fisheries resource with total fish production of over 21,000te yr^{-1}. Commercial fisheries in the Gulf include rainbow sardine (*Dussumeria aucta*), European anchovy (*Engraulis encrasicolus*), white sea bream (*Diplodus sargus*), yellowstripe barracuda (*Sphyraena chrysoteania*) and common pandora (*Pagellus erythrinus*) [Ref 6].

However, marine pollution and over-fishing are reducing fish resources. Turkey's marine waters are under pressure from heavy domestic maritime traffic, particularly in the Turkish Straits and marine pollution from land-based sources [Ref 9].

Important fishing grounds for a number of commercial fish species are found in this area, which are considered crucial for local fishing communities (see Figure 11.9, Section 11.4.8).

11.6.5.2 Fishing Patterns

Within the vicinity of the proposed BTC Marine Terminal, local fishermen from Golovasi/Sahil Sitesi and Incirli have identified (during focus group interviews) the principal fishing grounds comprising four main zones. Additional studies to identify fishing grounds with a wide range of stakeholders is on-going:

- Zone 1: between the Sugozu Thermal Power Plant and the existing BOTAŞ jetty exclusion zone (approximately 2.5 nautical miles[1] along the coast and up to 0.5 nautical miles offshore from Golovasi).

- Zone 2: between the existing BOTAŞ Jetty exclusion zone and the Sugozu Thermal Power Plant (approximately 2.5 nautical miles along the coast and from 0.5 to 2 nautical miles offshore).

- Zone 3: between the Toros Gubre Fertiliser jetty exclusion zone and the existing BOTAŞ jetty exclusion zone (approximately 0.5 nautical miles along the coast and up to 2 nautical miles offshore).

- Zone 4: over 2 nautical miles offshore.

Box 11.1 Main Fishing Locations/Settlements

Focus group workshops and interviews with local fishermen from Golovasi / Sahil Sitesi, Karatepe, Incirli, Haylazli, Deveciusagi during consultation enabled a broader understanding of the most frequently used fishing grounds in the vicinity of the BTC Marine Terminal. These results of those discussions are outlined below.

- *Golovasi/Sahil Sitesi*: fishermen fish daily in Zone 1 along the coast between Sugozu and the BOTAŞ exclusion zone and sometimes in Zone 2, depending on the season. Three to four times a month the fishermen fish in Zone 3 off the coast near Toros Gubre Fertiliser Facility. Zone 2 is the most important fishing ground for fishermen from Golovasi, because this is where shrimp, which sells at four times the price of other fish in the area, is caught.

- *Karatepe and Incirli*: fishermen fish daily in Zone 3 off the coast around the Toros Fertiliser facility and rarely (3-4 times a month) in Zones 1 and 2. Zone 3 is the most important fishing ground for Incirli fishermen (substantiated by an informal agreement they have with Golovasi fishermen that the latter will not use Zone 3 on a regular basis).

- *Haylazli and Deveciusagi*: fishermen fish in the vicinity of Sarigol, Adalar, Arap Bogazi, Dalyan, settlements and along the coasts of Yumurtalik and Haylazli.

Non-Local Fishermen: fish daily at least 2 nautical miles offshore in Zone 4. According to local fishermen, the non-local fishermen do not fish in Zones 1-3.

(1) [1] 1 nautical mile is equivalent to approximately 1852 metres.

Plate 11.7 Local Fishermen from Golovasi / Sahil Sitesi

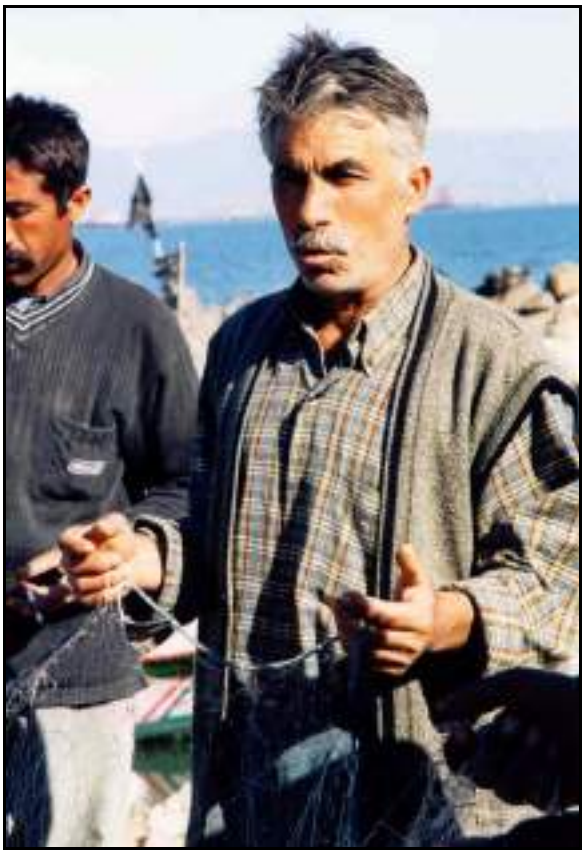


Plate 11.8 Fisherman from Golovasi / Sahil Sitesi

In addition to the activities of local fishermen, fishermen are also attracted to the Iskenderun Gulf from other regions, including Iskenderun, Samandag, Karataş, Hatay and the Black Sea (see Plate 11.9). It has been reported that the number of non-local fishermen has increased in the past ten years to approximately 60-70 boats, leading to elevated competition with local fishermen. Non-local fishermen tend to use more technologically advanced fishing equipment (eg radars) and have larger fishing boats. As a result, they are able to travel longer distances to fish (further than two nautical miles offshore). Non-local fishermen also typically fish using capital intensive line and radar methods, work for large fishing companies and live on their boats that dock in Yumurtalik port over night.

Plate 11.9 Non-Local Fishermen in Yumurtalik

In addition to the legal activities of local and non-local fishermen, discussions with local fishermen indicate that illegal fishing in the estuarine areas, which are important nursery areas for a range of commercial fish species, is of increasing concern (see Box 11.2). These activities were also cited as having direct consequences for sea turtle species (see Section 11.4.5 above). Marine restrictions also apply to local fishermen including the prohibitions of net fishing within the existing BOTAŞ Marine Terminal exclusion zone. However observations indicate net fishing constitutes an important method of fishing for local fisherman (see Section 12 and Plate 11.8).

Box 11.2 Illegal Fishing

The region is rich in estuarine pools and lagoons (referred to as 'fish ponds'). A recent law forbids the catching of fish from 'fish ponds'. However, local fishermen are reported to be catching small fish from these 'fish ponds' and selling them to fish farms in western Turkey.

The presence of an intense and sometimes illegal fishing effort along the south coast of Turkey is reportedly causing serious damage to fish stocks and other key species such as sea turtles.

Source: Fishermen from the Marine Terminal Survey Area

11.6.5.3 Catch statistics

Overall landings for Mediterranean fisheries in total are relatively modest (approximately 1.3 million te). However, Mediterranean fisheries resources are in a state of over-exploitation with over-fishing and fishing practices largely accounting for the impact on natural stocks and habitats.

The social survey of the fishing communities in the area indicated that shrimp (karides) is the most important marine species for all surveyed fishermen (as it is the most lucrative), followed by sea bass, blue fish, gilt-head bream and striped/ grey mullet. All these species are caught by fishermen from all five fishing settlements. However, lahos (logos), the most expensive type of fish, is only caught by fishermen from Golovasi/Sahil Sitesi. A number of fish species (eg tubara and karakulak) are caught solely by fishermen in Haylazli and Deveciusagi and other species (eg kayis and anchovies/ catal kulak) are caught solely by fishermen from Deveciusagi. Typically, shrimp is only caught in Zones 2 and 3, whereas the majority of other fish types are caught in all of the zones.

As indicated above, local fishermen use traditional nets that are cast in waters no more than 20-30m in depth; this generally equates to depths encountered within three nautical miles off the coast. The distances travelled by local fishermen is further constrained by the small size of their boats, the lack of sufficient engine power to enable long distance travel, the poor condition of the boats (often not sufficiently sea-worthy), the high cost of fuel, the lack of enclosed sections on their boats, which would enable night fishing, and competition with non-local fishermen (see Plate 11.10). By contrast, non-local fishermen use capital-intensive line and radar methods and are able to fish in deeper water.

Plate 11.10 Local Fishing Boats, Golovasi Port

Amongst the local fishermen, the average daily catches per species[1] per surveyed household was reported as follows:

- striped mullet (kefal) (2-10kg);
- sea bass (levrek) (1-5kg);
- gilt-head bream (cupra) (2-4kg);
- muskov (1-2kg); shrimp (karides) (1-3kg);
- shrimp (karides) (1-3kg);
- blue fish (lufer) (4-5kg);
- mackerel (istavrit) (1-3kg);
- waker/lahos (logos) (7-10kg);
- sole (dilbaligi) (4-5kg) ;
- tubara (7-23kg);
- golden mullet (sarikulak) (4-6kg);
- corb (karakulak) (1kg);
- sea bream (tranca) (2-5kg);
- kayis (2kg);
- bildircin (2kg);
- sabun baligi (5kg);
- anchovy (catal kulak) (4kg).

Respondents were noticeably hesitant to declare their catches, and it is likely that these data are underestimated for fear of taxation. Of the amount caught, each fisherman takes home an average of 1-2 kilograms for household consumption.

The social survey indicated that local fishermen fish for a maximum of five hours per day. Generally they release their nets in the late afternoon, between 5pm and 7pm and collect them the next morning between 7am and 10am. There are usually between 3-4 fishermen from different households on each boat catching all fish types, with the exception of shrimp farming which is usually undertaken by 2-3 fishermen from different households on each boat and 2-3 teenagers (school-age) who are involved in cleaning the nets on shore (see Box 11.3).

Box 11.3 Daily Catch

Most fishermen from Golovasi catch shrimp. This sells at approximately 15 million TL per kilogram. Usually one boat comprising on average three individuals (from different households) collects three kilograms of shrimp a day. Revenue is divided between the three respective households.

Source: Household Questionnaire, Marine Terminal Area

The local fishermen claim that the involvement of young people helps train them to become fishermen in the future. The wives of some of the fishermen (if they have skills useful for fishing related activities) also work to sort and arrange the nets (see Plate 11.11). The average age of local fishermen ranges between 35-40 years old, whereas non-local fishermen on average tend to be slightly younger at 30 years of age.

[1] The names of the majority of fish species (as provided by the fishermen) represent local terminology for the species listed.

Plate 11.11 Fishing Family in Golovasi / Sahil Sitesi Port

The social survey findings suggest that the fishing season for the different marine species varies throughout the year and peak/ off peak seasons cannot easily be identified. The key months for the main species of fish caught are as follows:

- Striped mullet: all year round;
- Sea bass and blue fish: between November and January;
- Gilt-headed bream: between June and September;
- Shrimp: between March and October;
- Muskov: between December and February;
- Lahos: all year round with the exception of July and August when fishing of this species is forbidden;
- Sole: peak months between November to January.

However, fishermen from both Golovasi and Incirli stated that there had been a decline in catch size over the past five years and attributed this to the following:

- an increase in environmental pollution as a result of industrialisation along the coast of the Iskenderun Gulf;
- trawling by non-local fishermen from the Black Sea and other regions;
- fish being attracted to lights on the existing BOTAŞ Jetty, thus entering the exclusion zone where fishing is prohibited;
- increased numbers of fishermen, due to a lack of alternative activities;
- over-fishing.

Some of the commercial and social implications of the decline in the fishery resource are illustrated in Box 11.4.

Box 11.4 The Decreasing Profitability of Fishing

In the early 1970s, an important economic activity in Golovasi was animal husbandry. However, the settlement lost most of its land during expropriation to establish the existing industry. Therefore more residents turned to fishing. Yet profitability has decreased due to inappropriate fishing activities of non-local fishermen, over-fishing and a rise in input prices. This has contributed to the rise in debts of fishermen to fishing companies.
Source: Fishermen from Golovasi

The problems faced by fishermen are impacting upon the career choice of the younger generations. *'The sons of fishermen are not becoming fishermen'.*
Source: Mayor of Yumurtalik Municipality

11.6.5.4 Commercial Significance

Fishermen from Golovasi and Incirli that land catches that are surplus to their domestic needs sell their surplus either within the settlement or to local traders in Yumurtalik). The local traders are registered small-scale entrepreneurs commonly functioning as a family business and composed of 1-2 people. They operate using trucks and travel everyday to Golovasi and other fishing grounds to buy fish from local fishermen. These local traders then sell the fish to fishing companies in Yumurtalik, Incirli, Adana and to larger companies in Izmir, Ankara and Istanbul. Many of the fishermen have informal contracts with local traders whereby they obtain equipment from the local traders and in return sell their catch to them (see section on debts in Section 10). Contracts between fishermen and the local traders preclude fishermen from selling directly to fish restaurants (eg in Sahil Sitesi and Incirli).

Additional information on importance of fishing as a source of both employment and livelihoods is provided in Section 10.

Table 11.15 below provides a summary of fishing activities for the existing BOTAŞ Marine Terminal area.

Table 11.15 Summary of Fishing

SETTLEMENT	ONE OF TWO MAIN SOURCES OF INCOME (% HH)	MAJOR FISHING GROUNDS USED[1]	AVERAGE CATCH* & MAIN FISH TYPE	USE OF FISH	AVERAGE COSTS & REVENUES /HH/SEASON (M TL)**	MAIN FISHING MONTHS
Golovasi	38%	Primarily zones 1 and 2, although zone 2 is important. Infrequently in zone 3.	Waker / Logos (10) Sea bass (5) Blue fish (5)	Sold to fishing companies	Costs : 108 – 800 m TL Total revenues: between 125 and 834 m TL	March-September
Sahil Sitesi	25%	Primarily zones 1 and 2, although zone 2 is important. Infrequently in zone 3.	Waker / Logos (10) Sea bass (5) Blue fish (5)	Sold to fishing companies	Costs : 108 – 800 m TL Total revenues: between 125 and 834 m TL	March-September
Incirli	26%	Primarily zone 3. Infrequently in zone 1 and 2.	Mullet (2) Muskov (1.5) Bream (1.3)	Majority sold to fishing companies (some household consumption)	Total costs between: 50 and 375 m TL Total revenues between: 100 and 250 m TL	October to November (mullet all year round)
Karatepe	3%	Primarily zone 3. Infrequently in zone 1 and 2.	-	-	-	-
Haylazli	37%	Sarigol, Adalar, Arap bogazi, Dalyan and coasts of Yumurtalik	Kefal (10) Tubara (23) Levrek (5) Sarikulak (5) Tranca (5)	Majority sold to fishing companies (some household consumption)	Total costs between: 29 and 292 m TL Total revenues: 34 and 250 m TL	Generally all year round
Deveciusağı	80%	Sarigol, Adalar, Arap bogazi, Dalyan and coasts of Yumurtalik	Kefal (8) Tubara (7) Levrek (5) Lufer (5)	Majority sold to fishing companies (some household consumption)	Total costs: between 28 and 250 m TL Total revenues: between 35 and 420 m TL	Generally all year round

*Average catches in kilograms per day
** Section 12.9.2 provides an explanation of the relationship between costs and income earned.

Source: Household Survey (HH = household)
Note: The above figures are based on estimates by individual household members and therefore there may be some inconsistencies in these estimates. Fishing activities were not reported by respondents in Sugozu, Karayilan and Hamzali as a main source of income.

[1] Details of each zone is provided in the text.

BIBLIOGRAPHY

Ref 1 UNEP, (1995). Iskenderun Bay Project Volume I. Environmental Management within the Context of Environment-Development.

Ref 2 Environment Foundation of Turkey (1995). Environmental Profile of Turkey.

Ref 3 PLE and Parmas (1999). Baku Tblisi Ceyhan Crude Oil Pipeline Feasibility Study and Existing BOTAŞ Marine Terminal: Volume I.

Ref 4 ENVY (1999). Identification of Marine Fauna and Flora and Turtle Nesting Assessment for the Sugozu Power Plant.

Ref 5 PLE-REP-EPR-PLG-009. Report for Marine Ecology Winter Term Survey, (Attachment II of the Baseline Report), Rev A. ENVY and PLE (2001a).

Ref 6 ENV-REP-ENM-TRG-001. Report for Marine Ecology Spring Term Survey, (Attachment II of the Baseline Report), Rev C. ENVY (2001).

Ref 7 ILF-TNO-EMT-TRG-002. Geohazard Study for Existing BOTAŞ Marine Terminal, Rev B. ILF (2001a).

Ref 8 ILF-REP-EMT-TRG-008. Geotechnical Report for Jetty of Existing BOTAŞ Marine Terminal, Rev B. ILF (2001b).

Ref 9 GEF/SGP, (2002). http://www.un.org.tr/undp/docs/sgp_strategy.pdf. Global Environment Facility Small Grants Program (GEF/SGP) Country Program Strategy for Turkey – Second Operational Phase 2000 - 2001.

Ref 10 UNEP (1996). State of the Marine and Coastal Environment in the Mediterranean Region – Mediterranean Action Plan. MAP Technical Report Series 100, UNEP, Athens.

Ref 11 Cairns WJ (1992) North Sea Oil and the Environment: Developing Oil and Gas Resources, Environmental Impacts and Responses. Elsevier, Cambridge.

Ref 12 OSPAR (1997). Oslo and Paris Conventions for the Prevention of Marine Pollution (Annex 5). Joint Meeting of the Oslo and Paris Commissions, Brussels 2-5 September 1997.

Ref 13 PLE-REP-EPR-PLG-005. Report for Oceanographic Monitoring and Chemical Analysis of Sediment Samples, (Attachment I of the Baseline Report), Rev 0. ENVY and PLE (2001b).

Ref 14 http://www.redlist.org. 2000 IUCN Red List of Threatened Species.

Ref 15 SAD-AFAG, (2002). http://www.afag.org/meet_monk_seal2.htm. Monk Seal Population and Distribution in Turkey and in the World.

Ref 16 Seal Conservation Society, (2002). http://www.pinnipeds.fsnet.co.uk/species/medmonk.htm. Mediterranean Monk Seal. Seal Conservation Society.

Ref 17 UNEP-WCMC, (2002). http://ims.wcmc.org.uk/scripts/esrimap. UNEP-WCMC: Mediterranean Interactive Map Series.

Ref 18 WWF, (2002). http://www.panda.org/species/loggerhead/population.htm. World Wide Fund for Nature (WWF).

Ref 19 WCMC, (2002a). http://ims.wcmc.org.uk/ipieca/regions/med/turtle.html

Ref 20 Kasparek, M, (2002) http://telematics.ex.ac.uk/euroturtle/medas/pdf2/Trionyx-CoE-2000.pdf. Status of the Nile Soft shelled Turtle, *Trionyx triunguis*, in Turkey, 2000.

Ref 21 Savona-Ventura, C, 2002. http://www.geocities.com/RainForest/3096/mar-rep.html. Sea Turtles of the Central Mediterranean

Ref 22 Baran, I. and Kasparek, M. (1989). Marine Turtles Survey – Status Survey 1988 and Recommendations for Conservation and Management. WWF Verlag, Heidelber, 123 pp.

Ref 23 ENV-REP-ENS-TRG-001. Sea Turtle Survey Report, Rev 0. ENVY (2001)

Ref 24 UNEP (1989, revised 1999): Action Plan for the Conservation of Mediterranean Marine Turtles, adopted within the Framework of the Mediterranean Action Plan.

Ref 25 WCMC, (2002b). http://ims.wcmc.org.uk/ipieca/regions/med/med_fauna.html

Ref 26 Kelleher, G., Bleakley, C., and Wells, S. (1995). A Global Representative System of Marine Protected Areas, Volume I. The Great Barrier Reef Authority, the World Bank and the World Conservation Union (IUCN).

Ref 27 IBA, (2002a) http://www.birdlife.net/sites/ibaeurope.cfm. Birdlife International: Important Bird Area (IBA) Europe Criteria.

Ref 28 IBA, (2002b) http://www.birdlife.net/sites/site_factsheet_search. Birdlife International: IBA Factsheet – Yumurtalik lagoons.

Ref 29 ENV-REP-ENS-GEN-001 Bird Survey Report, Rev0. ENVY (2001)

Ref 30 ENV-REP-ENS-GEN-002. Phase II Habitat Survey Report, Rev 0. ENVY (2002).

Ref 31 Mediterranean Pilot – Volume V (1988). Sixth Edition 1976 (revised 1988). The Hydrographer of the Navy.

Ref 32 Yilmaz, A., Basturk, O., Saydam, C., Ediger, D., Yilmaz, K., and Hatipoglu, E. (1992). Eutrophication in Iskenderun Bay, Northeastern Mediterranean. Science of the Total Environment, Supplement: 705-717.

Ref 33 European Environment Agency (1999). State and Pressures of the Marine and Coastal Mediterranean Environment – Summary. UNEP, EEA (Copenhagen).

Ref 34 ILF (2001) Geotechnical Report for General Facility Area of CMT (ILF-REP-EMT-TRG-007)

13 MARINE TERMINAL - MARINE IMPACTS AND MITIGATION

13.1 INTRODUCTION

13.1.1 Basis for the assessment

This section identifies the marine and coastal impacts associated with the construction, commissioning and operation of the crude oil handling and storage facilities at the proposed BTC Marine Terminal. The significance of identified impacts is assessed in light of mitigation measures incorporated during the planning and design development process. Where appropriate, specific control measures are described in greater detail.

The potential impacts have been derived through scoping and consultation activities and also through the consideration of potential impacts in light of the assessment significance criteria set out in Section 3 of this report.

13.1.2 Scoping

Preliminary details concerning the existing environmental baseline were established during initial scoping activities, which were undertaken between September 2000 and January 2001. This overview highlighted potential areas of concern and established the need for areas of further investigation. Potential areas of concern included several ecologically important areas for birds and turtles.

During Consultation, which commenced in August 2001, a number of perceived benefits and concerns were raised. These issues varied between stakeholders (from local residents to NGOs to local authorities) and are listed in Section 12. Concerns that relate to the marine environment were limited to potential impacts to fisheries and the effects associated with a potential increase in pollution from tanker activity.

13.1.3 Potential impacts

The possible interactions between marine receptors and the activities associated with the construction and operation of the proposed BTC Marine Terminal are numerous. However, the mitigation of potential impacts through an integrated approach to the design process, combined with the relatively low number of marine receptors, means the potential for impacts is limited in scope, particularly during routine construction and operating scenarios. These potential impacts are presented in Table 13.1.

Impacts due to accidental events (ie oil spills) are discussed separately in Section 14 of this report.

The assessment of each of these potential impacts is presented in the subsections that follow, although the secondary socio-economic impacts on fisheries, tourism and recreation, together with visual impacts are addressed in Section 12.

Table 13.1 Summary of Potential Impacts

MAIN ACTIVITIES	POTENTIAL IMPACTS
Jetty Installation: piling cement discharge vessel discharges and emissions exclusion zone	• physical disturbance of seabed • impacts to water and sediment quality • impacts to marine organisms • noise impacts on marine fauna • noise impacts on humans • exclusion of fishing vessels • navigation interactions • disposal of solid wastes • impacts to tourism and recreation
Commissioning: pressure test discharges	• physical disturbance to seabed • impacts to marine organisms • impacts to water quality • disposal of solid wastes
Operation: exclusion zone vessel discharges vessel emissions	• impacts to water quality • impacts to atmosphere • impacts to marine organisms • noise impacts on marine fauna • exclusion of fishing vessels • navigation interactions • disposal of solid wastes • impacts to tourism and recreation • visual impact

13.2 AIR QUALITY IMPACTS

13.2.1 Introduction

This section identifies potential impacts to air quality as a result of marine based activities associated with construction and operation of the BTC Marine Terminal. Impacts to air quality have been identified when an activity is predicted to result in a change to the baseline situation. The significance of an impact has been determined using the impact significance criteria set out in Section 3 of this report. The significance criteria are largely based on the Turkish and World Bank air quality standards. Mitigation measures have been identified and details are presented in this section.

13.2.2 Construction impacts and mitigation

Vessels and plant will generate atmospheric emissions during the installation and commissioning phases as a result of the combustion of marine diesel and fuel oil.

There will be a significant amount of activity from construction and support vessels during the installation and commissioning stage. The construction fleet will comprise approximately six vessels as follows:

- a crane barge;
- a barge with piling equipment;
- two support barges;
- two tug boats.

It is assumed that the construction fleet will use roughly 50te of fuel per day in total. Using generalised emission factors [Ref 1] and assuming vessels are using 1% sulphur fuel oil, this equates to the following approximate annual emissions:

- 3.0t NO_x;
- 4.0t CO;
- 163t CO_2;
- 1.0t SO_2;
- 0.2t hydrocarbons.

Distance dispersion will further serve to reduce impacts to coastal receptors, which will generally be well in excess of 2km from the emissions sources. Given the temporary, intermittent and dispersed source of these emissions, as well as the fact that they will be relatively remote from any sensitive receptors, only minor air quality impacts are predicted during construction.

13.2.3 Operational impacts and mitigation

Atmospheric emissions from tankers' engine exhausts will be relatively minor and will be an intermittent source during operation. A modern tanker uses relatively little fuel while berthed. Given that the tankers are loading, rather than offloading oil, their fuel requirement will be even lower. Using typical emissions factors [Ref 1], and assuming both berths are in regular use, the anticipated annual emissions from tanker burning 1% sulphur fuel oil at the proposed facilities are as follows:

- approximately 22t NO_x;
- approximately 3t CO;
- approximately 1,200t CO_2;
- 7t SO_2;
- 1t hydrocarbons.

While these emissions are not insignificant (for example an average household generates less than 1% of the equivalent CO_2), they are very low in the context of shipping. A tanker underway can use 60-200te of fuel per day, with commensurate increases in emissions, thus in the context of marine transport, the rate of emissions from tankers berthed at Ceyhan is considered minor.

Distance dispersion will ensure that air quality impacts to coastal receptors will be minor.

13.3 PHYSICAL IMPACTS TO THE SEABED

13.3.1 Introduction

This section identifies potential physical impacts to the seabed as a result of marine based activities associated with the construction and operation of the BTC Marine Terminal. Potential impacts to the seabed will result from any interaction between marine project components (eg the jetty) and the seabed. Such interactions are limited to minor disturbance

due to piling of the steel structure (ie construction impacts), as well as permanent loss of seabed habitat due to the stone causeway (operational impact). In the absence of criteria to determine the significance of impacts to the seabed, the impacts are based on professional judgement (see Section 3).

13.3.2 Construction impacts

The principal activity that has the potential to cause physical impacts to the seabed is likely to occur during jetty construction, in particular the installation of the 365m rock approach causeway from the shore and piling the legs of the trestle causeway extension. Construction of these structures is anticipated to involve the following key components.

- Construction of the causeway will be from shore, with rock material being dumped progressively seawards as the causeway is extended.
- Rock armour will be placed on the causeway from a barge, probably using a crane.
- Piling for the jetty will be carried out from a barge. Piles will be driven, though occasionally it may be necessary to drill through the piles to fit anchor bolts (though this is expected on less than 5% of piles).
- The deck and superstructure of the jetty will be prefabricated and placed using a crane barge.

Installation of the approach causeway will cause direct disturbance impacts to the seabed occupied and immediately surrounding the causeway structure (approximately 0.5ha). In addition, a total of 446 piles (approximately 1.5m diameter) and 36 piles (approximately 1.2m diameter) will be installed. The total pile footprint will result in disturbance to approximately 0.08ha of seabed.

Generation of localised, temporary turbidity plumes around the causeway and piles will be inevitable during construction activity. The majority of the piles will be driven rather than drilled, thereby minimising the re-suspension of seabed material. It is predicted that any increase in turbidity will be temporary in nature and will be well within the natural turbidity variation of the system. Disturbance impacts to the seabed during construction are therefore considered to be minor.

13.3.3 Operational impacts

Once construction is complete, the causeway will occupy less than 0.4 ha of shallow subtidal habitat (in a narrow strip from the shore down to the 5m isobath). This area represents a small area of seabed when considered in the context of the wider area. The physical presence of the causeway has the potential to cause changes in sediment dynamics locally and therefore to the ecology of the surrounding marine habitats. These impacts are discussed in Sections 13.4 and 13.6 respectively.

13.4 IMPACTS TO COASTAL PROCESSES

13.4.1 Introduction

This section identifies potential impacts to coastal processes as a result of marine based activities associated with construction and operation of the BTC Marine Terminal. Impacts to coastal processes are identified as occurring when an activity is predicted to result in a change

to the baseline situation. Any hard structure on the seabed or in the sea has the potential to affect microcirculation and associated sediment transport patterns. The extent of this impact relates to the precise nature of the structure as well as to the prevailing hydrodynamic regime and the precise composition and morphology of the seabed. In the absence of any guidelines or standards, professional judgement is used in order to assess the potential impacts to coastal processes.

13.4.2 Construction impacts and mitigation

There is only a limited scope for impacts to coastal processes as a result of the construction of the marine project components. Rock dumping for the causeway may cause a minor localised impact as the causeway grows. As with the operational impact of the causeway (see below), this is considered a minor impact.

13.4.3 Operational impacts and mitigation

There have been no reported erosional impacts from the existing numerous jetty structures that have been constructed as part of other industrial developments in the Gulf of Iskenderun. This is typically the case with open pile constructions, even those of the scale of the proposed jetty. Nevertheless, the configuration of the proposed BTC jetty differs from some other structures in that it incorporates a stone causeway/footing, as opposed to being an entirely 'open' steel structure.

Longshore drift is evident on the sandy beaches in the area (as seen in the aerial photograph reproduced in Figure 10.8). There is a consistent build up of sand on the southern side of headlands and hard coastal structures, indicating a net northward sediment transport regime. It is thus expected that sediments (primarily sand) will build up on the southern flank of the causeway, leading to the formation of a small sandy beach. This may in turn starve the existing BOTAŞ beach to the north of the proposed jetty, which as a result, may experience a slight decrease in size. Due to the small size of the causeway, worst case morphological impacts are anticipated to be moderate.

Monitoring of seabed levels and shoreline morphology will be conducted to determine the extent of changes on coastal morphology caused by the structure. If the changes are viewed to be significant, remedial action will be taken to replenish the existing BOTAŞ beach to the north of the proposed BTC Jetty structure.

13.5 IMPACTS TO WATER QUALITY

13.5.1 Introduction

This section identifies the potential for impacts to marine water quality as a result of construction, commissioning and operation of marine components of the BTC Marine Terminal. In addition, the impacts from terrestrial discharges to sea have also been identified and assessed. An impact to marine water quality is identified when an activity is predicted to result in a change to the baseline situation. The significance of an impact has been determined using the impact significance criteria set out in Section 3 of this report. The significance of any potential impact to marine water quality will ultimately depend on the use of the resource (eg for fishing, bathing) or its importance to ecology or amenity and the magnitude of the change caused by the Project. The significance criteria are largely based on World Bank and Turkish standards for each category of impact. Where no standards are available, professional judgement has been used. Mitigation measures have been identified and details are presented in this section.

13.5.2 Construction impacts and mitigation

13.5.2.1 Effluents

The principal effluents that will arise during construction of the marine terminal will comprise:

- sewage/grey water from the construction workforce (on land);
- untreated drainage from uncontaminated areas;
- treated drainage from potentially contaminated areas;
- standard vessel discharges (drainage, sewage).

Sewage and grey water generated at the main construction camps by the construction workforce will either be tankered to the municipal sewage works where it will be treated or it will be treated on site. If the latter option is used, sewage sludge will require subsequent disposal. In remote locations away from the main construction camps, chemical toilets will be used. These will be emptied on a regular basis by a licensed waste contractor. As no wastewater will be discharged to sea, there will be no impacts to marine water quality.

At present there are several disposal options for the uncontaminated and treated drainage, including disposal to sea. Untreated drainage will be limited to rainwater, sea spray run-off, etc from uncontaminated areas (eg the causeway under construction) and this will have no effects on the water quality and ecology of the receiving waters.

Drainage from potentially contaminated areas (eg vehicle washing areas, fuelling areas, machinery areas, roads, etc) will be routed to the oily water system for treatment. The preferred disposal route has not yet been finalised, however if treated water (oil in water content typically less than 15 mg l^{-1}) is discharged to sea, this will disperse rapidly. Impacts are therefore predicted to be minor under worst case scenarios.

Construction vessels used during construction will produce standard wastes and discharges typical of any vessel at sea. These will be managed according to Turkish and international regulations (specifically MARPOL 73/78) and will not be discharged within 12 nautical miles (21.5km) of land. Although discharges will not take place within the terminal vicinity, the following criteria will be met:

- Sewage will be comminuted and disinfected prior to discharge, which will not take place within 12 nautical miles from shore. Vessel sewage discharges will meet the following criteria:

  - BOD < 40 ppm;
  - Suspended solids < 50 ppm;
  - coliforms < 200 per 100 ml.

- Drainage, particularly that from ship machinery spaces, will be treated to ensure that oil in water does not exceed 15 ppm.

If the relevant regulations are followed and the standards met, impacts to the marine environment will be localised and minor in nature.

13.5.2.2 Solid wastes

Land based sources

Solid wastes will comprise a variety of substances, but can be categorised broadly into four groups:

- uncontaminated materials, including packaging, paper etc;
- kitchen wastes, predominantly comprising food scraps;
- clinical waste, potentially including bandages/dressings, used syringes and sharps;
- potentially contaminated materials, including oily rags/swabs, paint containers etc.

All solid wastes will be shipped offsite for appropriate disposal by licensed contractors according to the provisions of the Waste Management Plan (see Appendix C3). No solid wastes will be disposed of to sea or at locations where they could be transported to the sea by the wind or by surface run-off. Impacts to marine water quality from either construction or operation of the proposed facilities will be minor.

Construction vessel wastes

No trash will be disposed of overboard. Uncontaminated and other non-hazardous wastes will be stored for appropriate disposal onshore.

Kitchen wastes from construction vessels will be macerated and discharged overboard (consistent with MARPOL requirements, ie comminuted to pass through a 25mm grating and not discharged within 3 nautical miles from land), where they will disperse and degrade naturally. Any such discharge will not take place in port and will have no impact to marine water quality. Clinical wastes and potentially contaminated materials will be packaged and returned to shore for appropriate disposal by a specialist contractor. No special wastes will be discharged to the marine environment.

No impacts to the marine environment from disposal of solid wastes are therefore anticipated.

13.5.3 Disturbance to marine sediments

Localised disturbance to sediment during the construction of the approach causeway and trestle jetty structure has the potential to cause water quality impacts through the disturbance of potentially contaminated marine sediments. As the sediments in the vicinity of the causeway are not contaminated, secondary impacts to water quality are predicted to be minor at most.

13.5.4 Commissioning impacts and mitigation

It may be necessary to discharge the loading line hydrotest solution to sea. This will comprise approximately 4,300m^3 of inhibited seawater (if both are discharged together), ie seawater containing corrosion inhibitor or oxygen scavenger. The discharge will take place from the end of the jetty to maximise dispersion. Given this, and the low concentration of additives (residual levels of corrosion inhibitor will typically be present in concentrations of a few ppm, which is not toxic to marine life) in the discharge, impacts to the marine environment are anticipated to be minor on the basis that it is a temporary one-off event and that:

- chemical additives will be selected for their low toxicities to marine life and will be used at concentrations and discharged at a rate which will not cause harmful effects to

marine ecology beyond the immediate discharge mixing zone (ie a few tens of metres)

- the discharge will be at the seaward end of the jetty, into water with good depth and dispersion characteristics.

13.5.5 Operational impacts and mitigation

13.5.5.1 Effluents

The majority of aqueous wastes arising from marine terminal operations will be treated and discharged onshore.

Oily effluent water and contaminated surface drainage will arise from jetty operations. These will be treated to the required standards (as cited in Appendix D) in an oily waste separator and discharged to sea. A discharge of this volume flow and quality will have minor and very localised impact on water quality (and ecology). Sewage and grey waters will be retained in a tank and periodically transferred to the main wastewater treatment system at the onshore terminal site for treatment (see Section 9.4.13.3).

Tankers will produce standard wastes and discharges typical of any vessel at sea. These will be managed according to Turkish and international regulations (specifically MARPOL 73/78). Only segregated ballast tankers will berth at the proposed jetty, thus any ballast discharge will comprise clean water. There are no other anticipated discharges from vessels during the operational phase, thus only minor impacts are predicted from this source.

13.5.5.2 Solid wastes

Solid wastes during the operation of the proposed jetty and associated facilities will be managed in the same way as construction wastes, ensuring that there is no disposal to the marine environment and that all wastes are responsibly and appropriately disposed of in compliance with the Waste Management Plan (Appendix C3).

No environmental impacts from solid wastes associated with the marine facilities are predicted.

13.5.5.3 Antifouling treatment

Biofouling of all the submerged structures and those in the splash zone will inevitably occur. Biofouling can take place rapidly, with observable fouling communities being established within weeks on certain surfaces. Typically, bacteria and algae are the first organisms to settle, followed by larger algae, barnacles, tube-building worms, bryzoans and mussels. Eventually, a wide variety of animals may inhabit the community, including crabs and shrimps.

A well-developed fouling community has several implications for marine engineering of the jetty. The additional weight of a fouling community can be significant and static structures need to be designed to allow for this additional load otherwise chemical or physical antifouling treatments will be required. The facility will be designed to allow for the additional weight of a fouling community, therefore there will be no antifouling treatment required and thus no impacts will occur.

13.6 IMPACTS TO MARINE ECOLOGY

13.6.1 Introduction

This section identifies potential impacts to marine ecology as a result of construction and operation of marine components of the BTC Marine Terminal. Impacts to marine ecology are identified when an activity is predicted to result in a change to the baseline situation. The significance of an impact has been determined using the impact significance criteria set out in Section 3 of this report. The significance of any potential impact on ecology will ultimately depend on the status of the habitat or species and the predicted change as a result of an activity. The scale of an impact is generally subjective and often difficult to quantify, hence the significance of the impacts must quite often be based on professional judgement. Mitigation measures have been identified and details are presented in this section.

13.6.2 Construction impacts and mitigation

13.6.2.1 Physical disturbance

Disturbance to the seabed resulting from construction of the approach causeway and trestle jetty structure (Section 13.3) has the potential to result in localised sediment plumes. Sediment plumes and increased turbidity will result in some smothering to habitats and species in the vicinity of the proposed jetty structure. Organisms such as filter feeders are more susceptible to smothering than others, although many mobile species will simply move away.

Marine ecological data indicate that the diversity of benthic communities over the majority of the footprint of the jetty is low. Furthermore, the existing benthic community is pre-adapted to a certain degree of disturbance, as available data indicate that the seabed is mobile under prevailing natural conditions. Shallow water communities dominated by opportunistic species, as are present in this location, are anticipated to recover in 2-3 years.

An area of approximately 0.5ha in total will be permanently lost due to the presence of the causeway structure and piles supporting the trestle jetty. This represents only a small area of seabed in the context of the wider area. As no rare or protected species were noted during the marine surveys [Ref 2] and the faunal assemblages noted are typical of the wider area, the significance of habitat loss is anticipated to be minor.

The causeway structure will provide a hard substrate that will be colonised by hard bottom dwellers such as seaweeds, crabs and barnacles, thus increasing the biodiversity in the vicinity of the jetty structure and providing a refuge and feeding area for a number of small organisms and fish.

In the long-term geomorphological changes associated with the physical presence of the causeway and jetty piles will provide both new areas for colonisation and minor loss of existing habitats. Impacts will be localised and the net impacts to fauna are anticipated to be positive.

13.6.2.2 Acoustic disturbance

Characteristics of underwater noise

For a sound signal to be detected, it must contain sufficient energy to exceed any ambient noise present at frequencies near the signal frequency. The signal to noise ratio (at the receiver) is determined by the source level, the transmission through air or water and the

ambient noise level. The potential effects of anthropogenic noise on marine fauna may occur in a zone much smaller than implied by signal to noise ratios considerations alone, due to the varying responsiveness of different animals.

Generic impacts of noise on marine biota

The potential effects of noise on marine organisms can be categorised as follows:

- potential for changes in behaviour (including avoidance and attraction);
- potential for interference with acoustic communication;
- potential for physical damage (including damage to hearing apparatus).

Mobile fauna may exhibit behavioural changes, however, these are often hard to detect. Behavioural changes will typically involve a cessation of normal activities and the commencement of avoidance or 'startle' behaviour as a result of the detection of sound from marine construction activity. Continued detection of noise activity by organisms often results in habituation to the sound, followed by a re-commencement of normal behaviour.

Interference with sounds produced by animals for communication purposes is also difficult to assess, but is likely to result in the temporary cessation of sound production, or a muffling of sounds.

Physical damage can arise from the differential rate of transmission of sound pressure waves through tissues of varying densities. The effect is particularly marked at interfaces between tissues and gas-filled cavities, for example, the swim-bladders of fishes or the lungs of mammals. The sound-receiving apparatus of most organisms is generally comprised of sensory hair cells, which are extremely sensitive to vibrations. Over-stimulation of these can potentially lead to permanent damage.

For an organism to respond to anthropogenic noise, the sound has to exceed that of the ambient noise, which has either non-biological or biological origins. McCauley [Ref 3] noted that non-biological underwater noise has three sources, namely wind (including waves and the surf zone), rain and anthropogenic causes. Wind noise increases with increasing wind speed and most of the noise is generated by bubble oscillations within waves [Ref 4]. Rain produces broad-frequency spectra noise, increasing with the intensity of the downpour.

The most pervasive anthropogenic noise sources are those produced by ships. Shipping sounds cover a wide range of frequencies, and include extremely loud noises when the source is in close proximity. Table 13.2 summarises the non-biological sources of marine noise and provides some expected ranges in relation to the proposed terminal marine facilities.

Underwater biological noises are produced by a wide variety of marine organisms, particularly during reproduction, displays of territoriality and echolocation. Marine invertebrates, for example rock lobster *Panulirus* spp [Ref 3] and snapper shrimp *Alpheus* spp, generally utilise frequency spectra greater than 2kHz. Sounds produced by fish have a wider frequency range, from 100Hz to about 5kHz. Marine mammals demonstrate the greatest range of frequencies during sound production, ranging from 12Hz in large baleen whales such as blue whale *Balaenoptera musculus* to 160kHz in harbour porpoises *Phocoena phocoena* [Ref 4].

Table 13.2 Comparison of Underwater Noise Types (dB[(1)])

SOURCE	FREQUENCY AND STRENGTH
Wind	1Hz - 25 kHz; 95 at 100-200Hz (Force 12)
Rain	Broad spectrum; 80 (heavy rain)
Ships	1Hz - 1kHz; 0 - 200(depending on range)
Invertebrates	2-10kHz; <140
Fish	100Hz - 5kHz; <140
Note: (1) dB – decibels re 1µPa at 1m	

Potential impacts on fish

There appear to be no studies on the reactions of fish to marine construction noise, however there are several studies on fish reaction to seismic activity, which can be used to give an indication of the anticipated impacts. The noise from many marine construction activities is within the same frequency envelope as the noise from the seismic activity.

Behavioural changes became noticeable at about 180dB re1µPa at 1m, and increased with increasing sound intensity. Studies have also demonstrated the ability of fish to acclimatise to airgun noise with time [Ref 5].

The anticipated noise from jetty construction will be related both to vessel noise and the acoustic impact of driving piles.

- Tugs/barges typically generate noise levels in the order of 160 dB at 630 Hz [Ref 6].
- The underwater noise generated by pile driving is typically 130-135 dB re1µPa at 1m, with the strongest signals at approximately 35 and 100 Hz [Ref 6], although levels as high as 246 dB re1µPa at 1m have been recorded.

Both these noise sources are generally below the threshold where behavioural changes are seen in fish, though clearly at very close range (eg a few metres to tens of metres from the piles) fish will be deterred. Even if transient noise levels are significantly higher, this will only serve to make fish avoid the immediate area of marine works for the duration of the actual construction activity. There is considerable evidence to show that fish readily and rapidly return to their former ranges after noisy activities cease, even when the sound pressures are significantly higher eg those associated with seismic shooting [Ref 6]. Overall, impacts to fish due to construction noise will be minor, short-term and localised.

Potential impacts to cetaceans

Cetaceans in general are thought to be fairly tolerant of noise disturbance from marine construction activity and studies have indicated that they readily adapt to changes in noise levels as long as the disturbance is not associated with any activity having a negative effect on them or an apparent threat to them [Ref 4]. There appears to be little available information regarding the effects of noise on dolphins, however studies involving other toothed whales have indicated that disturbance as a result of marine construction has been minimal.

Bottlenose dolphins (*Tursipos truncatus*) reside in many channels used by vessels ranging in size from large tankers to pleasure boats and sport-fishing boats. In Mexico, bottlenose dolphins exposed to frequent boat traffic showed little reaction unless a boat came within 5m [Ref 7]. Sperm Whale (*Physeter macrocaphalus*) reactions to vessel presence are varied,

however, 'startle' reactions have been observed during some attempts to approach sperm whales [Ref 4]. Evidence from the Gulf of Mexico suggests that both pygmy and dwarf sperm whales (*Kogia breviceps* and *K. simus*) orient away from motorised vessels [Ref 4]. There is, however, no clear evidence to suggest that toothed whales have abandoned significant parts of their range because of vessel presence [Ref 4].

There do not appear to be any specific examples of studies undertaken in the Mediterranean, however, it is not anticipated that the noise from construction activity will have any significant effects on cetaceans. If cetaceans are observed within the vicinity of the proposed marine facilities during construction, any vessels will take great care. With the possible exception of an emergency situation, at no time will vessels approach marine mammals at high speed or make rapid changes in course in their vicinity. To this end, a watching brief for cetaceans during construction activities will be in place.

The noise from other marine construction activities is anticipated to have a minor impact only on cetaceans, due to several factors:

- Cetaceans are relatively tolerant of noise at the levels produced by such activities as piling.
- Cetaceans are unlikely to be present in the immediate vicinity of construction activities.
- Cetaceans can easily avoid areas of temporarily high noise levels.

Impacts of underwater noise to seabirds, turtles and seals

The effects of underwater noise on birds and reptiles have not been well studied. Nonetheless, these are highly mobile and wide-ranging animals and it is expected they would avoid areas where noise pressures were excessive. In any event, seabirds would only be subject to underwater noise while actively fishing. This activity is of short duration (relative to roosting and overflight) and any noise exposure will consequently be minor. Since turtles continue to use the wider Iskenderun bay, despite substantial past marine construction activity, it is reasonable to assume that construction noise impacts to turtles will be minor at most.

As the Mediterranean Monk Seal has not been observed within the project area, the potential for noise impacts to this specie is low.

13.6.3 Operational impacts and mitigation

13.6.3.1 General

The potential for ecological impacts from the operation of the marine facilities is relatively limited. The following sources of impact have been identified:

- physical and acoustic impacts associated with tanker traffic;
- the provision of new habitat;
- loss of habitat for turtles through beach erosion;
- impacts of invasive species brought by ballast waters.

Each of these impacts is addressed in the subsections that follow.

13.6.3.2 Impacts of tanker traffic

The typical noise generated by large tankers is in the order of 177dB predominantly around 100Hz [Ref 6], or in the region of 190dB at 25-35Hz [Ref 4]. The latter is at or below the frequency threshold for most fish, and is not likely to have significant impacts [Ref 8]. Loud noises at slightly higher frequencies (the 100-300Hz range) are likely to result in some behavioural change, eg formation of tighter schools and avoidance of the noise source, which is analogous to a normal defence reaction in shoaling fish. Available data suggest that typical avoidance/displacement distances in such situations are in the region of 100-200m [Ref 9].

It should be noted, however, that as the tankers will be stationary for most of the time, the noise generated will be considerably less, thus impacts to fish are expected to be minor. This is supported by the observation that fish frequently shelter under stationary or moored vessels, even if the engines are running. Additionally, tankers on approach to the BTC Marine Terminal jetty will not be running engines at full load, thus the noise levels quoted above will be a significant overestimation.

Research indicates that turtles and marine mammals may react to moving tankers. However, the Gulf of Iskenderun currently has significant amounts of large vessel activity much of it in defined ‘lanes’. It also has smaller fishing boat movements over a wide area. The main threats, other than loss of nesting beaches to turtles, are entanglement in fishing nets, hunting/deliberate killing and choking on marine debris (eg plastic bags). Tanker movements will not add to these threats. The Gulf of Iskenderun does not appear to support any substantial resident or migrating populations of marine mammals. Those that do use the area are probably acclimatised to the current level of marine activities and are unlikely to be further disturbed by tanker movements to and from the BTC Marine Terminal.

Given that the proposed facilities will comprise only two berths, and traffic will be limited to relatively slow moving tankers with approximately 350 to 400 movements per annum, it is expected that operational marine noise will cause only minor impacts to marine turtles and mammals. Further consideration is given to this impact assessment in Section 16, Cumulative Impacts.

13.6.3.3 Provision of new habitat

The jetty piles and rock armour of the causeway will provide a new habitat/substrate for marine organisms. This will have some minor positive ecological impacts in that the different substrata will attract different colonising organisms and add to the overall diversity of what is a fairly impoverished area. Any crevices would provide shelter for grazers and foragers. In addition, sediment may collect in the interstitial spaces encouraging the development of characteristic soft-bottom communities. The jetty structures will also provide shelter from predation for certain species of fish.

13.6.3.4 Loss of habitat through beach erosion

Turtles require low gradient sandy beaches for nesting. The changes in coastal morphology together with the process of longshore drift, has the potential to reduce the nesting resource for turtles locally. However, several factors combine to reduce the scope of such an impact, namely:

- the quantity of beach material intercepted by the jetty footing will be relatively small, thus the knock-on erosion impact to the BOTAŞ beach north of the jetty will be minor;

- the change in sediment budget will be temporary and only last for as long as it takes any accretion around the jetty footing to achieve equilibrium. Thereafter, surplus material will be transported to the BOTAŞ beach as it is currently;

- although two nests were observed on the BOTAŞ beach during the Envy 2001 survey [Ref 2], the relative importance of this beach in the context of the western part of the Gulf of Iskenderun is small. The area to the south of the terminal site between Uzunkelli and Golovasi is of significantly greater value to nesting turtles, where the density of turtle signs was up to 68 per 10km, compared to 20 turtle signs per 10km on the BOTAŞ beach;

- this beach is regularly used as an amenity by personnel from the existing terminal. The disturbance to turtles from regular use of the beach is considered to be much more of a limiting impact that any minor change in sediment.

Although it is not considered that minor changes in beach morphology constitute any significant habitat loss to breeding turtles, the evidence from the turtle surveys undertaken during the summer of 2002 indicates that egg and hatchling predation constitute a significant threat to the reproductive success of sea turtles in this area. As a consequence, it is recommended that measures be introduced to safeguard turtle nesting on the BOTAŞ beach; such measures may include the collection of laid eggs and the establishment of a protected hatchery area within the beach area as well as measures to discourage predators during the period when hatchlings are at risk.

13.6.3.5 Potential introduction of alien species

The introduction of alien species has been a problem in several sea areas around the world, notably the Black Sea, which has experienced significant ecological perturbations due to introduced species such as the planktonic predator *Mnemiopsis leydii* [Ref 10]. The eastern Mediterranean has more diverse and complex marine communities than the Black Sea. This means that ecological niches available for opportunistic colonists are generally fewer than in poorer systems where competition may be less intense. The potential for a catastrophic ecological impact by immigrant species is thus reduced. Of a total of 650 fish species recorded in the Mediterranean, 90 species, representing 56 families are relatively recent arrivals from distant seas. For the past 130 years, the main route of exotic fish species to the Mediterranean has been from the Red Sea through the Suez Canal (termed ‘Lessepsian migration’). The colonisation of Red Sea (Erythrean) fishes has had a major impact on Levantine waters where more than a dozen of these Lessepsian migrants have become important components of commercial fisheries[Ref 14]. Significant lessepsian fish species present in Iskenderun Bay are identified in Section 11.4.3.

The introduction of invasive marine species into new environments by ships’ ballast water, attached to ships’ hulls and via other vectors has been identified as a serious threat to the world’s oceans. Concerns have been voiced at the international level by several organisations including the IMO, GESAMP and CIESM. In response IMO has developed Guidelines for the Control and Management of Ships Ballast Water to Minimise the Transfer of Harmful Aquatic Organisms and Pathogens (Resolution A.868(20)). These Guidelines can be used as a tool, which if correctly applied, will help to minimize the risks associated with ballast water discharge. As scientific and technological advances are made, the Guidelines will be refined to enable the risk to be more adequately addressed. In the interim, the IMO has stated that port States, flag States and other parties that can assist in mitigating this problem should exercise due care and diligence in an effort to conform to the maximum extent possible with the Guidelines.

In recognition of the limitations of the current IMO voluntary guidelines, the current lack of a totally effective solution and the serious threats still posed by invasive marine species, IMO member countries have agreed to develop a mandatory international legal regime to regulate and control ballast water. The IMO's MEPC and its Ballast Water Working Group, are well advanced with developing a new Convention that, it is hoped, will be adopted in 2003. The draft Convention requires ballast water to be sampled and analysed for suspended solids, temperature, salinity, dissolved oxygen and toxic plankton. BTC tankers intending to discharge ballast water will be subject to this law and will require a certificate to discharge ballast at the BTC Marine Terminal. If a Port Authority with responsibility for sampling finds phytotoxins in the ballast water, the ship will be prevented from discharging. As a result, the potential for the introduction of phytotoxins will be minimised, thereby reducing the impact of alien species.

The Gulf of Iskenderun experiences a significant level of international and intercontinental shipping, and has done for decades. The opportunity for colonisation by opportunistic 'aliens' therefore already exists, and will not be significantly changed by the tankers operating from the BTC Marine Terminal, particularly, as many of these vessels will be operating within the Mediterranean basin.

The marine habitats of the project area have thus already been impacted, and will continue to be in the future, regardless of BTC related shipping. Impacts are therefore considered to be minor.

13.7 IMPACTS TO MARINE ARCHAEOLOGY

There are no marine archaeological receptors identified in the vicinity of the proposed BTC Marine Terminal, consequently no archaeological impacts are anticipated. During construction of the jetty, a watching brief will be kept to ensure that appropriate action is taken should any new marine finds be discovered. In the unlikely event of a find, the appropriate authorities will be notified and the find fully documented in accordance with the Cultural Heritage Management Plan (see Appendix C7).

13.8 IMPACTS TO FISHERIES

13.8.1 Introduction

This section identifies potential impacts to fisheries as a result of marine based activities associated with construction and operation of the BTC Marine Terminal. Impacts to commercial fisheries have been identified when an activity is predicted to result in a change to the baseline situation. This section focuses on the predicted changes to fish stocks and fishing activity. Any knock-on effects to livelihoods are discussed in Section 12.

As there are no formal fisheries statistics available for the study area, this assessment has relied, to date, on the reports of local fishermen from Golovasi/Sahil Sitesi, Incirli/Deveciusagi and Haylazi. An additional study, which has collated formal fisheries statistics, has recently been completed. Once the final results have been reviewed, the findings will be used to update the existing mitigation measures such that the impacts to local fishermen are adequately addressed.

13.8.2 Construction and operational impacts and mitigation

The jetty development requires the establishment of an Exclusion Zone and a Manoeuvring Area, enforceable for the full life of the Project (40 years).

The Exclusion Zone (ie that enforced by the coastguard) will be implemented during construction and operation and will be confined to an area 400m on either side of the jetty, ie an area in the order of 208ha.

The Manoeuvring Area around the proposed marine facilities will be approximately 1 nautical mile (1.8km) across, to allow for safe tanker manoeuvring. The size of this zone means that it will overlap with the operational area for the existing jetty to the north, and extend to cover an additional area to the south. In such operating zones, fishing is prohibited by law.

Ecologically, the presence of the exclusion zone and resultant reduced fishing activity in this area may cause an increase in fish numbers during the lifetime of the Project. The use of fishing refugia in promoting recovery of fish populations is receiving increased attention [Ref 11; Ref 12; Ref 13] and the proposed jetty exclusion zone could well act as such. This is anticipated to result in a minor positive impact.

The area in the vicinity of the proposed jetty area is already within a wider operating zone for the Toros Gubre Fertilizer Facility, in which fishing is prohibited by law. Although no formal fisheries statistics for the area are available, consultation with the local fishing community suggests that fishing is carried out in the vicinity of the proposed jetty. Although fish stocks are generally reported to be low in the Gulf of Iskenderun, local communities are reported to rely heavily on fishing as a source of income. It has been noted that shrimp (*karides*) fishing is important locally, having a higher market value than other fish. Due to the uncertainties associated with the information sources, the scale of the impacts to fishermen is unknown. Any negative impacts associated with the loss of fishing grounds, are however, likely to be confined to fishermen from the nearby settlements of Golovasi and the associated hamlet of Sahil Sitesi who are known to fish in the area. Section 12 discusses the likely implications for livelihoods. In the absence of any formal data, the available information suggests that fishing activity in the area is likely to be low to moderate, despite the existence of the wider exclusion zone.

Given the beneficial effects to fish biology (and fish stocks) that will result from the presence of the exclusion zone, overall impacts to fishermen will be mainly influenced by physical constraints on fishing efforts as opposed to the actual availability of fish (see Section 12 for a fuller discussion).

13.9 IMPACTS TO NAVIGATION AND SHIPPING

13.9.1 Introduction

This section identifies potential impacts to shipping and navigation in the Gulf of Iskenderun. Impacts to shipping and navigation have been defined when an activity is predicted to result in a change to the baseline situation. In the absence of significance criteria, the significance of an impact has been determined through professional judgement.

13.9.2 Construction impacts and mitigation

Construction vessel activity will be confined to the immediate vicinity of the BTC Jetty, other than during mobilisation and demobilisation. This area is not frequented by other vessels, other than tankers *en route* to/from the existing BOTAŞ Marine Terminal facilities, which, due to the presence of a wider exclusion zone, are under the direction of pilots.

It is not anticipated that vessels deployed during construction will affect other navigational interests in the Gulf of Iskenderun. Interaction between vessels at sea and rights of passage

are governed by international maritime regulations and protocols, which are generally adhered to by officers and crew of commercial maritime traffic, who will be familiar with them. As such, impacts from construction vessels are considered to be minor.

13.9.3 Operational impacts and mitigation

13.9.3.1 Exclusion zones

The limited aerial extent of the Exclusion Zone is such that it will not interfere with other navigation in the Gulf of Iskenderun. The wider manoeuvring area of 936ha (9.36km^2) may require some vessels en route to the Toros Gubre Fertiliser Facility to approach from a slightly more seaward direction, but given the presence of an exclusion zone around the existing BOTAŞ facility, any additional re-routing is not considered significant. The exclusion and operating zones will be clearly marked on future nautical charts, and notices to mariners will be posted as appropriate in the interim.

Local *bona fide* navigation associated with the fishing fleet from the settlement of Sahil Sitesi (Golovasi) will not be affected.

13.9.3.2 Tanker traffic

Tanker traffic associated with the operational terminal will follow the existing shipping lanes, and will only comprise an incremental change to the existing pattern of shipping. Within the Ceyhan port area, pilots will be used to guide vessels to ensure safe transit.

Given the existing level of commercial traffic in the Gulf of Iskenderun (eg that associated with existing terminals, the Toros Gubre Fertiliser Facility and industries around Iskenderun itself), tanker traffic is likely to represent a minor impact to the current maritime navigation regime. It is recommended that a shipping risk study be undertaken prior to operation in order to predict cumulative impacts and design appropriate procedures for the long term management of tanker traffic in the vicinity.

13.10 IMPACTS TO TOURISM AND RECREATION

13.10.1 Introduction

Construction and operation of the BTC Marine Terminal site and proposed marine facilities has the potential to cause impacts to recreation and tourism. Impacts have been defined when an activity is predicted to result in a change to the baseline situation. The significance of impacts to tourism and recreation is often difficult to determine and is quite subjective in nature. In the absence of significance criteria, the significance of an impact has been determined through a combination of consultation with local stakeholders that might be affected and professional judgement.

13.10.2 Construction and operational impacts and mitigation

Tourism is not an existing major source of income in the project area. Existing tourism and recreational facilities in the project area are largely confined to tourist facilities at the settlements of Incirli, Golovasi, Sahil Sitesi and the BOTAŞ recreational facilities.

Factors, which may affect the area's suitability as a tourist site, are the visual impacts of the existing BOTAŞ Marine Terminal, tanker traffic and increased industrialisation in the wider project area. The proposed BTC Marine Terminal will result in incremental visual impacts,

increased tanker traffic and minor noise impacts (construction phase only), however it will not change the overall character of the area.

It is possible that there may be some decline in regional visitors to the area as a result of the reduced tourism and recreational appeal, however these impacts are anticipated to be minor at most.

The potential for impacts to livelihoods associated with tourist activities is discussed in Section 12 of this report.

BIBLIOGRAPHY

Ref 1 Lloyds Register (1990) Marine Exhaust Emissions Programme: Steady State Operation. Lloyds Register, London.

Ref 2 ENV-REP-ENS-TRG-001. Sea Turtle Survey Report, Rev 0. ENVY (2001)

Ref 3 McCauley, R.D. (1994) *Seismic Surveys* In: Swan, J.M., Neff, J.M. and Young, P.C. (eds) Environmental Implications of Offshore Oil and Gas Development in Australia – The findings of an independent scientific review – APEA, Sydney.

Ref 4 Richardson, W.J., Greene, C.R., Malme, C.L. and Thompson, H.H. (1995) Marine Mammals and Noise. Academic Press, San Diego, 576 pp.

Ref 5 Chapman, C.J. and Hawkins, A.D. (1969) The importance of sound in fish behaviour in relation to capture by trawls. *FAO Fisheries Report* 62 717-729.

Ref 6 Vella, G., Rushforth, I., Mason, E., Hough, A., England, R., Styles, P., Holt, T. and Thorne, P. (2001) Assessment of the Effects of Noise and Vibration from Offshore Windfarms on Marine wildlife. Department of Trade and Industry Energy Technology Support Unit (DTI/ETSU) report w/13/00566/REP

Ref 7 Acevedo, A. (1991) Interactions between boats and bottlenose dolphins in the entrance to Ensenada de la Paz, Mexico. *Aquatica Mammalia* 17 120-124

Ref 8 Engas A, Misund O A, Soldal AV, Horvei B and Solstad A (1995) Reactions of penned herring and cod to playback of original, frequency filtered and time smoothed vessel sound. *Fish. Res.* 22, 243-254

Ref 9 ICES (1995) *Underwater Noise of Research Vessels: Review and Recommendations* ICES Cooperative Research Report 209, ICES Copenhagen

Ref 10 GESAMP (IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). 1997. Opportunistic settlers and the problem of the ctenophore *Mnemiopsis leidyi* invasion in the Black Sea. *Rep.Stud.GESAMP*, 58 84 pp.

Ref 11 Carr, M. & Reed, D. (1993) Conceptual Issues Relevant to Marine Harvest Refuges *Can. J. Fish. Aquat. Sc.,* 50

Ref 12 Rowley, R.J. (1994) Case Studies and Review, Marine reserves in fishery management, in *Aquatic Conservation: Mar. & Freshwater Ecos.* 4 233-254

Ref 13 Dayton, P.K., E.Sala, M.J. Tagner and S. Thrush (2000) Marine Reserves: parks, baselines and fishery enhancement. *Bull. Mar. Sci* 66(3) 617-634

Ref 14 *International Commission for the Scientific Exploration of the Mediterranean Sea (2002),* from their website http://www.ciesm.org/.

14 MARINE TERMINAL - ACCIDENTAL EVENTS AND INCIDENTS

14.1 INTRODUCTION

A description of the facilities and anticipated operational activities associated with the BTC Marine Terminal is presented in Section 9. The assessment of terrestrial and marine baseline environmental conditions at (and in the vicinity of) the Terminal are presented in Sections 10 and 11 respectively, while potential impacts and measures for their mitigation under normal operating conditions are provided in Sections 12 and 13. This section of the EIA Report addresses potential accidental events, which could lead to a spill of oil and consequential environmental damage.

This section of the Report addresses the accidental oil spill events associated with the Proposed BTC Marine Terminal, their likelihood of occurrence, the principal environmental sensitivities in the vicinity, and contingency measures that will be put in place to avoid any impact. It specifically excludes the assessment of accidental events arising from operation of the pipeline or the associated AGIs, which are covered in Section 8.

The underlying principles of environmental risk assessment (ERA) are described fully in Section 8.3 (with reference to the BTC Pipeline and associated facilities) and the discussion is not repeated here, other than to emphasise that for the purposes of this assessment, environmental risk may be defined as follows.

Environmental Risk = Frequency of Failure Event x Consequences of Event (which relates to Volume of oil spilled and Environmental Sensitivity)

The ERA has followed a similar broad approach to that adopted for determination of environmental risk of the Pipeline AGIs in Section 8.8. However, because of the more extensive nature of the facilities, higher intensity of oil movements and greater sensitivity of the (marine) environment, a significantly more wide ranging assessment is appropriate for assessment of accidental events associated with operation of the BTC Marine Terminal.

The assessment has focused on three aspects of BTC Marine Terminal operations:

- risks associated with accidental events within the terminal complex leading to oil spills that impact the terrestrial environment only;
- risks associated with accidental events both on-shore and offshore that impact the marine and coastal environment (principally within the Gulf of Iskenderun);
- trans-boundary consequences of shipping accidents at sea.

14.2 TERRESTRIAL SPILLS

14.2.1 Initiating events

14.2.1.1 Overall approach to assessment of risks

The approach adopted for the assessment of risk posed by the Pipeline and associated AGIs has been presented in Section 8. A similar approach has been adopted for the assessment of environmental risks posed by activities associated with operation and export of oil from the BTC Marine Terminal.

A Quantitative Risk Assessment (QRA) has been undertaken of the BTC Marine Terminal, which has identified various scenarios relating to the accidental release of oil from the proposed Terminal facilities. As a first step, the main hazards associated with the BTC Marine Terminal facilities have been identified. These included the following equipment installations:

- the storage area with seven crude oil floating roof tanks;
- two 42" gravity fed ship loading pipelines;
- scraper receiving station and relief tank.

A detailed assessment of the likely frequency of release of crude oil from these facilities was then carried out. The following modes of release were considered:

- releases from crude storage tanks and scraper receiving station;
- releases from ship loading pipelines.

A consequence assessment to determine associated release quantities was then carried out and this, combined with the frequency of spills, was used to determine the overall level of risk of a spill event.

By including a consideration of the key receptors of potential spill scenarios, the conventional assessment of the risk of a spill event (ie size of spill versus frequency) has been extended to ascertain the risk to the environment. The result of this is a more complete understanding of the likelihood and consequences of spills, which will feed into the development of the Oil Spill Response Plan (OSRP, an outline of which is presented in Appendix C6). It is intended that the OSRP will address the full range of identified scenarios and develop strategies to mitigate the potential hazardous outcomes.

14.2.1.2 Assessment of terrestrial hazards

The hazards identified in the ERA have been assessed in a HAZOP study and essentially relate to a release of oil to the environment. The failure mode or initiating event that may result in a release, the cause of the initiating event and related control and mitigation actions are detailed in Table 14.1 and Table 14.2. Control actions relate to actions that limit the frequency of occurrence of the failure mode. Mitigation actions relate to actions that limit the potential hazardous impact in the event that failure mode does occur.

Table 14.1 Crude Oil Storage Failure Modes and Associated Actions

Failure Mode	Cause	Control and Mitigation Actions
Tank overfilling:	Human error	Status of tank valves, as well as levels is monitored by SCADA system.
	Faulty level indication	Tank management system is backed-up by independent LSHH which closes the inlet valve.
Tank Leak:	Corrosion	Internal coating will be in place for lower shell course and tank bottom. Cathodic protection system provided. Leak detection system will be in place in tank foundation. Daily tank external inspections and annual internal inspections.
	External loading/impact	Wind, rain, seismic loadings are taken into consideration in accordance with the standards. Thermal loading of pipe connections is also considered.
	Defect in wall and/or bottom	Tests will be carried out during construction, as well as hydrotest as required by the standards.
	Gasket/flange/valve leak in bunded area	All areas where leakage could occur are protected by a bund or catchment pit. Operator inspections shall detect such minor leaks.
	Poor QC inspection	Appropriate requirements are defined in the specifications. Construction shall be monitored by nominated Employer's Representative and Third Party Inspectors as required.
Catastrophic tank rupture:	Corrosion	Corrosion control as appropriate.
	External events (earthquake)	Seismic loading is included in the design.
	Fire	Fire fighting systems (cooling water, rim foam, external water and foam hydrants) will be in place in accordance with the required standards. Twofire tenders will be provided. Fire station is permanently manned. Fire detection system is provided.
	Flame impingement	Cooling rings are provided for tanks.
Bund failure:	Overtopping of bund by surge of liquid	Bund is sized for 110% of tank capacity in accordance with the required standards.
	Structural failure of bund wall due to impact of liquid	Bund wall has been designed in accordance with the relevant standards.
	Over flow of bund wall by retained fire water	Single tank bund capacity is 165,000 m^3, fire fighting reservoir capacity is 6,800 m^3.
General hazards:	Drain valves left open	Main process drain valves are connected to the closed drain system. Closed drain tank has LAH and LAHH. Tank drain valves are routed to drain pits within the respective bunds; each drain pit has a LAH alarm.

Failure Mode	Cause	Control and Mitigation Actions
	Holes in the bund wall	Monitoring by operators. Internal bund wall has appropriate lining, pipe penetrations have special sealing arrangements.
	Failure of two or more tanks in a common bund	Each main storage tank has its own bund.
	Rocketing of tanks carrying associated burning liquid.	Separation distances between tanks and other facilities are in accordance with standard practice.
	Vandalism/sabotage	Main tank farm is within its own security fenced area, which is respectively located within the existing BOTAŞ security fenced area.

Table 14.2 Ship Loading Pipelines Failure Modes and Associated Actions

Failure Mode	Cause	Control and Mitigation Actions
Leak in ship loading pipeline:	Corrosion/erosion	Buried pipeline has external coating and cathodic protection system. Leak detection system is also provided. Flow velocities are below the erosion velocity.
	External loading/impact	Pipeline is buried with min 0.8m cover up to jetty and along jetty is separated from the main causeway.
	Defective pipe	Pipe is factory tested and will also be subject to field NDT and hydrotest.
	Gasket/flange/valve leak	The pipe and associated valves are generally fully welded. All areas where leakage could occur (such as flanged connections) are protected by a bund or catchment pit.
	Surge	Surge study has been carried out and appropriate overpressure protection facilities will be in place.
	Inadequate QA/QC controls/inspection	Appropriate requirements are defined in the specifications. Construction shall be monitored by nominated Employer's Representative and Third Party Inspectors as required.
	Materials/construction defect	Appropriate NDT and inspection requirements have been specified.
Rupture of ships loading pipeline:	External loading/impact	Jetty is designed for impact of 0.2 m/s
	Overpressure and surge	Surge study has been carried out and appropriate overpressure protection facilities will be in place.

Failure Mode	Cause	Control and Mitigation Actions
	Natural hazards	Geohazard study has been carried out and appropriate design factors incorporated. Other environmental conditions (eg wave height, wind, etc.) have been investigated and appropriate design factors incorporated.
	Inadequate QA/QC controls/inspection	Appropriate requirements are defined in the specifications. Construction shall be monitored by nominated Employer's Representative and Third Party Inspectors as required.
	Materials/construction defect	Appropriate NDT and inspection requirements have been specified.

The above tables demonstrate the extent to which design measures have been implemented to minimise risk to both the terrestrial and marine environments.

14.2.2 Frequencies of failures and consequences of spills to land

For land releases, the maximum spill into the local environment is catastrophic rupture of a storage tank with subsequent bund overtopping. This could lead to the release of up to 12,600te oil, but such an event is rare. It is calculated that the return period for such an event is in the order of 100,000 years [Ref 10; Ref 11].

Bund walls are not designed to contain catastrophic failures, but unless the bund wall is built significantly higher, theoretically it will not fully contain all the oil if the stock tank unzips. It is concluded however, due to the remoteness of the event increasing the height of the bund is not justified. Table 14.3 shows the frequency of release of various spill sizes resulting from the rupture of storage tanks based on the maximum head from the storage tanks to the onshore pipeline.

Table 14.3 Spill Sizes vs Frequency of Releases from Storage Tanks

Release	Amount spilt (tonnes)	Frequency (per year)	Impact
50mm leak	2300	6×10^{-4}	Release in bund
Rupture into bund	126000	4×10^{-5}	Release in bund
Rupture and overtop	12600	1×10^{-5}	Release outside bund

A rupture of the pipeline connecting the terminal to the jetty would also give rise to a catastrophic release into the local environment. The release rates of the spills from the ship loading pipelines have been modelled using the BP Cirrus software (version 6.1, 2000). The release rates for the various hole sizes are given in Table 14.4 based on the maximum head from the storage tanks to the onshore metering (120m head).

Table 14.4 Release Rates for Ship Loading Pipeline

Hole size (mm)	Release rates (kg/s)
25	2.9
50	12
100	47
Full bore rupture	5000

The frequency of spills from the ship loading pipeline have been determined and Table 14.5 shows the frequency of spills along with the corresponding spill quantities.

Table 14.5 Spill Sizes vs Frequency from Ship Loading Pipelines

Hole size (mm)	Amount spilt (tonnes)	Frequency per year
25	21	6.5×10^{-4}
50	45	3.7×10^{-4}
100	90	3.1×10^{-4}
Full bore rupture	2600	2.2×10^{-5}

There are standard codes of practice for such pipelines and it is judged that adherence to such codes would ensure that the risk is as low as reasonably practicable (ALARP) as the frequency of a major pipeline failure is again remote.

14.2.3 Accounting for geohazards

The ERA has included a quantitative assessment of the possible geohazards at the proposed BTC Marine Terminal. During this study hazards and associated actions to mitigate these hazards have been identified (see Table 14.6).

The main geohazard identified is a seismic event due to the Karasu, Yumurtalik and Karatas Faults.

Table 14.6 Geological Failure Modes

Failure Mode	Threats	Controls / Action Taken in Design
Earthquakes: Terminal is in area of seismic activity and with fault lines	Tank and equipment failure leading to potential fire and fatalities	Engineering design considerations include: • strengthening tank bases and bunding to withstand lateral and vertical movement; • utilising uprated pipe flanges and pipe thickness; • automated flow control valves which close within 5 seconds to reduce loss due to pipe or tank failure.
Erosion/ subsidence	Tank and equipment failure leading to potential fire and fatalities	Taken into consideration in design. No history of ground slide etc in 25 years of operation of current terminal.

14.2.4 Accounting for seismic events

A methodical approach has been followed to determine the frequency of earthquake events that exceed the Safe Shutdown Earthquake (SSE) that could result in failure of plant and piping and give rise to a release of oil to the terrestrial environment. Based on these earthquake frequencies, Table 14.7 summarises the spill sizes for those events that exceed the SSE. It is assumed that during a severe earthquake the bund may not maintain its structural integrity and therefore any release has the potential to impact the surrounding area.

Table 14.7 Spill Sizes vs Frequency of Releases for Seismic Events

Hazard Source	Release Size	Modified Mercalli Intensity	Frequency (per year)	Spill amount (tonnes)
Crude Storage Tanks	50mm	VIII	2×10^{-5}	2300
		IX	5×10^{-5}	2300
		X	6×10^{-6}	2300
	Rupture in Bund	X	4×10^{-6}	126000
		XI	5×10^{-6}	126000
	Rupture overtops Bund	X	4×10^{-6}	12600
		XI	5×10^{-6}	12600
Pipelines	50mm	VIII	2×10^{-5}	150
		IX	5×10^{-5}	150
		X	6×10^{-6}	150
	Full Bore	X	4×10^{-6}	3000
		XI	5×10^{-6}	3000

Box 14.1 shows the comparison between the earthquake magnitude (Richter Scale) and the intensity scale (Mercalli). The Mercalli scale is considered to provide a more meaningful measure to the non-scientist as it refers to effects that are actually experienced.

Box 14.1 Magnitude/Intensity Comparison

Magnitude	Intensity	Description
1.0 - 3.0	I	**I:** Not felt except by a very few under especially favourable conditions.
3.0 - 3.9	II - III	**II:** Felt only by a few persons at rest, especially on upper floors of buildings. **III:** Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognise it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
4.0 – 4.9	IV – V	**IV:** Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably. **V:** Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 – 5.9	VI – VII	**VI:** Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. **VII:** Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0 – 6.9	VII – IX	**VII:** Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. **IX:** Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7.0 and higher	VIII or higher	**X:** Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent. **XI:** Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly. **XII:** Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Source: USGS National Earthquake Information Centre

14.2.5 Overall frequency and spill size of release

The impact of release on land will depend on whether a release is within a bunded area or not. The majority of releases from tanks will be contained within the bunds. However, in the event of a catastrophic failure, some liquid may overtop the bunds due to the momentum of the release. Such a phenomenon has occurred in the past, although this has generally been over low height earth dykes with sloping sides. Pipeline releases are all assumed to occur outside the bunded area, although there are small sections within the bunds.

The frequencies of releases to land are given in Table 14.8 and are illustrated in Figure 14.1 and Figure 14.2 respectively, which show the cumulative frequency against spill size.

Table 14.8 Summary of Releases on Land

Hazard Source	Release Size	Frequency (per year)	Spill amount (tonnes)
Crude Storage Tanks (bunded)	50mm	6.8×10^{-4}	2300
	Rupture in Bund	4.9×10^{-5}	126000
	Rupture overtops Bund	1.9×10^{-5}	12600
Pipelines	25mm	3.2×10^{-4}	21
	50mm	2.6×10^{-4}	45
	100mm	1.5×10^{-4}	94
	Full Bore	2.0×10^{-5}	2600
Oil Reception	25mm	1.1×10^{-3}	31
	50mm	8.4×10^{-4}	70
	100mm	3.5×10^{-4}	180
	Full Bore	2.4×10^{-4}	620
Metering	25mm	2.6×10^{-2}	4
	50mm	7.1×10^{-3}	10
	100mm	2.2×10^{-3}	24
	Full Bore	8.8×10^{-4}	350

14.2.6 Environmental Receptors for Terrestrial Spills

The above sections have identified the hazards and risks associated with the onshore facilities at the BTC Marine Terminal. In order to understand the potential consequences of accidental events, these are summarised below along with the potential receptors for each event.

The limited environmental sensitivities within and adjacent to the terminal site (as discussed in Section 10) serve to reduce the scope of potential accidental impacts. Critically, there are no permanent surface water features, other than the sea or sensitive ecological habitats at risk from a terrestrial spill. The key sensitivities can therefore be summarised as follows (see Table 14.9):

- agricultural land is present within the site boundary and immediately adjacent to it.
- the afforested area of BOTAŞ is located in the vicinity of the tank farm site.
- a corral for a small herd of goitred gazelle is located near the existing general facilities area.
- an unconfined aquifer lies approximately 1.2km to the west of the site. There are, however, a series of ephemeral channels within 500m that will connect to the aquifer.

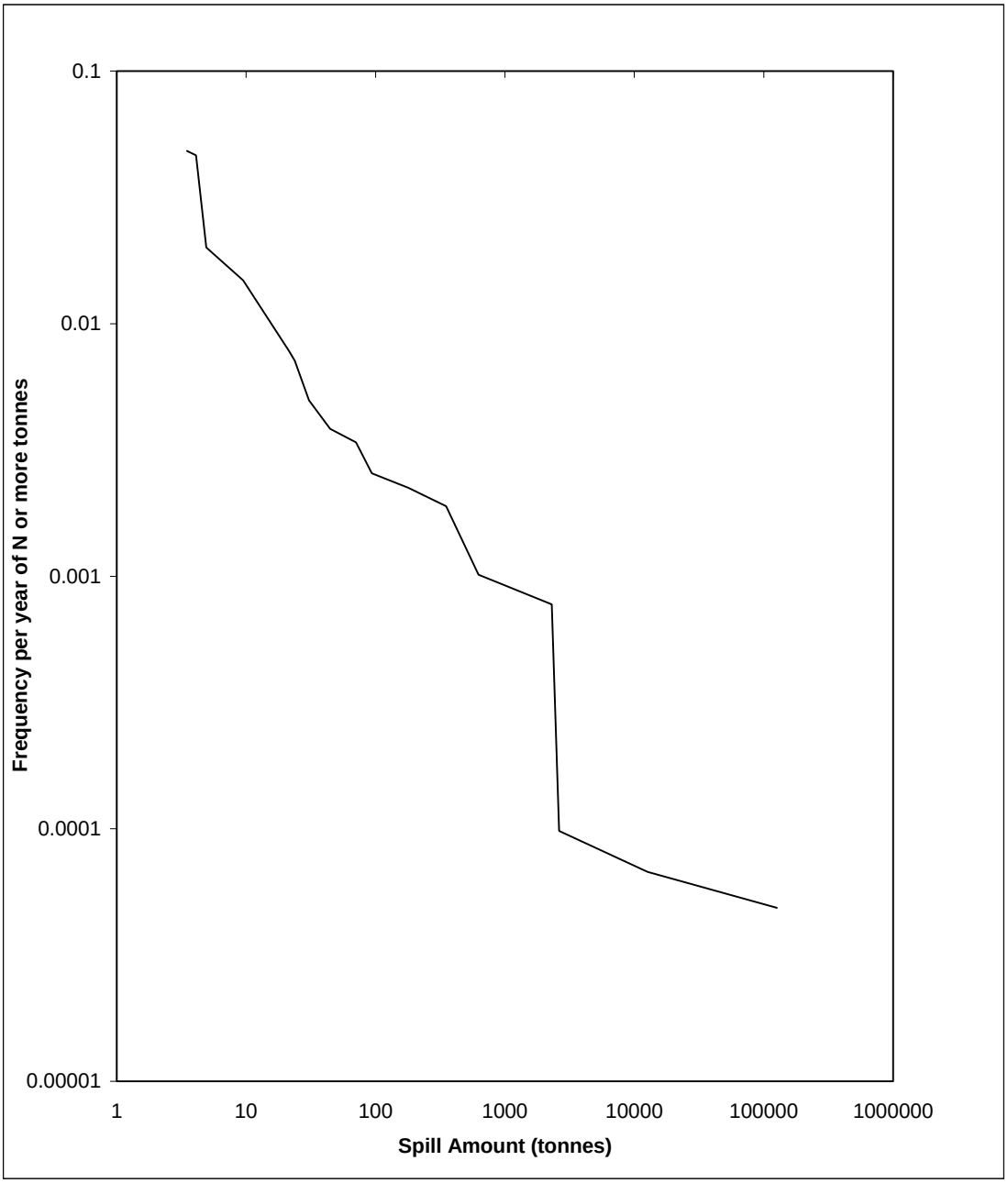


Figure 14.1 Cumulative Frequency vs Spill Size for Releases on Land (including releases into Bund)

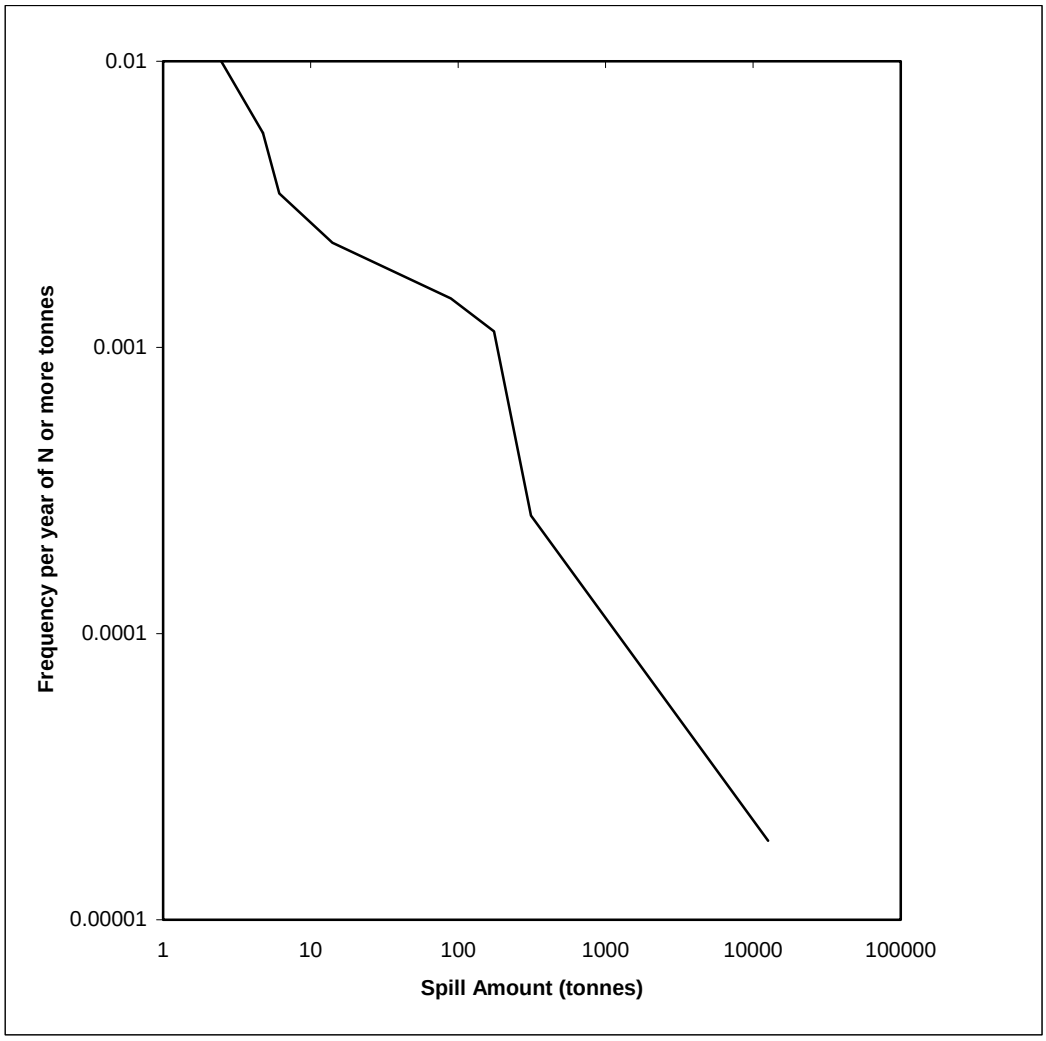


Figure 14.2 Cumulative Frequency vs Spill Size for Releases on Land (releases outside bund)

Table 14.9 : Environmental Sensitivities to Terrestrial Spills

Source	Spill Size (te)	Frequency	Main Receptor	Sensitivity	Comment
Storage Tanks					
50mm leak into bund	2300	6.8×10^{-4}	bund area	not sensitive	Engineered bund designed to contain spills.
rupture in to the bund	126000	4.9×10^{-5}	bund area	not sensitive	Large spill volume mostly contained in bund.
rupture overtops bund	12600	1.9×10^{-5}	land downhill from tank	Highly sensitive	The land, which is exposed to flooding, may be used for agriculture or an afforestation site. Spill may enter ephemeral watercourses. No perceived threat to dwellings.
Oil Reception, Loading Line, Oil Metering					
25mm leak	4-31	2.8×10^{-2}	land in vicinity of leak	Potentially sensitive	Small volume of release is thus unlikely to have an extensive impact.
50mm leak	10-70	8.4×10^{-3}	land in vicinity of leak	Potentially sensitive	Moderate release volume. Potential to impact sensitive receptor if leak is in or near an agricultural area.
100mm leak	24-180	2.8×10^{-3}	land in vicinity of leak	Potentially sensitive	Moderate release volume. Potential to impact sensitive receptor if leak is in or near an agricultural area or at western edge of site, where groundwater is at risk.
full bore rupture	350-2600	1.1×10^{-3}	wider area	Potentially sensitive	Exceptionally rare event. Potential to impact surrounding agricultural areas, unconfined aquifer and ephemeral watercourses.

14.3 SPILLS IMPACTING MARINE/COASTAL ENVIRONMENT

An ERA of oil spills impacting the marine/coastal environment has been undertaken by DNV. The DNV Summary Report is presented below in its entirety, subject only to reformatting to fit into the structure of this EIA Report.

DNV has, on commission from BOTAŞ Petroleum Pipeline Corporation, performed an environmental risk assessment (ERA) for the planned BTC Marine Terminal (DNV report no. 2002-0396). The following section is an extraction of this risk assessment.

The risk assessment comprises the following elements:

- Technical risk assessment (TRA) with quantification of the frequency of accidental oil spill to the marine environment. The TRA is limited to the tank farm, the transport pipelines from the tank farm to the jetty, the jetty, the loading arm and to accidental events with the transport vessels within the operational zone of the terminal. The TRA will not comprise accidental events in the ship lane.

- Oil drift modelling based on scenarios defined in the TRA.

- Description of environmental conditions relevant for the risk assessment and establishment of Valuable Ecosystem Components (VEC), which will act as risk indicators.

- Assessment of consequences of the VEC, based on the results of the oil drift modelling and effects of oil on the actual VEC.

- Assessment of risk as a combination of frequency of an oil spill and its consequences to the VEC.

14.3.1 Description of accidental release scenario

Section 4 in DNV Report No. 2002-0396 presents the assessment of accidental release scenarios, which forms the basis for the ERA.

An **accidental release scenario** is defined as:

> *"an accidental event where the consequence is release of oil to the sea. The frequency of this event has been assessed together with the estimated consequence in terms of amount of oil spilled (given as an oil release rate combined with a release duration)."*

The accidental release scenarios for the BTC Marine Terminal have been defined by carrying out a technical risk assessment (TRA), by applying the methodology described in Table 14.10. In general, it has been sought to reflect the local operational and technical conditions at the terminal when assessing the accidental release scenarios. The assessment has been carried out based on information from technical drawings, maps, reports and direct communication with the staff projecting the terminal. All assumptions made in the TRA are considered to be on the conservative side.

Table 14.10 Methodology for TRA

ACTIVITY	DESCRIPTION
Hazard identification	The purpose of this task is to identify all potential accidental events (hazards), which may cause release of oil to the sea in the terminal area.
Frequency assessment	The expected average occurrence frequencies per year for events identified in the Hazard identification are assessed based on a combination of theoretical models and statistical data.
Consequence assessment	By estimating the potential amount of oil released to the sea, the consequence of each hazard is assessed. Both release rate and release duration are estimated by applying simplified theoretical models, seeking to reflect the actual technical and operational conditions at the terminal.
Risk assessment	The risk of each hazard is expressed by the *accidental release scenarios*, which, as already stated above, are defined as the product of the frequency of each hazard and its consequence.

14.3.1.1 System definition and main assumptions

The systems analysed in the TRA comprise:

- seven onshore atmospheric storage tanks, each with a storage capacity of 126 000 tonnes of crude oil;
- two ship loading pipelines (42’’), each 6.1km long, transferring the oil from the storage tanks to the export tankers at the jetty. The transfer of crude oil is purely gravity driven;
- one jetty with two berths, each berth can receive an export tanker with loading capacity between 80 000 – 300 000 dwt. Loading may take place at both berths simultaneously;
- ship activity within the BTC Marine Terminal harbour restriction zone. Tanker activity data is specified in Table 14.11.

Table 14.11 Tanker activity data

Tanker size (kbbls)*	Tanker size (dwt)**	Proportion of total number of tankers (assumed)	Average loading time per loading operation (hours)	Number of visits per year
500	70 000	10%	16	70
1000	140 000	70%	25	245
2000	280 000	20%	40	35
Total	-	-	-	350

**kbbls = kilo barrels
*dwt = dead weight tons; 1 ton = 7,3 bbls
Based on the data in Table 14.12, the total number of hours vessels loading at the new jetty will be 8645 hours per year.

Assumptions applied for the risk assessment:

- Three loading arms per tanker are always used during loading operations (independent of ship size).

- Total loading rate per berth = 9540m^3/hour (independent of ship size).
- ESD (emergency shut-down) within 15s, and ERS (emergency release system) is activated within 5s. The particulars regarding these systems are described in the control and operating philosophy document.
- Disk Valves (as part of the ERS system) are not assumed to resist surge pressure in case of activation of ERS before ESD is completed.
- The pipelines are assumed to be filled with oil 100% of the time
- The pressure in the loading lines at the jetty is about 12 barg.
- On average there is always one ship loading at the jetty (ref. 8645 loading hours per year/8760 hours = 0,99).
- The BOTAŞ port regulations and the offshore control and operating philosophy form the basis for the assessment of risk related to overloading of cargo tanks.
- The storage capacity of one cargo tank is typically 10 000 tonnes.
- 67% of the export tankers have single hull.
- On average the loading tankers at the jetty are half filled, and so is each cargo tank.
- The storage capacity of a fuel oil tank is typically 2000 tonnes. The fuel tanks are assumed always to be located in wing tanks, and also to always be full.
- The cargo tank area is assumed to be 75% of the ship length, and fuel oil tanks are assumed to be 5% of the ship length.

14.3.1.2 Release to the sea from loading arms

Table 14.12 presents the basis frequencies for oil release to the sea from loading arms. The frequencies are related to loading operation of product tankers, a study performed by DNV for the UK Health and Safety Executive in 1990, but are considered to be valid for crude oil tankers as well.

Table 14.12 Release from loading arms, basis frequencies

#	Failure mode	Frequency per loading operation	Release size distribution		
			small	medium	large
A	Release from loading arm	5.10E-05	0.8	0.19	0.01
B	Loading arm quick disconnection failure	5.10E-06	0	0	1
C	Failure in vessel piping or pumping system	7.20E-06	0.8	0.19	0.01
D	Human failure	7.20E-06	0.8	0.19	0.01
E	Mooring failure	3.80E-06	0	0	1
F	Overfilling of cargo tank	1.20E-04	0.8	0.19	0.01
	Total	1.94E-04			

The failure frequencies are assumed to include oil releases caused by the following events:

- Release due to surge pressure caused by activation of ERS before ESD is completed,
- Excursion of loading tanker due to earthquake/tsunamis, heavy swell and/or mooring failure, impact from other ship.

Given that there are 350 loading operations per year, the release frequencies related to loading arm operations are given in Table 14.13.

Table 14.13 Loading arm releases - frequency of oil spill to sea per year distributed on release size

#	Failure mode	Frequency per year	Release size distribution		
			small	medium	large
A	Release from loading arm	1.79E-02	1.43E-02	3.39E-03	1.79E-04
B	Loading arm quick disconnection failure	1.79E-03	0	0	1.79E-03
C	Failure in vessel piping or pumping system	0	0	0	0
D	Human failure	2.52E-03	2.02E-03	4.79E-04	2.52E-05
E	Mooring failure	1.33E-03	0	0	1.33E-03
F	Overfilling of cargo tank*	4.20E-04	0	0	4.20E-04
	Total	2.39E-02	1.63E-02	3.87E-03	3.74E-03

*** overfilling of cargo tanks is treated as a separate hazard (see Section 14.3.1.4)**

The release rates will depend on pressure and damage size. For the TRA a minor and a large release scenario have been defined (see Table 14.14):

Table 14.14 Release rates and duration – loading arms

Scenario	Release rate, prior to shut-down	Average release rate during shut-down	Detection time	Shut-down time	Total release to sea (tonnes)*
Minor	1 kg/s	1 kg/s	4 hours	15 seconds	14
Large	2250 kg/s	2250/2 = 1125 kg/s	0 – 60 seconds	15 – 60 seconds	17 - 200

***release of loading arm content after shut-down of cargo transfer is not included.**

The risk for oil spill to the sea from loading arms is summarised in Table 14.15**.**

Table 14.15 Loading arm release risk – accidental release scenarios

Failure mode	Frequency per year	Release size distribution	
		Minor*	Large*
Release from loading arm	1.79E-02	1.43E-02	3.57E-03
Loading arm quick disconnection failure	1.79E-03	0	1.79E-03
Failure in vessel piping or pumping system	0.00E+00	0	0
Human failure	2.52E-03	2.02E-03	5.04E-04
Mooring failure	1.33E-03	0	1.33E-03
Total	2.35E-02	1.63E-02	7.19E-03

***Release rates and duration as specified in Table 14.14.**

14.3.1.3 Release to the sea from ship loading pipelines

The frequency assessment of accidental cargo releases from the ship loading lines has been based on failure frequencies used in several former risk assessments performed by DNV, see Table 14.16. The failure data has, however, been adjusted to reflect the relatively high seismic activity in the area.

Table 14.16 Failure frequencies (per km.year) for ship loading pipeline – distribution on failure mode and damage size*

Damage size / Failure Mode	Small	25mm	50mm	100mm	Rupture	Total	Contribution
Defects	3.60E-05	1.20E-05	6.00E-06	6.00E-06		6.00E-05	22 %
Operational	8.20E-06	2.70E-06	1.40E-06	1.40E-06		1.37E-05	5 %
External Corrosion	2.60E-05	7.30E-06	3.60E-06			3.69E-05	14 %
Internal Corrosion	1.80E-05	5.20E-06	2.60E-06			2.58E-05	10 %
Natural Hazards	5.70E-05	1.90E-05	9.50E-06	9.50E-06		9.50E-05	36 %
External Impact	1.10E-05	7.10E-06	7.10E-06	8.80E-06	1.80E-06	3.58E-05	13 %
Total	1.56E-04	5.33E-05	3.02E-05	2.57E-05	1.80E-06	2.67E-04	100 %

***Damage size is given as hole diameter, damage assumed to be circular**

Table 14.17 and is found as; failure frequency per km year multiplied by sea exposing pipeline[1] length multiplied by 2 (because of two pipelines). Large damages (100mm and rupture) due to natural hazards and external impact are expected to affect both pipelines in the same event and the frequency is not multiplied by two. The sea exposing pipeline length for a minor release is equal to the offshore part of pipeline, 2.5km. While for a large release it comprises the offshore part of pipeline and 20% of onshore part of pipeline, 3.2km.

[1] The "sea exposing pipeline" is defined as that length of terrestrial pipeline between the storage tanks and the loading jetty. Any spill from this section is deemed to potentially impact on the sea.

Table 14.17 Failure frequencies (per year) for ship loading pipelines – distribution on failure mode and damage size*

Damage size / Failure Mode	Small	25mm	50mm	100mm	Rupture	Total	Contribution
Defects	1.80E-04	6.00E-05	3.00E-05	3.86E-05	0	3.09E-04	24 %
Operational	4.10E-05	1.35E-05	7.00E-06	9.02E-06	0	7.05E-05	5 %
External Corrosion	1.30E-04	3.65E-05	1.80E-05	0	0	1.85E-04	14 %
Internal Corrosion	9.00E-05	2.60E-05	1.30E-05	0	0	1.29E-04	10 %
Natural Hazards	2.85E-04	9.50E-05	4.75E-05	3.06E-05	0	4.58E-04	35 %
External Impact	5.50E-05	3.55E-05	3.55E-05	2.83E-05	5.80E-06	1.60E-04	12 %
Total	7.81E-04	2.67E-04	1.51E-04	1.07E-04	5.80E-06	1.31E-03	100 %

***Damage size is given as hole diameter, damage assumed to be circular**

Two scenarios have been defined with respect to release rate and release duration. This is illustrated in Table 14.18.

Table 14.18 Release rates and duration – ship loading pipelines

Scenario	Release rate, prior to shut down of loading operation	Average release rate per pipeline – loading operation is shut down	No. of pipelines damaged	Detection & shut down time	Total release to sea (tonnes)
Minor	10 kg/s	10 kg/s	1	4 hours	144
Large	2250 kg/s	2 x 2000 in 1 hour	2	10 minutes	6700

With reference to Table 14.17**,** the frequency of the scenarios specified in Table 14.18 are assessed by assuming that:

- Minor release = release damage categories “small” + “25mm” + “50mm”;
- Large release = release damage categories “100mm” + “rupture”.

Table 14.19 presents the frequency assessed for these scenarios.

Table 14.19 Accidental release scenarios related to ship loading pipelines

FAILURE MODE	MINOR	LARGE	TOTAL
Defects	2.70E-04	3.86E-05	3.09E-04
Operational	6.15E-05	9.02E-06	7.05E-05
External Corrosion	1.85E-04	0	1.85E-04
Internal Corrosion	1.29E-04	0	1.29E-04
Natural Hazards	4.28E-04	3.06E-05	4.58E-04
External Impact	1.26E-04	3.41E-05	1.60E-04
Total	1.20E-03	1.12E-04	1.31E-03
Distribution in% of total	91 %	9 %	100 %

14.3.1.4 Release to the sea from crude oil tankers

Overloading of cargo tanks

Overloading of cargo tanks is most likely to be caused by a technical failure of the alarm-system or human failure related to operation. The frequency of large spill due to overloading is found from Table 14.13 to 4.2E-04 per year.

The scenario assumed for a large spill due to overloading is that a cargo tank is overloaded, and oil is released on to the main deck through the PV- valve with a rate of 9540m^3/h (=loading capacity rate). It is assumed that the overloading will be detected and shut down 30 minutes after it started. Approximate 2,000 tonnes of the oil spill will be retained on deck, while the total amount of oil spilt to the sea will be about 2,000 tonnes. The accidental release scenario related to overloading of export tankers will have a frequency of 4.2E-04 per year, and the amount of oil released will be 2,000 tonnes within 15 minutes.

14.3.1.5 Structural failure

Frequency of structural failure for crude oil tankers has been assessed based on analysis of relevant data from the LMIS database (Loyds' Maritime Information System). Analysis of the data gives a total frequency of structural failure with potential to cause oil spill from tankers of 3,0E-04 per year.
Figure 14.3 presents the event tree model used for assessing the release risk related to structural failure on tankers, which can be summarised as follows.

- Small release: 45 tonnes within 12 hours with a frequency of 5.4 E-05 per year;
- Large release: 10 000 tons within 12 hours with a frequency of 6.8 E-05 per year.

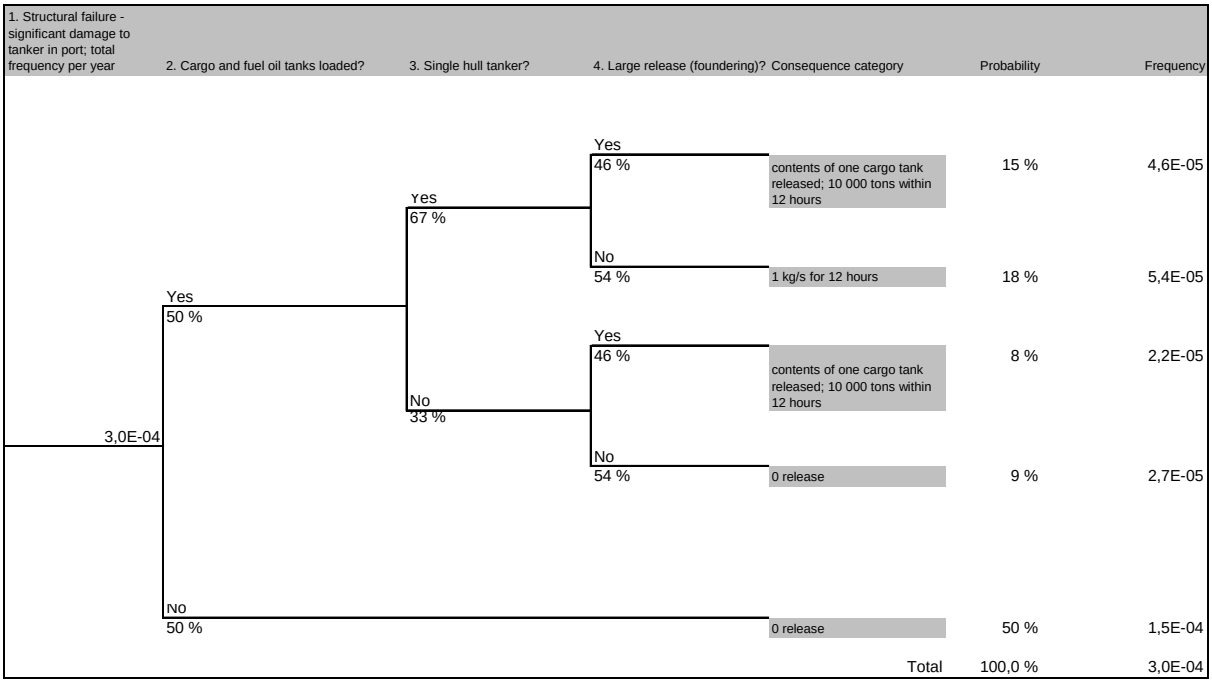


Figure 14.3 Event tree risk model – release from export tanker due to structural failure

Fire/explosion

A fire and/or explosion in the cargo area may damage the cargo tanks so that crude oil is released to the sea. Analysis of the LMIS data gives a frequency of 3.4E-04 per ship year for fire/explosions in cargo area for tankers. This is the frequency of events causing serious damage to, or total loss of, the ship. It is assumed that these events also have the potential to cause release of crude oil from the cargo tanks. The total yearly tanker loading activity at the terminal is 0.99 ship-years. Thus, the frequency of fire/explosion in cargo area with potential to cause release of crude oil to the sea is 3.3E-04 per year.

Given a fire/explosion in the cargo area two cargo tanks are assumed severely damaged. The cause of the damage will most likely be an explosion in one cargo tank. The cargo tanks involved are assumed to be half-filled, thus 10,000 tonnes is expected to be released to sea within 1 hour. It is assumed that 80% of the released oil will burn, thus 2,000 tonnes of the oil spill can drift away.

Impact from other ship

The following collision scenarios are considered possible with respect to causing release of cargo or fuel oil:

- tug impacts with tanker;
- arriving/departing tanker impacts with another tanker due to operational error (violation of port regulations);
- passing ship accidentally (due to technical or operational error) impacts with tanker in terminal area.

Figure 14.4 presents the event tree model used for assessing the release risk related to ship impact to export tankers frequencies are based on LMIS data.

The risk can be summarised as follows:

- Small release: 45 tonnes within 12 hours with a frequency of 2.8E-04 per year;
- Medium release: 2000 tonnes within 12 hours with a frequency of 2.4 E-05 per year;
- Large release: 10 000 tonnes within 12 hours with a frequency of 1.8 E-04 per year.

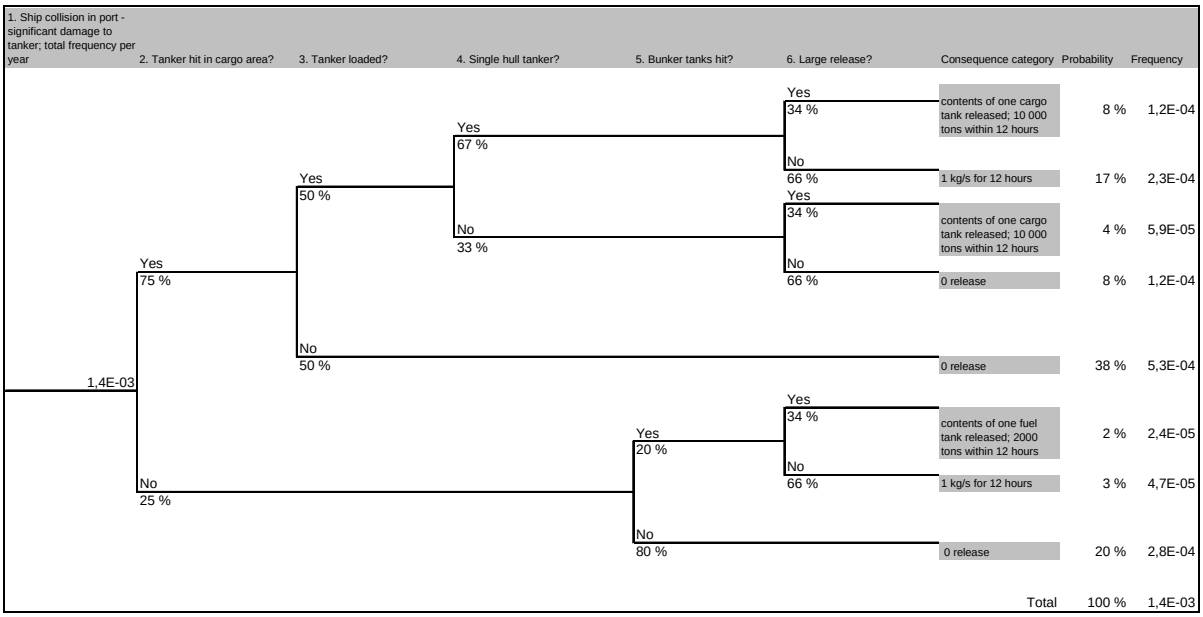


Figure 14.4 Event tree risk model – release from export tanker due to ship collision

Impact with berth on arrival/departure

A tanker impacting with the jetty on departure may cause release of oil if cargo tanks are damaged. Release from fuel tanks may occur as well in case of jetty impact, both on arrival and departure.
Figure 14.5 presents the event tree model used for assessing the release risk related to ship impact to export tankers, frequencies are based on LMIS data. The risk can be summarised as follows:

- Small release: 45 tonnes within 12 hours with a frequency of 1.2 E-04 per year;
- Small release: 200 tonnes bunker fuel within 12 hours with a frequency of 2.6 E-05 per year;
- Medium release: 2000 tonnes within 12 hours with a frequency of 1.3 E-04 per year.

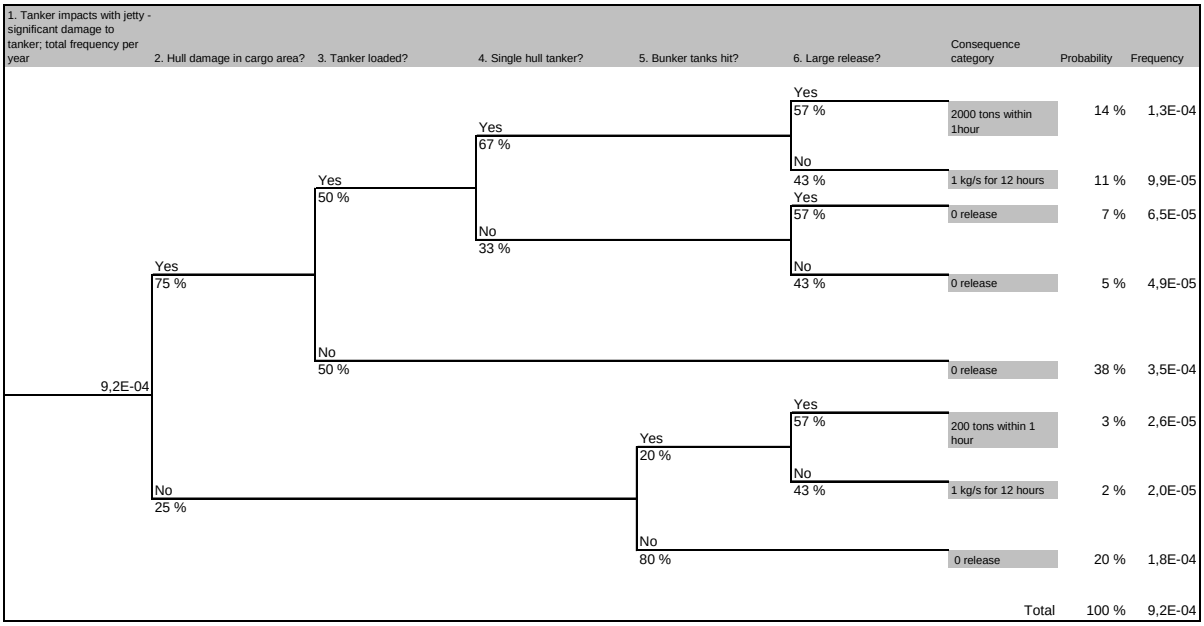


Figure 14.5 Event tree risk model – release from export tanker due to impact with jetty

14.3.1.6 Collapse of onshore oil storage tanks and release to the sea

The tank farm consists of seven atmospheric storage tanks, each with a storage capacity of 126,000 tonnes. The tanks are to be located on a height 120 – 130m above sea level. The tank farm will be designed to meet the requirement for safe shutdown for an earthquake with a return period of about 2,500 years.

The shortest distance between the tank farm and the sea is about 1,5km. Based on information from maps and drawings it seems possible that a large release of crude oil from the tank farm may reach the sea. Such large releases are only likely to be caused by a major earthquake significantly exceeding the design limits of the tank farm.

Based on the geohazard study and the Seismic Design Criteria report, earthquake frequencies as function of intensity and damage severity are presented in Table 14.20, a total frequency of 9E-06 per year has been assessed for earthquakes with potential to collapse of one or more storage tanks and bunds. It is assumed that only one tank and bund will collapse and that 50% of the spilled oil will reach sea. The spill to sea will last for about 24 hours. As a summary, the spill scenario is a total discharge of 63 000 tonnes oil to sea within 24 hours with a frequency of 9E-06 per year.

Table 14.20 Earthquake intensity vs frequency for the BTC Marine Terminal area

MM Intensity*	Damage	Frequency per year	Moderate damage	Severe damage
VIII	Moderate damage	2.0E-04	2.0E-05	0.0E+00
IX	Heavy damage	1.0E-04	5.0E-05	0.0E+00
X	Extreme damage	2.0E-05	6.0E-06	4.0E-06
XI	Profound damage	1.0E-05	0.0E+00	5.0E-06

***Modified Mercalli Intensity**

14.3.1.7 Summary of accidental release scenarios

The TRA risk results; accidental release scenarios, are summarised in Table 14.21.

Table 14.21 Summary of risk results - accidental release scenarios

#	Description	Main causes	Release rate	Release duration	Frequency (per year)
1	**Release from loading arms**				
1.1	Minor release from one loading arm	Mechanical Defects. Corrosion. Wear and Tear. Operational Error.	1 kg/s	4 hours	1.63E-02
1.2	Large release from loading arms	Drift-Off	17 tonnes - 200 tonnes within 15 - 120s	15 – 120 seconds	7.19E-03
2	**Release from loading pipelines to the sea**				
2.1	Small/moderate size release from loading pipeline	Mechanical Defects. Corrosion. etc.	10 kg/s	4 hours	1.20E-03
2.2	Large release from loading pipelines	Ship Impact. Earthquake	6700 tonnes in 1 hour	1 hour	1.1E-04
3	**Release from crude oil tankers**				
3.1	Overloading of cargo tank	Operational/Technical Error	2000 tonnes in 15 minutes	< 1 hour	4.2E-04
3.2	Release from vessel piping system during loading	Mechanical Defects. Corrosion. Wear and Tear. Operational Error. etc.	Spill will be contained on deck of the tanker. Release to sea is thus not considered likely.	-	0
3.3	Minor release of cargo or fuel oil due to crack in tanker hull	Structural Failure. Impact from other Ships, Impact with Jetty	1 kg/s	12 hours	4.5E-04
3.4	Large release from vessel cargo tanks	Structural Failure. Impact from other ships.	10000 tonnes within 12 hours	12 hours	2.5E-04
3.5	Large release from vessel fuel oil tanks	Impact from other ships.	2000 tonnes within 12 hours	12 hours	2.4E-05
3.6	Large release from vessel cargo tanks	Fire/Explosion. Impact with Jetty	2000 tonnes within 1 hour	1 hour	4.7E-04
3.7	Release from vessel fuel oil tanks due to impact with jetty	Impact with Jetty	200 tonnes within 1 hour	1 hour	2.6E-05
4	**Release from tanker fuelling operations**				
4.1	Release from fuelling operations	Operational/technical error	Not relevant as such operations are not to take place in the terminal area	-	0
5	**Release from onshore tankfarm**				
5.1	Release from rupture of onshore storage tank and bund resulting in oil running in to the sea	Major earthquake	50% of the contents of one tank (63,000 tonnes) are estimated to enter the sea in 24 hours.	24 hours	9.0E-06

As the consequences, in terms of release rate and duration, of several of the accidental release scenarios presented above are quite similar, the total number of scenarios have been reduced to 4, as presented in Table 14.22. The environmental risk associated with these scenarios has been analysed further in the ERA. The total release frequency is not affected by the reduction of the number of scenarios.

Table 14.22 Accidental release scenarios analysed further in the ERA

Scenario	Category	Total Spill (tonnes)	Rate (tonnes/hour)	Duration	Frequency	Hazard #
1	Small spill	4 - 200	4 - 200	1 - 4 hours	2.40E-02	1.1 - 1.2 - 2.1 - 3.3 - 3.7
2	Medium spill	200 - 2000	170 - 2000	1 - 12 hours	4.70E-04	3.1 - 3.5 - 3.6
3	Large spill	2000 - 10 000	850 - 7000	1 - 12 hours	2.46E-04	2.2 - 3.4
4	Very large spill	> 10 000 (63 000)	2600	24 hours	9.00E-06	5.1

14.3.2 Oil drift simulations

Simulations of the transport and fate of oil on the sea surface were performed with the model OILTRAJ without any mitigation such as those proposed in the Oil Spill Response Programme. OILTRAJ combines the changes in the spilled oil properties with current and wind inputs to simulate statistical persistence and drift trajectory of the spilled oil. The model calculates, amongst other aspects, oil pollution probability, mass factors (evaporated, dispersed and remaining part of oil) and arrival time in a 1×1km grid. The transport of the discharged oil is computed by means of several trajectories for a given wind history for the area considered. The wind may vary both in space and time, while the main ocean surface currents are assumed to vary in space, but not in time. However, wind generated ocean currents are computed based on statistical wind data, this current varies both in space and time according to the wind variations. The simulation of the fate of the discharged oil includes algorithms for the evaporation, emulsification, dispersion, viscosity and density.

The oil drift simulations are performed with the characteristics of Azeri crude oil. OILTRAJ was applied to model the drift of oil for the four oil spill scenarios shown in Table 14.22. The oil drift is modelled for two seasons; winter half-year (October – March) and summer half-year (April – September).

The result for the winter season (see Figure 14.6 and Figure 14.7) show that the most likely fate of the oil is for rapid beaching close to the release position Most of the oil will remain principally within the bay. The dominant north-east wind component, together with the south westward sea current at the west coast, will make part of the oil leave the Iskenderun Bay. The likelihood that oil will leave the bay is < 3%. For the small spill scenario, the pollution probability is within 5-20% in about 20% of the area in the Bay. For the medium, large and very large spill the 5-20% limit cover about 35%, 60% and 70% respectively. During relatively strong offshore winds the oil moves and beaches on the east and southern coasts of Iskenderun Bay.

In the summer season (see Figure 14.8 and

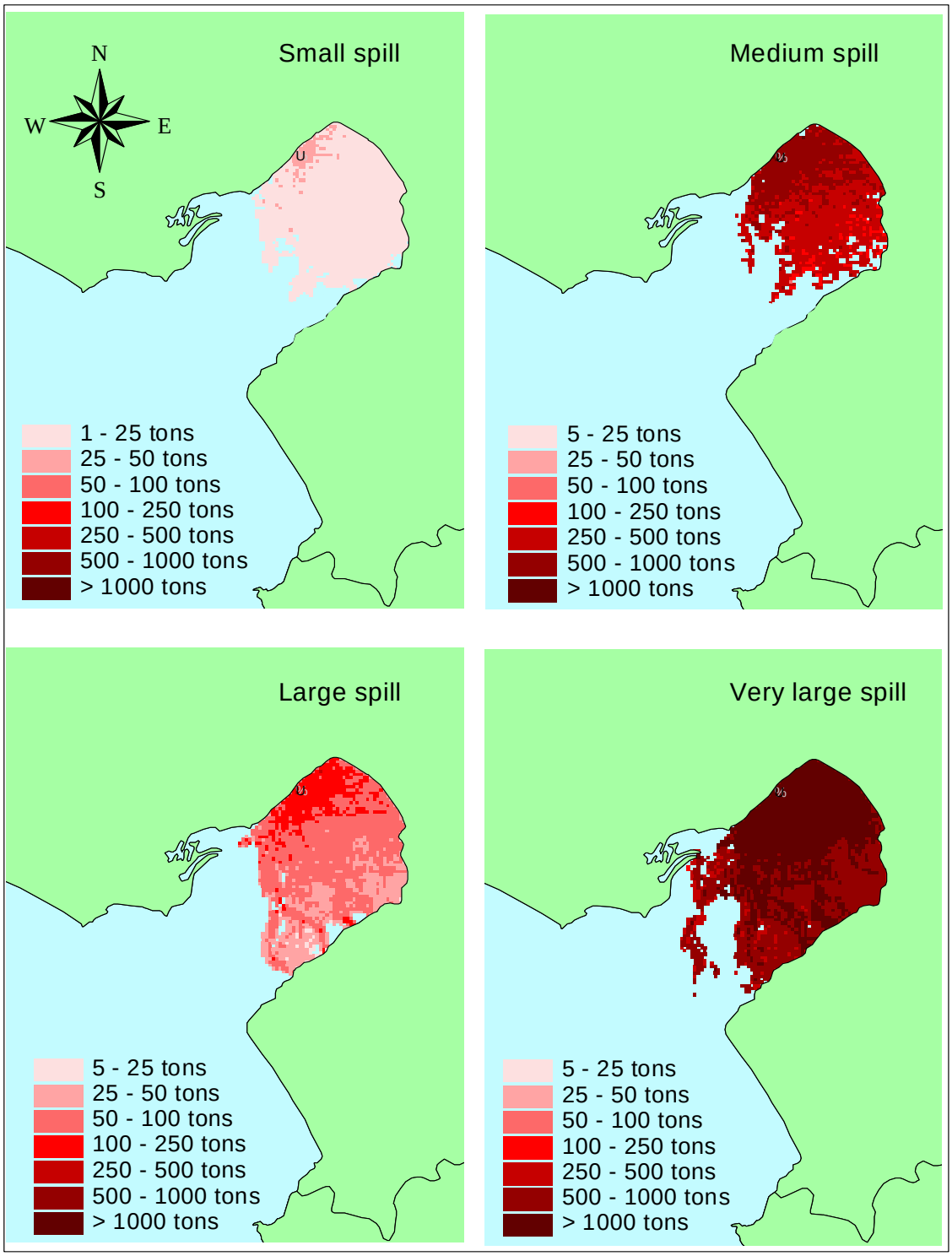


Figure 14.9) the most likely fate of the oil will be rapid beaching close to the release position. The oil will remain principally within the Bay within 1% pollution probability. The dominating south/south west wind component together with the clockwise current circulation will prevent the oil slick from leaving the Iskenderun Bay. The likelihood that oil will leave the Bay is < 1%.

For the small spill scenario, the pollution probability is within 5-20% in about 25% of the area in the Bay.

For the medium, large and very large spill, the 5-20% limit cover will be about 35%, 50% and 60% respectively.

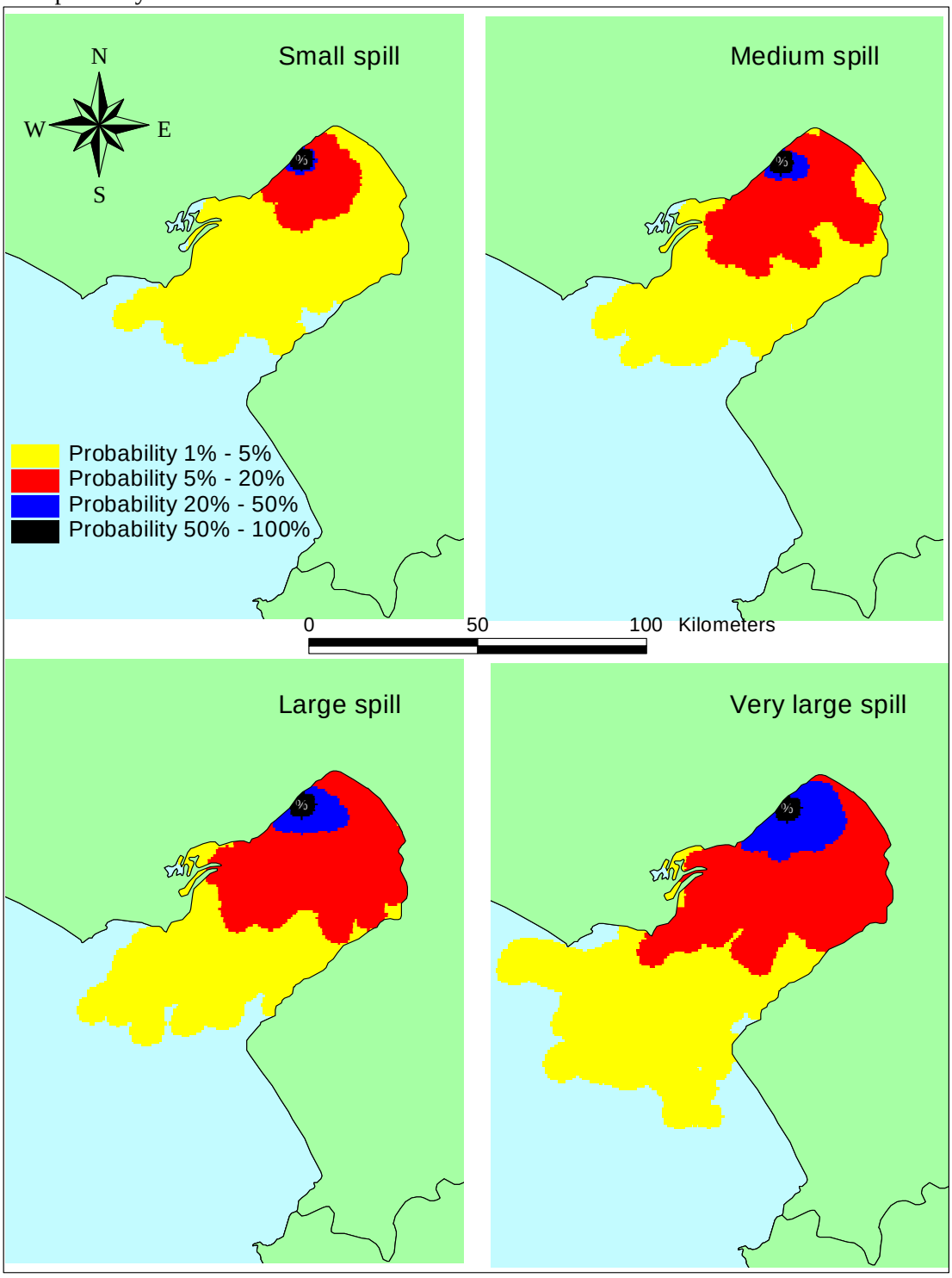


Figure 14.6 Pollution probability from the oil drift simulations for the winter season, (October – March) scenario 1 – 4

Figure 14.6 shows the influence area where the pollution probability is greater than 1% and the average oil quantity is greater than 5 tonnes (1 ton for the small spill scenario). The release position is marked with a grey square.

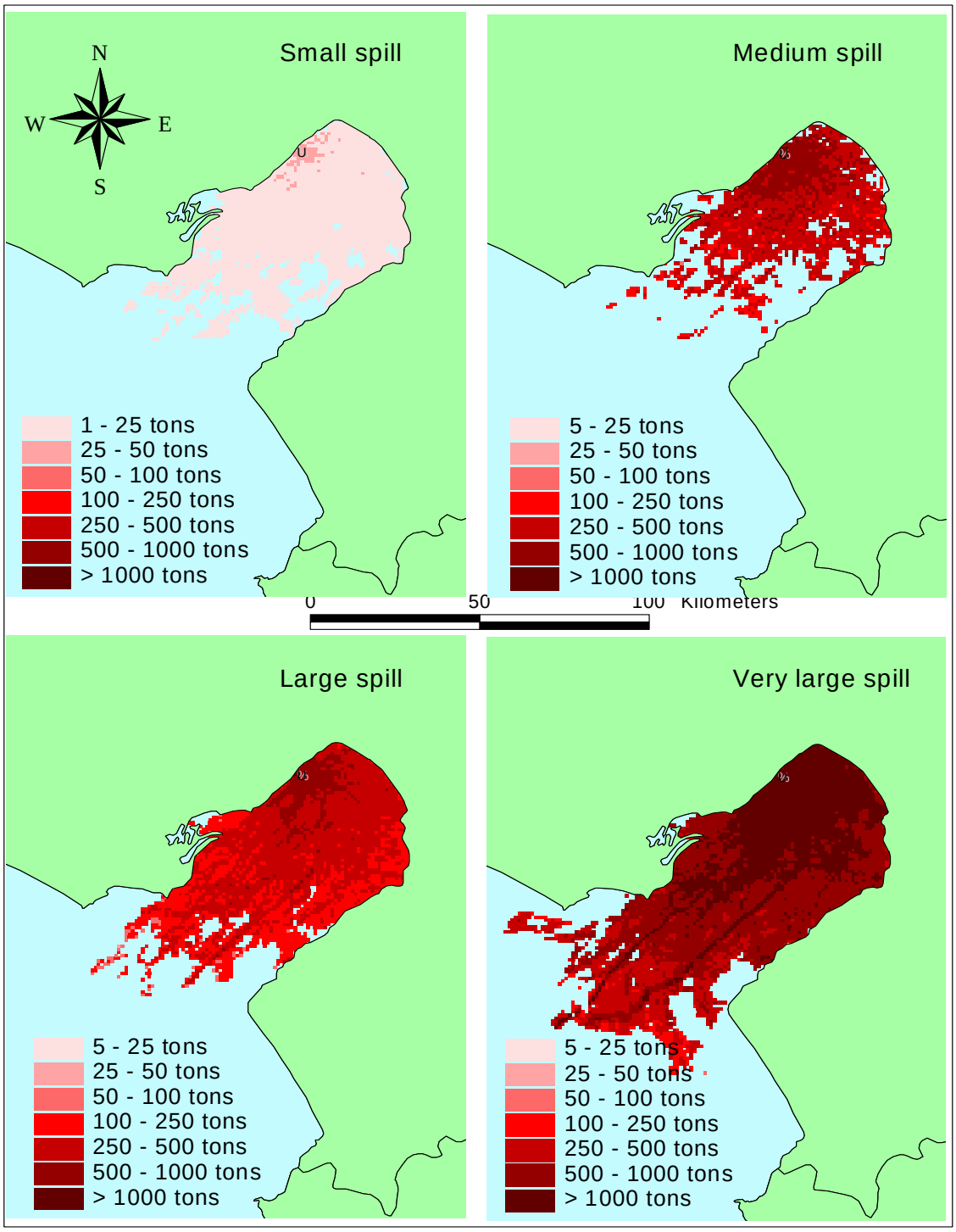


Figure 14.7 Average oil (not emulsified) quantity in tonnes for the winter season (October – March) scenario 1 – 4

Figure 14.7 shows the influence area where the probability is greater than 1% and the average oil quantity is greater than 5 tonnes (1 ton for the small spill scenario). The release position is marked with a grey square.

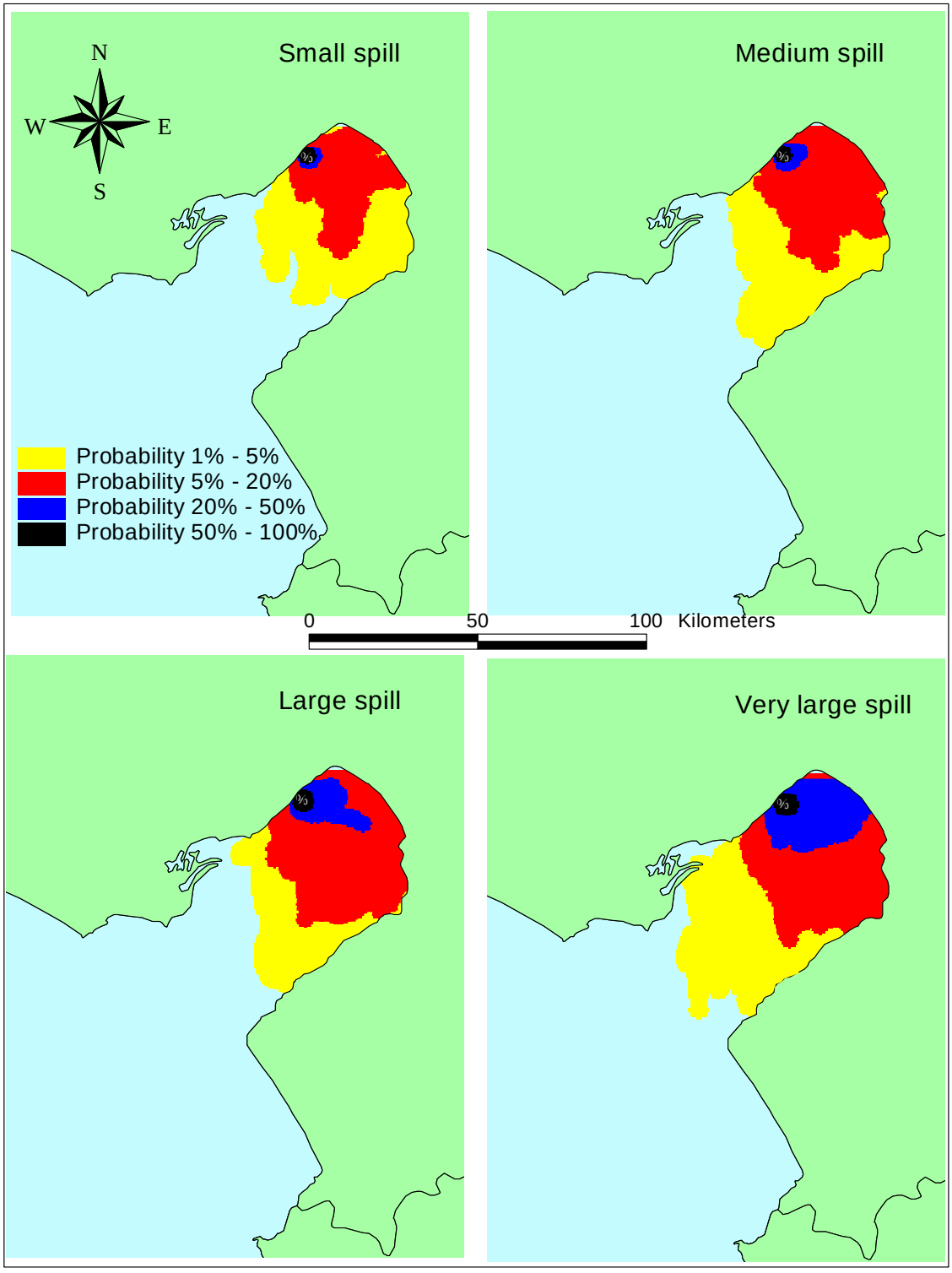


Figure 14.8 Pollution probability from the oil drift simulations for the summer season, (April – September) scenario 1 – 4

Figure 14.8 shows the influence area where the pollution probability is greater than 1% and the average oil quantity is greater than 5 tonnes (1 ton for the small spill scenario). The release position is marked with a grey square.

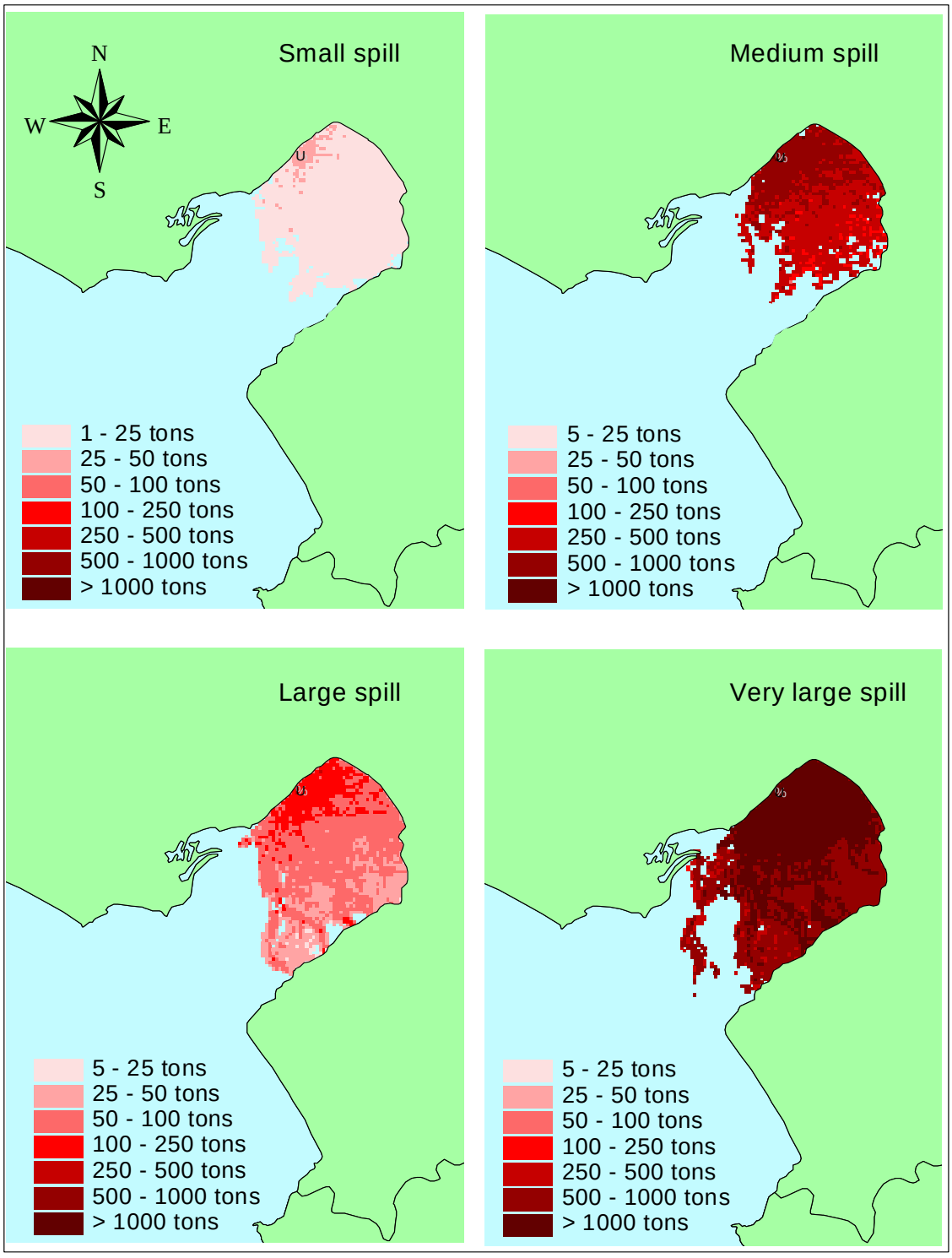


Figure 14.9 Average oil (not emulsified) quantity in tonnes for the summer season (April – September) scenario 1 – 4

Figure 14.9 shows the influence area where the probability is greater than 1% and the average oil quantity is greater than 5 tonnes (1 ton for the small spill scenario). The release position is marked with a grey square.

14.3.3 Valued ecosystem components

The most important natural resources in and around the Gulf of Iskenderun are described in Section 6 of the ERA report (DNV report no: 2002-0396), with special emphasis on resources that are potentially vulnerable to oil pollution (including fisheries and aquaculture). Based on this review, a selection of Valued Ecosystem Components (VEC) has been chosen for this ERA study. The priority list of VECs are those resources that are considered to be the most important and valuable, in combination with a high vulnerability to oil pollution, which will be assessed with respect to the assessment of environmental risk. The list of selected VECs for this ERA study is shown in Table 14.23 below. The assessment of the consequences of the identified oil spill scenarios, for each of the listed VECs, is presented in section 14.3.4.

Table 14.23 Selected VECs for the ERA study of the BTC MarineTerminal

VEC#	Resource category	Name	Description
1	Fish and Fisheries	Various fish species	Gulf of Iskenderun is one of the most productive fishing areas in the Turkish part of the Mediterranean. It is both a locally and regionally important fishing area. Local fishermen use small boats and catch fish in shallow waters along the coast, while the regional fishing takes place with trawlers all over the Gulf. Iskenderun Gulf has several important spawning grounds, among the most important is the Yumurtalik Lagoon.
2	Saltmarshes	Yumurtalik Lagoons	The Yumurtalik Lagoons area is a wetland complex for breeding birds and large numbers of wintering waterbirds. The site is recognised nationally as a Nature Reserve Area and qualifies as an IBA under both global and European criteria with a high national protection status. The wetland consists of coastal lagoons, mud and sand flats, saltmarshes, sand dunes, beaches and water fringe vegetation. Saltmarshes are extremely vulnerable to oil spills as they serve as nursery and breeding ground for fish. They can trap and retain large quantities of oil, they are difficult to clean, and the anaerobic conditions present slow down the natural degradation of oil. Recovery time for saltmarshes varies from about two years to decades.
3	Waterfowl	White-headed Duck (winter)	The White-headed duck populations are distributed into a small resident population in Spain and the Western Mediterranean and a larger migratory population in the Eastern Mediterranean across to Central Asia. The White–headed Duck is a coastal surface feeding bird that breeds on small stagnant wetlands, usually brackish with no outflow and fringed with dense emergent vegetation. Breeding in Europe is concentrated in southern Spain, but it also occurs in Russia and Romania. North-eastern Greece, the western Black Sea coast and Turkey are important wintering areas for birds breeding in European Russia and further east. Large numbers of the White-headed Duck winter at Agyatan lake, Akyatan lake and the Yumartalik lagoons. The wintering populations qualify for the IBA criteria A1, which means that this is a species of global conservation interest. Due to the breeding habitat and the fact that the White-headed duck is a globally threatened species, this bird is very vulnerable to oil pollution.

VEC#	Resource category	Name	Description
		Kentish Plover (breeding/ summer)	The Kentish Plover is a small wader that most often breeds in sparsely vegetated sites along seacoasts, lagoons, estuaries and beaches. In Europe, the Kentish Plover populations are distributed predominantly at the coasts of the western Baltic, North Sea, Atlantic Ocean, Mediterranean Sea and the Black Sea. The breeding populations of Kentish Plover at Agyatan lake, Akyatan lake and the Yumartalik lagoons qualifies for the IBA criteria B2, which means that this species has a threatened conservation status in Europe, and for which the site-protection approach is thought to be appropriate. Large numbers of the Kentish Plover also pass by or winter at these IBAs. Due to their breeding habitat, these birds are very vulnerable to oil pollution.
4	Sea turtles	Green Turtle	The Green Turtle are in danger of extinction. It is listed as critically endangered (CR) in the 2000 IUCN Red List of Threatened Species. Groombridge (1990) estimated that only 300 to 400 Green Turtle females nest annually in the entire Mediterranean. Even with this threatened status, they are regarded as the second most abundant population of turtles in the Mediterranean Sea. Green Turtle are more numerous than any other sea turtle species within the actual area. There are only three important nesting beaches along the Turkish coast, and all are located within the area between Mersin Bay and Gulf of Iskenderun. This area holds more than 70% of the Green Turtles nests in the entire Mediterranean Basin (Yerli and Demirayak, 1996).
5	Sea mammals	Monk Seal	The most sensitive sea mammal in the area in and around the Gulf of Iskenderun is the Monk seal. Monk seal has had a drastic decline in population size all over the world. The Mediterranean Monk seal is considered as a distinct species due to the large geographical separation between this population and populations in the Pacific ocean. The Mediterranean monk seal is listed as critically endangered by the International Union for the Conservation of Nature and Natural Resources (IUCN). This species is also listed on Appendix I of the Convention on International Trade in Endangered Species (CITES). They are extremely sensitive to human disturbance, today the Mediterranean monk seal numbers between 300- 500 animals. Monk seals reproduce slowly, sometimes only every other year, starting at the age of four. Adult females, larger than the males, come ashore to give birth to one pup, then remain on the beach nursing and protecting the pup for up to six weeks. Living off stored fat, the female does not leave the pup even to feed herself during this period. The pup may stay with its mother for as long as three years after weaning.

14.3.4 Impact of oil pollution on Valued Ecosystem Components, assessment of consequence values

Risk assessment is an evaluation and quantification process where both the probability and consequences of an accidental event are estimated, and the combination of these constitutes an expression of the risk.

Guideline consequence assessment parameters (Table 14.24) have been developed which allow qualitative assessments of environmental consequences to be classified and ranked quantitatively. These consequence parameters are used to assess the potential impact to selected Valued Ecosystem Components (VEC).

In the ERA, such resources will serve as risk indicators and will provide a sufficient basis for assessing the risk level and as a basis for identifying and designing risk reduction measures, including oil spill preparedness.

Table 14.24. Guideline consequence assessment parameters for the BTC Marine Terminal ERA

Consequence level	A	B	C	D	E
	Ecological effects:				
	Recovery time	**Percent of area affected**	**Conservation value of VEC**	**Socio-economic impact**	**Economic value of VEC**
1 Negligible	Not detectable	Not detectable	-	Not detectable	-
2 Minor	Detectable, but short duration; recovery time less than one year	1-5%	No classification	Minor; limited extent (insignificant)	Minor
3 Moderate	Recovery time less than 5 years	5-15%	Regional/local	Moderate; impact on local level	Moderate
4 Major	Recovery time less than 10 years	15-30%	National	Major; impact on regional level	High
5 Severe	Recovery time more than 10 years	>30%	International	Severe; impact on national level	Very high
Weighting factors if parameter B is applicable	**25%**	**25%**	**20%**	**20%**	**10%**
Weighting factors if parameter B is not applicable	**50%**	**-**	**20%**	**20%**	**10%**

The five consequence parameters are assessed for each spill scenario, in both winter and summer half-years. Based on scientific evaluations each parameter is classified with a value from 1 to 5. An average value is then calculated on the basis of the weighting factors (shown in the two lowest rows of Table 14.24) to provide an overall consequence value (CV).

The impact assessment of VECs has been carried out in a semi-quantitative manner. All assumptions drawn to assess the consequence values for each consequence parameter are outlined in the section for impact assessment in DNV Report No. 2002-0396. Each consequence parameter is weighted and a total consequence parameter for each spill scenario is calculated. The following four assessments show the consequence values for the actual VECs.

14.3.4.1 VEC 1: Fish and Fisheries

Gulf of Iskenderun is one of the Levant seas', in fact one of the Mediterranean seas', most productive areas for fisheries. Fisheries are an important source of food and income for households in Gulf of Iskenderun. Furthermore, the Gulf of Iskenderun is a regionally important area for trawl fishing. Potential effects on fisheries can be divided into direct effect on fishery species, an indirect effect as ecosystem disturbance and direct effect as tainting and loss of commercial interest for the fish.

Ecological recovery time is first of all relevant in relation to effects on the survival of eggs and larvae spawned in shallow waters. Estimated recovery periods after impacts of a theoretical oil spill from the BTC Marine Terminal are outlined in Table 14.25. Due to highest spawning activity in the summer, the consequences of a very large spill are higher than for the winter.

Table 14.25 Estimated recovery time for ecological effects of oil spill

Scenario	WINTER		SUMMER	
	Recovery time	Consequence category	Recovery time	Consequence category
1 small spill	Insignificant	1	Insignificant	1
2 medium spill	Insignificant	1	Insignificant	1
3 large spill	< 1 year	2	< 1 year	2
4 very large spill	< 1 year	2	< 5 years	3

The criteria for the assessment of socioeconomic impact of an oil spill is categorised based on the percent of the Gulf that has more than 5% probability of being polluted with more than 50 ton oil per km^2:

- less than 20% of the Gulf no significant effect
- 20%-80% of the Gulf local effect
- more than 80% of the Gulf regional effect

Table 14.26 shows the assessment of the impact of an oil spill in Gulf of Iskenderun. The effects are divided into the four spill scenarios that are based on the TRA results. The consequence values are shown in Table 14.27.

Table 14.26 Effects on fisheries

Scenario		Summer		Winter	
		% of Iskenderun Gulf that has more than 5% probability of being affected with more than 50 ton oil per km^2	Consequence	% of Iskenderun Gulf that has more than 5% probability of being affected with more than 50 ton oil per km^2	Consequence
1	Small	2 %	no significant effect	1 %	no significant effect
2	Medium	25 %	local effect	26 %	local effect
3	Large	37 %	local effect	62 %	local effect
4	very large	81 %	regional	90 %	regional

Table 14.27 Consequence assessment for VEC 1: Fish and fisheries

VEC 1: fish and fisheries	consequence assessment	scenario	winter	summer	weighting factor
Ecological recovery time	See Table 14.25	1	1	1	**50 %**
		2	1	1	
		3	2	2	
		4	2	3	
Conservation value	It is no conservation value related to the most important fishery species	1	2		**20 %**
		2			
		3			
		4			
Socioeconomic impact	See Table 14.26	1	1	1	**20 %**
		2	3	3	
		3	3	3	
		4	4	4	
Economic value of VEC	Because the Gulf of Iskenderun is one of the most important fishing areas of the Levant Sea fishery. It is assessed to be of high economic value in a regional aspect.	1	4		**10 %**
		2			
		3			
		4			
Total consequence value for VEC 1: fish and fisheries		**1**	**1,5**	**1,5**	
		2	**1,9**	**1,9**	
		3	**2,4**	**2,4**	
		4	**2,6**	**3,1**	

14.3.4.2 VEC 2: Saltmarshes, Yumurtalik Lagoon

Saltmarshes are found globally and are often protected areas due to their provision of nursery areas and form productive food web support for fish. They serve as important habitats for wildlife species such as wading birds, and are used as grazing land in some regions. Of all estuarine and coastal environments, saltmarshes are among the most ecologically sensitive areas with respect to oil spills because they can trap and retain significant quantities of oil and because they are very difficult to clean. These habitats are also categorised as 'most vulnerable' according to the international shoreline vulnerability indices. In this risk assessment, a categorisation of recovery time of an oil saltmarsh is based on the categorisation applied in the method for quantitative environmental risk assessment developed by OLF and DNV (OLF 2001). The matrix in Table 14.28 shows the relation between oil pollution and recovery time for a sensitive shoreline.

Table 14.28 Matrix of relation between oil pollution and recovery time for sensitive shorelines.

	Consequence category/Recovery time				
	1	2	3	4	5
Ton oil in 1 km^2	insignificant	<1 year	1-5 years	5-10 years	>10 years
< 5	50 %	50 %			
5-50	10 %	60 %	20 %	10 %	
50-500			20 %	50 %	30 %
>500				40 %	60 %

The four scenarios for an oil spill from the BTC Marine Terminal has more than 1% probability of hitting the salt marshes of Yumurtalik Lagoon with oil amounts per km^2 as shown in Table 14.29. The consequence number is calculated by weighting the consequence categories with the probability for the consequence category related to the actual oil amount (see Table 14.28). As an example 50-500 ton/km^2 gives the consequence:

$$3 \times 0.2 + 4 \times 0.5 + 5 \times 0.3 = 4.1$$

Table 14.29 shows the amount of oil in km^2 with more than 1% probability for pollution of the saltmarshes. It also shows the related consequence that is weighted, based on the impact matrix in Table 14.28 above.

Table 14.29 Seasonal Impacts to Oil Spills and Consequence Analysis

Scenario		Winter		Summer	
		Ton oil/km^2	Consequence	Ton oil/km^2	Consequence
1	small	0	1	0	1
2	medium	5-50	2,3	0	1
3	large	50-500	4,1	0	1
4	very large	>500	4,6	>500	4,6

In addition to oil amount beached at saltmarshes, the size of the polluted area is an important parameter to assess the impact on saltmarshes. The total length of shoreline with saltmarsh in Yumurtalik Lagoon is roughly 60km.

Table 14.31 shows the length and percent of the saltmarsh shoreline that has more than 1% probability for oil pollution. The consequence values are derived from the following categorisation in Table 14.30.

Table 14.30 Consequence and Probability

Consequence	Percent of area with more than 1% probability for oil pollution
1	Not detectable
2	1-10%
3	10-30%
4	30-50%
5	>50%

Table 14.31 Percent of sensitive saltmarsh area with more than 1% probability for oil pollution

	WINTER			SUMMER		
Scenario	km affected	% of shoreline	Consequence	km affected	% of shoreline	consequence
1	15	25 %	4	0	0 %	1
2	25	42 %	5	0	0 %	1
3	60	100 %	5	0	0 %	1
4	60	100 %	5	9	15 %	3

The consequence assessment is summarised in Table 14.32. The consequences are highest in the winter period, due to more frequent wind directions that can drift the oil into the lagoon.

Table 14.32 Consequence assessment for VEC 2; Saltmarsh (Yumurtalik Lagoons)

VEC 2: Saltmarsh (Yumurtalik Lagoon)	Consequence Assessment	Scenario	Winter	Summer	Weighting Factor
Ecological recovery time	Ecological consequences are outlined in the Section and summarised in Table 14.29	1	1	1	**25 %**
		2	2,3	1	
		3	4,1	1	
		4	4,6	4,6	
Percent of area affected	See **Table 14.31**	1	4	1	**25 %**
		2	5	1	
		3	5	1	
		4	5	3	
Conservation value	Yumurtalik Lagoon are nationally protected	1	4		**20 %**
		2			
		3			
		4			
Socio-economic impact	The saltmarsh in Yumurtalik Lagoon is an important area for nursery and breeding of fish, birds and other species important for both fishing and tourism. Oil pollution will have limited socioeconomic impact	1	2		**20 %**
		2			
		3			
		4			
Economic value of VEC	The saltmarshes have low economical value	1	1		**10 %**
		2			
		3			
		4			
Total consequence value for VEC 2: Saltmarshes (Yumurtalik Lagoon)		**1**	**2,3**	**1,8**	
		2	**2,9**	**1,8**	
		3	**3,6**	**1,8**	
		4	**3,7**	**3,2**	

14.3.4.3 VEC 3: Waterfowl

There is a significant bird population that over-winters in the wetlands and along the coast within the influence area of a theoretical oil spill from the proposed BTC Marine Terminal. The White-headed duck is a globally threatened species, which has a significant part of its population over-wintering within the area potentially influenced by oil spills. In the summer time breeding species are of concern, one of the most vulnerable is the Kentish Plover that nest at mudflates close to the shoreline. This is a species with a threatened population status in Europe and with high density within the area of concern.

For the risk assessment, it assumed that the majority of the birds are within the stippled line in the map (Figure 14.10). It is also assumed that 50% of the birds are along the shoreline, while the other 50% are in the lakes. The total size of the marine part of the bird roosting area is 350km^2.

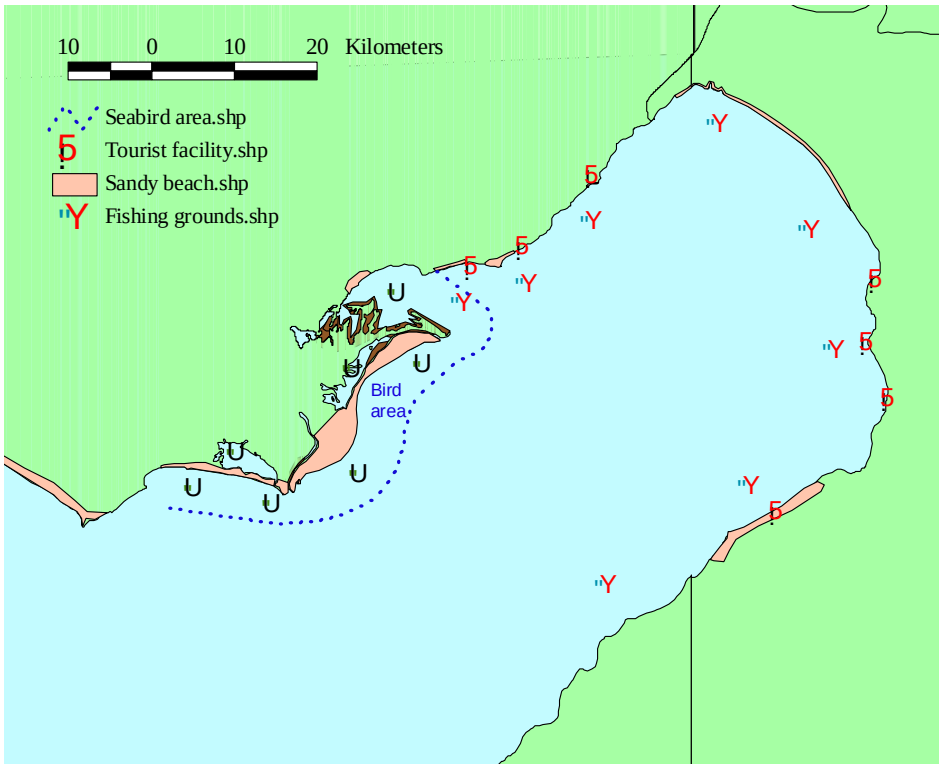


Figure 14.10 Areas were the bird density is significantly high.

The estimated recovery times of theoretical oil pollution incident on the important waterfowl areas are shown in Table 14.33. The recovery time is shown for a range of seasonal conditions. The recovery time is estimated by assessing the total percentage of birds in the area that would die as a result of an oil pollution incident. The key aspects of the assessment are the size of the oil spill and the area affected by the oil spill. The key conclusion from Table 14.33 is that the highest recovery time is in the winter months as the metocean conditions combine to retain the maximum volume of oil in the sea and the current/wind conditions drive the oil on to the sensitive coastal areas with the highest waterfowl densities.

Table 14.33 Estimated recovery time for waterfowl if it is polluted by oil from an oil discharge from BTC Marine Terminal

Season	Scenario	Amount of Oil	Probability	Area Km^2	% Of Total Bird Area	Total % Of Bird Mortality	Recovery Time	Consequence
Winter	1	5-50	5 %	170	49 %	2 %	Not detectable	**1**
	2	50-500	5 %	180	51 %	10 %	< 1 year	**2**
	3	50-500	5 %	280	80 %	16 %	< 5 years	**3**
	4	>500	5 %	300	86 %	26 %	< 10 years	**4**
Summer	1	5-50	0	0	0	0	Not detectable	**1**
	2	50-500	0	0	0	0	Not detectable	**1**
	3	50-500	0	0	0	0	Not detectable	**1**
	4	>500	5 %	140	40%	12 %	< 5 years	**3**

The total consequence assessment summarised in Table 14.34 that shows that the consequences to waterfowl are highest in the winter period.

Table 14.34 Consequence assessment for VEC 3: Waterfowl

VEC 3: Waterfowl	consequence assessment	scenario	winter	summer	weighting factor
Ecological recovery time	See text and tables above	1	1	1	**50 %**
		2	2	1	
		3	3	1	
		4	4	3	
Conservation value	White-headed Duck is endangered and thus internationally protected Kentish Plover has a declining population status	1	5	4	**20 %**
		2			
		3			
		4			
Socioeconomic impact	There is no socio-economic impact	1	1		**20 %**
		2			
		3			
		4			
Economic value of VEC	The birds have no economic value	1	1		**10 %**
		2			
		3			
		4			
Total consequence value for VEC 3: Waterfowl		**1**	1,8	1,6	
		2	2,3	1,6	
		3	2,8	1,6	
		4	3,3	2,6	

14.3.4.4 VEC 4: Sea Turtles

The total numbers of sea turtles are declining worldwide. In the Gulf of Iskenderun, they are particularly susceptible to oil pollution as there are a number of beaches used for nesting during the summer months. Because of this sensitivity, a conservative approach has been taken to the risk assessment using the categories listed in Table 14.35 below. Records from previous oil spill events have shown that the recovery time for nesting beaches can be in the order of less than one year.

Table 14.35 Relation between oil amount and recovery time for nesting beaches

Oil amount per km^2	Recovery time of nesting beaches
<5	Insignificant
5 – 50	< 1 year
50 – 500	1 - 2 year
> 500	2 - 4 year

In this assessment, the consequences are related to two criteria categories: one for the winter months and one for the summer months, which are deemed to be the most sensitive time of the year, as that is when the main turtle nesting period occurs. The consequence values also depend on the percentage of the nesting beaches that are affected by any oil spill.

The categorisation of the consequence values is shown in Table 14.36.

Table 14.36 Categories for consequence values for an oil pollution in the winter and summer half-year

Consequence value	WINTER Percent of nesting beaches in the Gulf of Iskenderun with more than 5% probability for oil pollution	SUMMER Percent of nesting beaches in the Gulf of Iskenderun with more than 5% probability for oil pollution
1	<10%	<1%
2	10-30%	1-10%
3	30-50%	10-30%
4	50-80%	30-50%
5	>80%	>50%

Table 14.37 shows the consequence values due to assessed recovery time and due to percent of nesting beach that has more than 5% probability for oil pollution. The total length of beaches suitable for turtle nesting is approximate 98km.

Table 14.37 Consequence value due to estimated recovery time and consequence value due to size of area with more than 5% probability for oil pollution

Season	Scenario	Amount of oil	Probability	Recovery time	Consequence	Length of Beach	% of Total Beach	Consequence
Winter	1	5-50	5 %	< 1 year	1	9	9 %	1
	2	50-500	5 %	1 - 2 year	2	28	29 %	2
	3	50-500	5 %	1 - 2 year	2	30	31 %	3
	4	>500	5 %	2 - 4 year	3	37	38 %	3
Summer	1	5-50	5 %	< 1 year	1	1	1 %	1
	2	50-500	5 %	1 - 2 year	2	22	22 %	3
	3	50-500	5 %	1 - 2 year	2	30	31 %	4
	4	>500	5 %	2 - 4 year	3	58	59 %	5

The total consequence value in Table 14.38 shows that, for the Green turtle, the highest consequence of oil pollution is if the pollution occurs in the summer.

Table 14.38 Consequence assessment of oil impact on Green turtle beaches

VEC 4: Sea Turtles	Consequence Assessment	Scenario	Winter	Summer	Weighting Factor
Recovery time	See Table 14.37 and the text above	1	1	1	25 %
		2	2	2	
		3	2	2	
		4	3	3	
Percent of area affected	See Table 14.37 and the text above	1	2	1	25 %
		2	3	3	
		3	4	4	
		4	4	5	
Conservation value	Green Turtle is critical endangered and internationally protected	1	5		20 %
		2			
		3			
		4			
Socio-economic impact	No socio-economic impact	1	1		20 %
		2			
		3			
		4			
Economic value of VEC	Green turtle have no direct economic value	1	1		10 %
		2			
		3			
		4			
Total consequence value for VEC 4: Sea Turtles		**1**	**1,8**	**1,8**	
		2	**2,3**	**2,6**	
		3	**2,6**	**2,8**	
		4	**2,8**	**3,3**	

14.3.4.5 VEC 5: Sea mammals, Monk Seal

The main area for Monk seal in the Mediterranean is the Aegean Sea and the Levant Sea south to the area between Cyprus and Mersin bay. Even though Monk seal have been observed from time to time in the Gulf of Iskenderun, it is clear that this is outside of their normal area. The probability of any impact to Monk seal in case of oil pollution, within the Gulf of Iskenderun, is very low. However, focus has to be put on impact and consequences to the Monk seal in relation to accidental oil discharge from transport vessels in the sailing lane to and from the BTC Marine Terminal. This task is outside the scope of this ERA, but it is strongly recommended to also carry out an ERA for the ship sailing lane. There is a commitment to undertake this work and it will be included in the Oil Spill Response Planning Schedule.

14.3.5 Environmental risk

The results from the assessment of Environmental Consequences Values (CV) are taken from the consequence assessment tables in the previous section and summarised in Table 14.39.

Table 14.39 Summary of the assessment of consequence values for oil spill scenarios 1-4

			VEC 1	VEC 2	VEC 3	VEC 4
Season	**Scenario**	**Frequency**	**Fish and fisheries**	**Saltmarshes**	**Waterfowl**	**Green turtle**
Winter	1	1,26E-02	1,5	2,3	1,8	1,8
	2	2,35E-04	1,9	2,9	2,3	2,3
	3	2,07E-04	2,4	3,6	2,8	2,6
	4	4,50E-06	2,6	3,7	3,3	2,8
Summer	1	1,26E-02	1,5	1,8	1,6	1,8
	2	2,35E-04	1,9	1,8	1,6	2,6
	3	2,07E-04	2,4	1,8	1,6	2,8
	4	4,50E-06	3,1	3,2	2,6	3,3

The consequence values for each VEC, with related scenario and frequency, have been sorted in ascending order. The consequence values have been related to a cumulative frequency in the way that the highest consequence value is related to the frequency of the scenario that causes the high value. The frequency for the next consequence value is the sum of the frequency for the scenario with the highest consequence value and the frequency of the scenario related to the consequence value. For each consequence value the frequency for all higher consequence values are added to the frequency for the actual consequence value. An example of how the cumulative frequency is calculated is given in Table 14.40.

Table 14.40 Example of calculating the cumulative frequency for a VEC

Season	**Scenario**	**Frequency**	**Fish and Fisheries**	**Cumulative Frequency**
Winter	1	1,26E-02	1,5	2,61E-02
Summer	1	1,26E-02	1,5	1,35E-02
Winter	2	2,35E-04	1,9	8,93E-04
Summer	2	2,35E-04	1,9	6,58E-04
Winter	3	2,07E-04	2,4	4,23E-04
Summer	3	2,07E-04	2,4	2,16E-04
Winter	4	4,50E-06	2,6	9,00E-06
Summer	4	4,50E-06	3,1	4,50E-06

The environmental risk in terms of cumulative frequency for the consequences for all VEC are shown in Figure 14.11. Frequencies above the black stippled line indicate that the environmental risk is considered to be reasonably high, without taking into account the effect of any risk reducing measures (including oil spill contingency). The results show that the frequency for the consequence values for VEC 2 (Saltmarsh), is higher than for the other VEC. This signifies that the saltmarshes in Yumurtalik Lagoon has the highest environmental risk due to operation of the proposed BTC Marine Terminal. Yumurtalik Lagoon is also important for the waterfowl VEC and partly for the fish and fishery VEC.

This implies that the Yumurtalik Lagoon is a very sensitive and vulnerable for oil spill from the oil export terminal. The dominating wind direction in the winter half-year makes oil drift south- southwest and possibly into the Lagoon. In contrast, the predominating winds in the summer half-year, tends to press the oil further in to the Gulf of Iskenderun and thus the probability of oiling the sensitive areas of Yumurtalik Lagoon is much lower.

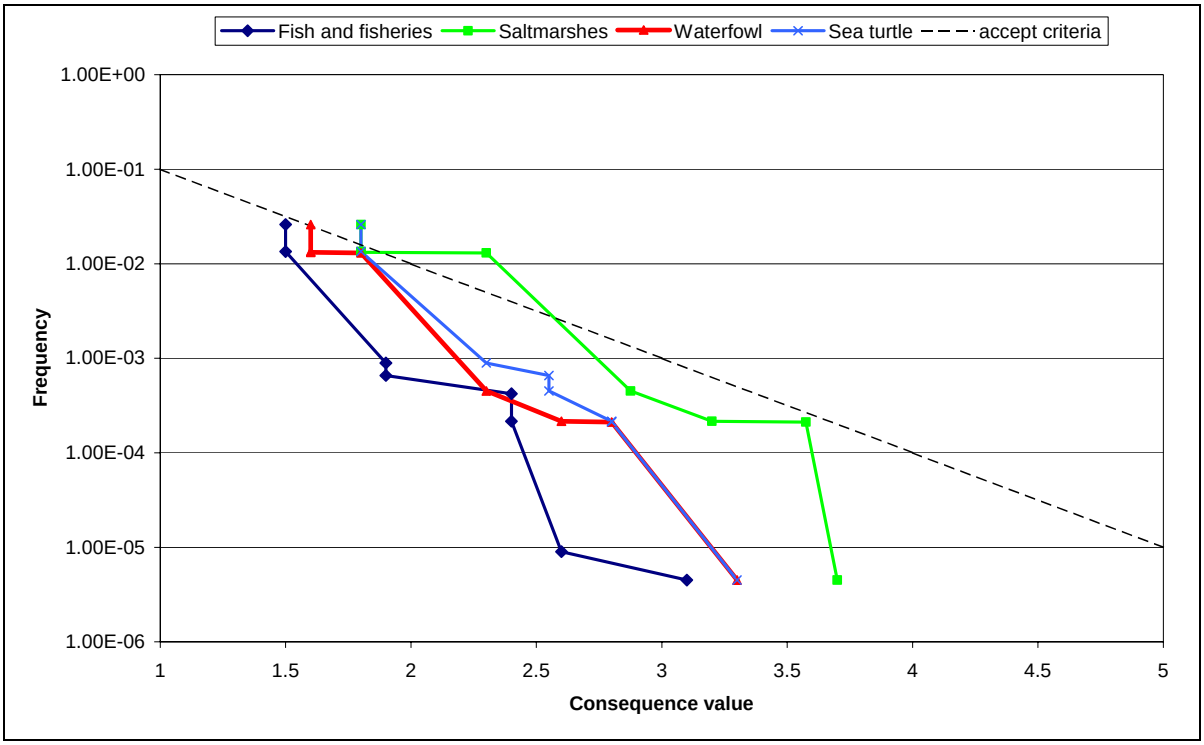


Figure 14.11 Environmental risk related to the BTC Marine Terminal

The stippled line in Figure 14.11 indicates tentative limit for acceptable risk. [Ref 1]

14.4 TRANS-BOUNDARY ISSUES

14.4.1 Introduction

14.4.1.1 The relevance of an assessment of transboundary impacts

Trans-boundary impacts in the context of the proposed BTC Marine Terminal are limited to marine impacts from major oil spills. The Espoo Convention (*The Convention on Environmental Impact Assessment in a Transboundary Context, held at Espoo, Finland*) commits its signatories to carrying out environmental impact assessment on any proposed activities that are likely to cause significant adverse transboundary impact, and to inform and consult the neighbouring countries affected. Although Turkey is not a signatory of the convention, good EIA practice recommends the assessment of significant trans-boundary issues, which are considered further below.

14.4.1.2 Objectives and scope

Section 14.3 presents an environmental risk assessment associated with accidental oil spills which occur within the operational zone of the BTC Marine Terminal. This Section 14.4 presents a consequence assessment, focusing on potential transboundary impacts associated with major accidental oil spillages at sea.

This section comprises a summary of a more detailed oil spill modelling study for tanker accidents outside of the proposed BTC Marine Terminal operational zone, but within Iskenderun Bay. The full study is appended to this EIA Report as Appendix B4.

14.4.2 Spill modelling

14.4.2.1 General Approach to Spill Modelling

Oil spill trajectories have been modelled to simulate slick behaviour in the unlikely event of a major spillage. The simulations have been carried out using the OSIS computer-modelling programme. The model combines oil properties with the environmental conditions of tidal currents, winds and sea state, and air and sea temperature to provide an estimate of the spill's trajectory and its weathering and dispersion behaviour.

It is important to note that the oil spill modelling outcomes make no allowance for any pollution response action, notably the application of dispersants. Also the volumes and location of the spills depict the absolute worst-case scenario, ie adjacent to the Yumurtalik Lagoons, which are recognised nationally as a Nature Reserve and internationally as an Important Bird Area (IBA).

14.4.2.2 Metocean data inputs to model

Meteorological data were obtained from the Yumurtalik Meteorological Station. The annual windrose is illustrated in Figure 14.12.

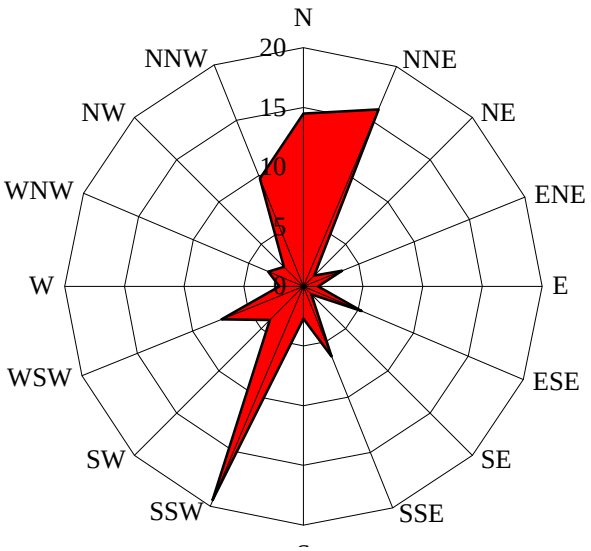


Figure 14.12 Annual Wind Rose (Yumurtalik Meteorological Station, 1996)

For the majority of the year light winds blow from a northeasterly direction, averaging 1.5-2.0 m s^{-1}. The wind direction changes to a westerly direction in April. During the summer months (from June through to September), the prevailing wind direction is south-to-south

west. Wind speeds increase to a brisk 2.1-4.3 m s^{-1} in the summer months, before reverting back to a northerly direction in the winter.

The residual current in the Gulf of Iskenderun indicates distinct seasonal patterns, with a weak flow (0.05 ms^{-1}) in the winter, but a stronger current (0.18 ms^{-1}) in the summer.

14.4.3 Oil weathering process

Oils can be classified into groups according to their overall persistence in the marine environment. Estimates can subsequently be made of their rate of removal from the sea surface. An example of such a classification system is shown below in Figure 14.13.

The figure shows that the volume of Azeri crude oil spilled at sea may increase dramatically soon after it is spilled, as it absorbs water. Subsequently, the slick will break down but 5-10% may persist for a week or more. Box 14.2 shows typical hydrocarbon densities.

Box 14.2 Typical Hydrocarbon Densities

Group	Density	Examples
Group I	Less than 0.8	Gasoline, Kerosene
Group II	0.8 – 0.85	Gas oil, Abu Dhabi Crude
Group III	0.85 – 0.95	Arabian light crude, North Sea Crude Oils, Azeri Crude
Group IV	Greater than 0.95	Heavy fuel oil. Venezuelan Crude Oils

The weathering behaviour of Azeri crude oil has previously been examined through a series of laboratory-based tests designed to replicate the at-sea behaviour (Davies, 2001). That study identified the following key characteristics for the oil.

- Fresh Azeri crude oil is a light oil, with a viscosity of 30 mPas at 27°C and 310 mPas at 6°C.
- The oil readily takes up water to form stable emulsions, with a final water content of 82%. The volume of emulsion on the sea surface can, therefore, be 4-5 times greater than the volume of crude oil spilt.
- After a few hours at sea, the oil will lose 20% by volume through evaporation and the viscosity of emulsified oil ranges from 2,900 mPas at 27°C to 10,500 mPas at 6°C.
- Over periods of 1-2 days, approximately 32% of the oil will be lost by evaporation and the viscosity of emulsified oil increases to 5,800 mPas at 27°C and 31,200 mPas at 6°C.
- Due to the high viscosity of the emulsified oil, spills of Azeri crude oil can be expected to persist for periods of many days on the sea surface.

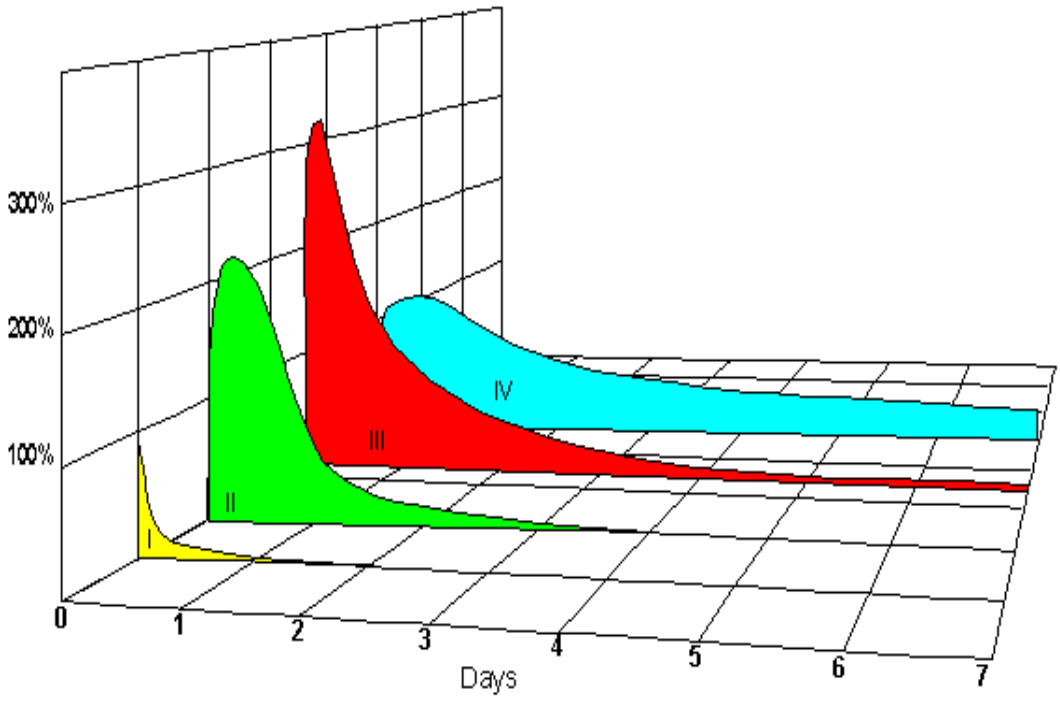


Figure 14.13 Rate of Removal of Oil from the Sea Surface According to Type

14.4.4 Potential transboundary impacts

14.4.4.1 500 tonne spill

The following potential trans-boundary impacts have been identified:

During the winter months the higher wind speeds increase the probability of an oil spill travelling beyond the Bay. During northerly winds, a >500 tonne spill could beach on the northern and eastern coasts of Cyprus or along the coast of Syria. The volume of emulsified oil beaching on these coastlines ranges from 8,000 to 20,000 m^3. The slick would take 3 to 4 days to reach the northern part of the Syrian coastline.

Spills under high wind speeds during the winter will persist for many days. Under Force 8 conditions, the surface oiling diagram indicates that the remote possibility of the spill persisting for long enough to reach the coast of Egypt, near the Ramsar site at Lake Burullus. A total volume of 1,500 m^3 of emulsified oil is predicted to beach 300 hours after the initial release. However, this event is considered to be largely an artefact of the modelling process, as explained previously.

As with the winter scenario, strong northerly winds could carry an oil slick out of the Gulf and onto the coast of Syria during summer months. The time that elapses before beaching occurs ranges from 65–140 hours, depending on wind speed. The volume of emulsified oil impacting on the coastline ranges from 240–112m^3.

14.4.4.2 10,000 tonne spill

The spill model results indicate that oil from a catastrophic spill could beach on the coast of northern Cyprus or along the coast of Syria. The volume of emulsified oil that may end up on these beaches ranges from 8,000 m^3 to 20,000m^3, depending metocean conditions. The slick would take 3-4 days to reach the northern part of the Syrian or Cypriot coasts.

Under Force 8 conditions, the spill may persist sufficiently for 1,500 m^3 of emulsified oil to reach the coast of Egypt (near Lake Burullus), 300 hours after the initial release. As with the smaller spill scenarios, this must be viewed essentially an artefact of the model. In reality, northeasterly winds are unlikely to persist for sufficiently long to drive the slick past the Levantine coast near Haifa.

During the summer months a 10,000 tonne spill is highly likely to remain principally within Iskenderun Bay. The likelihood that oil would leave the Bay is relatively low, whereupon it may pose a threat to the coasts of Syria.

Figure 14.14 depicts the probable trajectory of a 10,000 tonne release of crude oil following a major tanker accident in winter from a point approximately 3km offshore Iskenderun Bay.

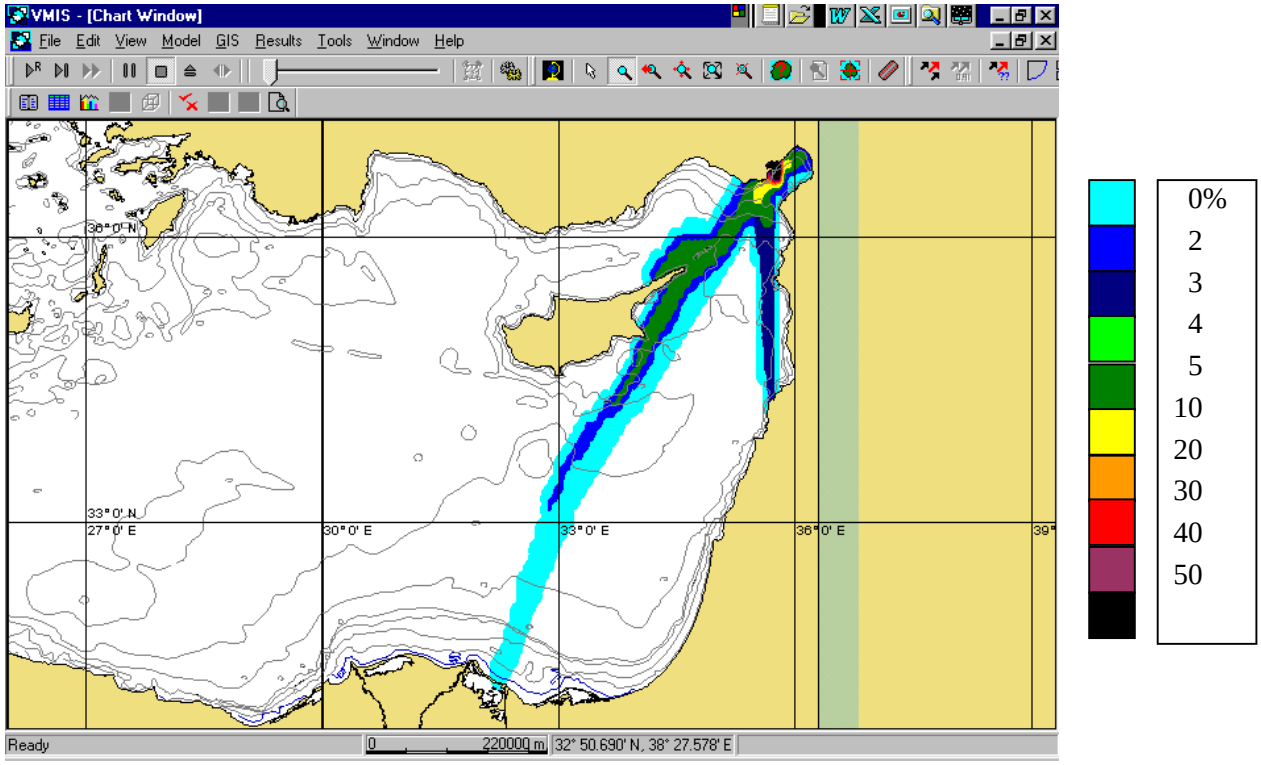


Figure 14.14 Probability of Surface Oiling, 10,000 tonne release of Azeri crude oil, winter

14.4.5 Consequence of transboundary spills

As previously stated, a consideration of the key receptors of potential spill scenarios is required in order to ascertain the risk to the environment of a given scenario. Accordingly, an analysis of the frequency of initiating even and the probability of the required metocean conditions occurring has been used to determine the frequency of incidents resulting in trans-boundary impacts. In addition, specific sensitivities known from each of the impact locations have been noted in order to understand more fully the consequences of these scenarios (see Table 14.41). This information will feed into the development of a specific oil spill response plan (OSRP) to be devised during ongoing detailed design and construction phase.

Table 14.41 Consequences of Transboundary Scenarios

Spill scenario	Wind conditions	Impact	Time to Beaching (days)	Amount (approx)	Specific Sensitivities
500 te Winter	Northerly	Lebanon	9 – 10	150 m^3	Tourism
	North-easterly	North and East Cyprus	4 – 5	300 m^3	Monk seal, green turtle, tourism
500 te Summer	Northerly > Force 4	Syria	2.5-6	240 – 112 m^3	none known
10000 te winter	Northerly Force 8	North Cyprus	3 – 4	8,000 – 20,000 m^3	Monk seal, green turtle, tourism
	Northerly Force 8	North Syria	3 – 4	8,000 – 20,000 m^3	none known
	Northerly Force 8	North Egypt	12-13	1,500 m^3	Lake Burullus Ramsar site
10000 te summer	Northerly > Force 4	North Syria	2.5-6	8,000 – 20,000 m^3	none known

14.5 INCIDENT RESPONSE

14.5.1 General framework

BTC recognises that an integrated approach to oil spill preparedness and response is required to minimise the risk of a spill and the potential environmental damage from a spill. The framework for the development of the OSRP has been developed as part of the preliminary work programme to address the following:

- Ensuring appropriate emergency response resources and procedures are in place;
- Ensuring appropriate training is undertaken.

The aims and objectives of the proposed BTC OSRP will be to provide the means to:

- Control a release which may arise from a fault in the operation of the pipeline and associated facilities;
- Minimise the volume of such releases when they do occur by securing the source in the most appropriate way;
- Minimise the movement from the source of released oil by timely containment;
- Minimise the environmental impact of primary releases by timely containment and recovery response;
- Maximise the effectiveness of such response through appropriate equipment and technique selection. This will be based on full knowledge of the relevant properties of the oil and the changes in their properties arising from the ambient conditions into which they are released and the sea and land conditions and morphologies onto which they are released;
- Maximise the effectiveness of the response through trained and competent operational and response teams.

For each country in the BTC system (Azerbaijan, Georgia and Turkey) a country specific OSRP will be developed to cover all of the facilities. These OSRPs will not only cover BTC but also other projects operated by the BP Baku Business Unit. The contents of the OSRP will include:

- Response and organisation;

- Notification and callout procedures;
- Contact details;
- Roles and responsibilities;
- Risk assessment;
- Response action plans.

Specifically for the BTC Marine Terminal, the existing containment and recovery provision at Ceyhan and the opportunity to incorporate the OSIS model into the future response planning arrangements for the port will be explored.

14.5.2 OSRP concept

To respond effectively to a spill, it is important to appropriately prioritise actions and assign response resources to different incidents. The usual way of achieving this is to define tiers of response, which are related to the size of a spill incident and the availability of resources to deal with it. Definition of a spill event in terms of Tier 1, 2 and 3 have already been used for the existing Azerbaijan and Georgia OSRPs. The existing OSRP definitions are set out below:

- **Tier 1 event**: A small local spill requiring no outside intervention and can be dealt with on site by local staff and stockpiled equipment; ie dedicated resources available at the CMT.

- **Tier 2 event**: A larger spill that would require additional outside resources and manpower, such as an oil spill response contractor, or co-operative action between local operators, eg utilising resources from Iskenderun and Dortyol.

- **Tier 3 event**: A large, possibly ongoing spill, which will require additional regional and possibly international resources. Such spills are very rare (as discussed above) and would only occur through full diameter pipe rupture, storage tank collapse or a major tanker incident such as collision with another vessel. The clean up for a Tier 3 event will utilise all BTC manpower and resources, and be augmented by additional resources from external resources such as Briggs Marine Environmental Services (BMES) in Baku or other Tier 3 contractor and/or Oil Spill Response, Ltd (OSRL) from Southampton, UK, or the East Asian Response Ltd (EARL) in Singapore.

One of the key purposes of the OSRP is to provide, as far as possible quantitative measures for the various tiers for each component of the Project. In addition, each tier of response will have associated operation details, such as:

- Roles and responsibilities;
- Contact numbers list;
- Mobilisation of appropriate external response (eg Oil Spill Response Ltd (OSRL)) in the event that an oil plume may impact on territories in which no OSRP capability or Inter-Governmental agreement exists;
- Containment Plans (ie identification of containment locations inside the Azerbaijan border to ensure a spill in Georgia can be appropriately contained when it crosses).

14.5.3 Recommendation for risk reduction and oil spill contingency

Storing, loading and transport of large quantities of oil will always be associated with a risk of accidental events, despite the fact that the operators continuously seek to improve the

technological, operational and organisational elements so that the safety level of the operations are improved. This safety and risk management process involves all aspects of the operation; both personnel, assets and the environment. Many of the general recommendations for risk reduction are incorporated in other areas, only recommendations based on the results from the ERA are outlined below.

Area of highest risk is Yumurtalik Lagoon. The oil spill response plan should include methods to avoid oil from entering the lagoon. The highest probability for oil pollution in the lagoon is in the winter period.

The oil preparedness plan must, among other, take into consideration the following parameters:

- Response time: 1 day. The fastest drift time of oil from the terminal to the Yumurtalik Lagoon is 1.9 days.

- Capacity: average emulsified oil within the outer part of the Lagoon is estimated to be ca 4700 tonnes for a medium spill, ca 11000 tonnes for a large spill and ca 49500 for a very large spill.

- Oil spill combating near the source is the best option. Especially for this case where sensitive environmental resources are situation close to the terminal.

- Use of oil dispersants must be carefully elucidated, especially regarding shallow fish spawning sites in the summer half-year.

14.5.4 Linking the EIA to the OSRP

As detailed above, an assessment has been undertaken to understand the possible spill scenarios that could be expected from the BTC Marine Terminal operations. The assessment is considered conservative as it is based on historical data and does not take into consideration improvements in design techniques or asset management methodologies.

Notwithstanding the conservative assumptions made in the risk assessment the outputs will however be very useful in enabling the Oil Spill Response planners to define the appropriate resources that should be employed for the BTC Pipeline. In particular the outputs from this assessment can be used to determine what Tier 2 resources will be required. It will also be necessary to develop different response strategies dependant not only on the probable release size but also on the sensitivity of the environment in the leak location.

For offshore spills, the OSRP will address:

- Means to estimate evaporative losses, emulsification and natural dispersion rates, based on oil properties and exposure times;
- Amounts of released oil requiring containment and removal from the various locations as a function of exposure time;
- Recovery rates (tonnes per hour) likely to be achieved by the selected techniques and equipment;
- Optimisation of response resource provisions as between sea (inland water) and shorelines (river banks).

There will be a number of specific response plans prepared as part of the overall OSRP including response plans for onshore and offshore spills.

The OSRP will establish sufficient response capabilities in each country to enable a moderate to large (7-700 te) incident to be handled using in-country resources. Notwithstanding this, the BTC Owners will continue to consult with the boundary authorities in Azerbaijan, Georgia and Turkey to ensure that appropriate equipment could be moved from country to country in the event of a spill. The OSRP will also address the responses required in the event of an oil spill occurring in one country that could potentially impact another country (as detailed below).

14.5.5 Transboundary response

A catastrophic tanker incident has the potential for major trans-boundary impacts. The OSRP will address the responses required in the event of an oil spill occurring in one country that could potentially impact another country. In the case of BTC Marine Terminal operations, these are Cyprus, Syria, Lebanon, Israel and Egypt. Co-ordination with the Regional Marine Pollution Emergency Response Centre for the Mediterranean (REMPEC) will also be required.

14.6 CONCLUSIONS

The potential impact of an oil spillage to sea depends on the type and quantity of oil spilt, the location of the spill and the sea state and winds at the time of the spill. Major crude oil spills have a very low probability of occurrence, however, if they do occur there is the potential for them to cause pollution with major environmental consequences.

The primary aim is to prevent any spillages occurring and to this end, procedural controls will be firmly in place. An integrated approach to preparedness for oil spill response will be adopted for all aspects of incident management and this will include:

- construction of the Project in a manner that minimises risks of incidents;
- design of the pipeline system and terminal to ensure the risks of incidents during operation are minimised;
- ensuring the pipeline and terminal are operated in a manner that minimises the risk of incidents;
- recognition that incidents may occur and have an understanding of the risks.

The loading of oil tankers and jetties is a well established process and the risks are understood therefore allowing appropriate prevention procedures to be put in place eg addressing the identified risks during the design phase and purchase of equipment as well as ensuring that all personnel are properly trained. As operational procedures are put in place, the OSRP will be aligned with them and with the overall BOTAŞ Emergency Response Plan and the overall Strategy for the BTC Pipeline.

Marine traffic within the harbour will be strictly controlled by the Harbour Authority in accordance with the Ceyhan Harbour Operating Regulation to ensure risk is minimal.

BIBLIOGRAPHY

Ref 1 Den Norste Veritas (2002). Environmental Risk Assesment Ceyhan Oil Export Terminal, Report No 2002-0396

Ref 2 Corps, J, (2002). Oil Spill Modelling for Tanker Accidents in Iskenderun Bay, Turkey. AEAT/ENV/R/0939, January 2002.

Ref 3 GESAMP, (1993). Impact of Oil and Related Chemicals and Wastes on the Marine Environment. IMO/FAO/UNESCO/WMO/WHO/IAEA/UNEP. GESAMP Reports and Studies No. 50.

Ref 4 ILF, (2002). Existing BOTAŞ Marine TerminalExisting BOTAŞ Marine Terminal Environmental Risk Assessment. ILF/REP/SEC/TRG/001 Revision B, 2002.

Ref 5 IPIECA. (2000). A Guide to Contingency Planning for Oil Spills on Water. 2nd edition, March 2000.

Ref 6 ITOPF, (2001). Accidental Tanker Oil Spill Statistics, International Tanker Owners Pollution Federation Led, 2001.

Ref 7 Peters, HJ. (1990). Marine Pollution in the Mediterranean: Incidence, Control Issues, and Abatement Options. GEP-CR-90-04. April 1990.

Ref 8 PLE-PLN-EPR-PLG-001. Spill Response Plan. Map 1 Habitats on Topographic Map.

Ref 9 Reid, HJ. (2001). Framework for Development of a Comprehensive Oil Spill Response Capability for the BTC Project

Ref 10 Rijnmond Public Authority (1982), "A Risk Analysis of Six Potentially Hazardous Industrial Objects in the Rijnmond Area - A Pilot Study", COVO, D. Reidel Publishing Co., Dordrecht.

Ref 11 Wilkinson, A (1991), "Bund Overtopping – The consequences following catastrophic failure of large volume liquid storage vessels" AEA Technology SRD/HSE R530.

DNV BIBLIOGRAPHY

Ref 12 BirdLife International/European Bird Cencus Council (2000) "European bird populations: estimates and trends" Cambridge, UK: BirdLife International (BirdLife Conservation Series No.10)

Ref 13 BOTAŞ (Ceyhan) Port Regulation

Ref 14 DNV Report No. 2002-0396 rev 1. (May 2002) Environmental Risk Assessment for BTC Existing BOTAŞ Marine TerminalExisting BOTAŞ Marine Terminal.

Ref 15 DNV Technica, London, Report No. C1216 (oktober 1990), Port risks in Great Britain from marine transport of dangerous substances in bulk; a risk assessment for The Health and Safety Executive."

Ref 16 Groombridge B., 1990. Marine turtles in the Mediterranean: Distribution, Population status, Conservation. A report to the Council of Europe Environment Conservation and Management Division, 99 p.

Ref 17 ILF-REP-EMT-TRG-006 rev.D, Control and Operating Philosophy - Offshore

Ref 18 OLF (The Norwegian Oil Industry Association), January 2001: Guidelines for quantitative environmental risk assessments for offshore petroleum activities - the MIRA method. (in Norwegian

Ref 19 PLE-REP-EPR-PLG-011, Geohazard study at Existing BOTAŞ Marine Terminal

Ref 20 PLE-REP-EPR-PLG-001, Seismic Design Criteria Report

Ref 21 Yerli S. and Demirayak F., 1996. Turkiye'de Deniz Kaplumbagalari ve Ureme Kumsallari Uzerine Bir Degerlendirme '95. DHKD Kiyi Yonetimi Bolumu 96/4, 129 p. (in Turkish)

15 SUMMARY OF KEY RESIDUAL IMPACTS

15.1 INTRODUCTION

Sections 6, 7, 11 and 12 of this EIA Report describe the potential environmental and social impacts and benefits that could occur as a result of the construction and operation of the BTC Project, together with the mitigation measures that will be applied to identified impacts.

During the planning and design development of the BTC Project many potential impacts have been completely avoided by design and routing decisions during the Basic and Detailed Engineering phases. Many other potential impacts are minor by virtue of the characteristics of the receiving environment, the nature of the project activity and measures that are an inherent part of good design and good practice. However, not all impacts can be fully mitigated, and residual effects will be experienced by environmental and social receptors. This section summarises residual environmental and social impacts of the BTC Project in Turkey that are viewed as being most important.

It should be noted that some (but not all) of the significant residual impacts described in this section stem in part from uncertainty (in the baseline, in the project intent, in the effectiveness of mitigation and in how the environment and people might respond). Where there is a level of uncertainty and a vulnerable/sensitive/valuable environmental or social receptor, it is appropriate that the EIA be cautious (or adopt what is also referred to as a 'worst case' or 'precautionary principle' approach) in applying the significance criteria. This caution serves to highlight key areas of critical uncertainty so as to ensure that additional actions (over and above those already defined within the available mitigation measures that have been provided for in the impact assessment) are undertaken to manage the implications of this uncertainty. Such additional actions may include increased levels of vigilance and scrutiny during project implementation, additional studies (of the baseline, of engineering techniques, etc) and enhanced level of communication with affected people. The rigorous application, and further development, of the provisions and requirements of the various environmental and social management plans presented in Appendix C (noting that these may in turn be amended to reflect new information obtained during pre-construction surveys), provides a robust means of managing the ongoing environmental and social issues associated with the Project and is critical to the application of the EIA as a powerful management tool throughout the project life cycle.

It should be reiterated, however, that the mechanisms and provisions of the management plans have already been applied to identified impacts during the assessment process and that the residual impacts discussed within this Section are those that remain after the application and maintenance of the requirements of the management plans as they are currently drafted.

For residual environmental impacts, those that are regarded as most important have been evaluated as Moderate and Major. These levels of impact broadly equate to those that have been defined as Significant social impacts. However, the social impact assessment has not distinguished between two levels of significant impacts in the way that the environmental impact assessment has. Box 15.1 provides a further explanation in the context of the ensuing discussion of residual impacts.

Box 15.1 Significant Environmental and Social Impacts

ENVIRONMENT	SOCIAL
Major: these are residual impacts that are judged to be in excess of the thresholds defined in Section 3 for the various environmental aspects despite the planned mitigation which has sought to reduce those impacts to as low as reasonably practicable. Many of these stem from uncertainty in the baseline or over the effectiveness of mitigation combined with conservative evaluation of significance. The basic principles behind dealing with Major impacts described subsequently in this section are to: (a) resolve uncertainty through additional studies; (b) amend mitigation in light of the further studies; (c) implement the mitigation (and monitoring) with an extra degree of vigilance. An extra degree of vigilance for some matters does not imply a lack of it elsewhere. An example would be in certain areas having the work of the on-site Environmental Inspector supplemented by the presence of specialist experts (eg soils scientist, archaeologist, bat expert etc). **Moderate:** these are residual impacts that exceed the thresholds defined in Section 3 despite the planned mitigation, which has sought to reduce those impacts. Whilst some of these moderate residual impacts stem from uncertainty (and may therefore be amenable to further mitigation on the basis of improved information), some will require additional and sustained management scrutiny to avoid major impacts occurring. Their inclusion is intended, therefore, to ensure that ongoing management scrutiny is maintained over these impacts.	In the consideration of social impacts, an impact is defined as either 'Significant' or 'Not Significant'. Ranking the importance of impacts is frequently based on assessment criteria such as duration, geographical extent, probability, number of people affected etc. However, this approach (when assessing social impacts) does not take cognisance of the significance of an impact on the household or individual level. This applies particularly to poorer households who are more vulnerable to social impacts. Thus, where an impact has the potential to leave a household worse off than before, the impact is considered to be significant. However, it is reasonable, based on professional judgement and feedback from consultation, to identify those significant impacts that are considered to be most important. This differentiation is based on the following criteria: **Most important significant impacts:** • impacts where there is uncertainty regarding the effectiveness of mitigation; • impacts that were targeted as key areas of concern during the consultation process; and • impacts that require additional studies in order to more fully understand the nature of the impact and devise refined mitigation measures. **Other significant impacts:** these impacts are still important, but there is a higher degree of assurance that mitigation will be effective.

This EIA Report represents the Project's status at Draft EIA disclosure. Although major environmental and significant social residual impacts have been described in the EIA, in this Section guidance is provided on the range of additional mitigation measures (including the development of additional management provisions, the collection and utilisation of stakeholder feedback, the commissioning of further studies etc) that might be required during Project implementation in order to avoid impacts at these levels of significance. The future, ongoing management scrutiny, impact monitoring and process auditing that is provided for within the EMMP and the supporting environmental and social management plans, will determine the degree to which these additional opportunities for impact reduction have been taken.

15.2 RESIDUAL IMPACTS ALONG THE PIPELINE

15.2.1 Residual environmental impacts of Major significance

This section describes the residual environmental impacts evaluated as Major. Major residual impacts could potentially occur for soils, landscape, ecology and noise at various locations along the pipeline. As stated above, the evaluation of Major impacts stems in part from uncertainty factors and a precautionary approach to impact assessment. The following subsections have identified means and mechanisms, therefore, by which uncertainty will be addressed and managed. In the majority of instances, if not all, these measures should ultimately ensure that the residual impact becomes Moderate.

15.2.1.1 Soils

The EIA has identified the need for the appointment of a soil expert to provide ongoing advice on the management of residual soil impacts during the construction and reinstatement phases of the BTC project.

The residual impacts associated with different soils are discussed below.

Soils - tuff

Pipeline construction on mesic coarse-loamy Entic Dystrandept soils wherever tuff dominates the landscape, will potentially give rise to Major residual impacts between KPs 0 – 10, 16 – 45, 85 – 137, 156 – 171 and 192 - 238. According to the criteria in Section 3 these impacts could be of regional extent given their repetition along the corridor. The impacts are reversible through both management intervention and natural recovery so, while they may extend beyond the short-term, they will not endure throughout the project lifetime.

At this stage, there is a degree of uncertainty in the assessment that stems from the precise nature of soils on the working width (assessment was largely based on data collected for the 500m corridor) and how these soils will respond to reinstatement. These issues and project actions to resolve them are discussed below.

While it may not be possible to reduce major impacts to moderate ones everywhere the measures described should be able to both localise the impacts more and reduce their duration.

Tuff is volcanic ash. It occurs as broad, white - or grey-coloured sheets that, once disturbed, erode into angular, craggy outcrops and deep canyons. Its fertility is comparable to powdered glass. Tuffaceous lands occur in northeastern Turkey, where they support a low-density coniferous forest underlain by xeric shrubs and coarse grass. Such soil has inherently low productivity and is difficult to reinstate due to lack of depth, leaving the whitish tuff exposed and mixed with the original topsoil. Reduced soil productivity and increased rates of soil erosion constitute the main potential impacts (along with indirect impacts to landscape – see below), which will be mitigated as far as practicable through application of reinstatement specifications described in the impact tables in Section 6 and the Reinstatement Plan (RP) (see Appendix C2). However, despite the application of these mitigation measures there will be a Major residual impact as soils developed from tuff are unlikely to respond to standard reinstatement and exposed tuff and its effects on soil productivity will continue throughout the duration of the Project.

Mitigating the impacts of pipeline construction on tuff will require an additional narrowing of the construction corridor to as small a width as possible. This is feasible because the topsoil is so thin that it will occupy little space when reserved during trench excavation. However, careful management of reserved topsoil will be required as tuff topsoil is the sole reservoir of fertility in tuffaceous soils and an important store of seeds. Since the topsoil is thin and variable in depth it is inappropriate to specify to contractors a prescriptive thickness to be removed. If the thickness is too great the outcome will be that topsoil will be removed together with subsoil of near-zero productivity. When they are returned the two could be mixed and the overall productivity substantially reduced before reinstatement even starts.

To address these issues will require pre-construction surveys and close supervision during construction and reinstatement, both involving expert soil scientist input employed specifically for such work. Topsoil thickness will therefore be established at regular intervals. Intervals will vary and will be decided by a soils expert. The soils expert will also establish the topsoil depth and discuss the most appropriate removal technique with the construction contractor. The Project's Contractors will set aside shrubs and coarse grasses for replanting. On a strip of some length, if possible, replanting materials will be removed and replanted along a length of the RoW with the same soil and soil climate conditions and where reinstatement is nearing its end. Temporary soil erosion control measures will be established while constructing the pipeline. These will include temporary water bars, ditch breakers, and runoff barriers such as filter fences or straw bales.

The land will be returned to as close to its natural contours as practicable. The infilled subsoil will be returned in layers following the same sequences as its removal. A crown no higher than 0.3m high will be left to allow for eventual settling of the soil. The resulting surface will then be profiled to conform to slope breaker and other specifications. Slope breakers will drain into a cuvette sculpted into the soil at each slope breaker outlet. Only then will the topsoil be replaced. If the growing season is nearing its end, the on-site soils expert may require the topsoil berm to be seeded with a fast growing cover crop, when it will be stored for spreading the following spring.

Vegetation will be replanted accompanied by a basal dose of fertiliser mix. On tuff the usual 10-10-10 application of NPK will require additional micro-nutrients. Local expert advice will be sought from the Ministries of Forestry and Agriculture. Plants in addition to those recovered during topsoil stripping will likely be required if reinstatement is to succeed. Again, expert local advice will be sought in identifying seed or plant sources.

East Anatolian Natural Gas Pipeline (NGP)

From KPs 259 to 546, existing soil related liabilities of the NGP, which was not adequately reinstated, would be potentially exacerbated by the BTC Pipeline, where their RoWs lie adjacent or closely parallel.

It is a project requirement that the BTC Pipeline will not inherit the reputation and soil erosion problems caused by poor reinstatement of the NGP. Therefore, a two-phase approach to reinstatement in the vicinity of the NGP will be adopted, which is more fully described in the Reinstatement Plan (RP) (see Appendix C2). Briefly, phase one will entail the NGP construction contractor undertaking remedial reinstatement measures prior to BTC Pipeline construction to resolve existing problems and phase two will require the BTC Contractor to undertake any additional mitigation measures to ensure the integrity of the BTC corridor in areas impacted, or potentially impacted, by the presence and/or proximity of the NGP pipeline. Special areas identified as requiring specific reinstatement measures prior to, or during, reinstatement of the BTC Pipeline are as follows:

- general reinstatement;
- adjacent agricultural land – for example, in areas of poor topsoil management;
- hill slope reinstatement – for example, installation of slope breakers across entire parallel corridors;
- erosion – for example, in areas of rill and gully development;
- river crossings – for example, bank and bed erosion.

Responsibilities between the NGP and BTC Contractors are described in the RP (see Appendix C2).

Soils - marl on hills, plateaux and plateaux scarps

Marl is calcareous clay that classes as a soft rock. It occurs throughout the Mediterranean basin and its environs, where it supports a productive, rainfed agriculture. It is susceptible to subsurface piping in which runoff rapidly infiltrates to flow along regular conduits deep in the soil. These occasionally enlarge sufficiently to emerge onto the land surface as ravines. It typically has a thick, dark brown topsoil. Its erosion under agriculture can be intense. The topsoil is made up of a residuum of impurities, such as silicates and iron from the primordial earth; approximately 400m of marl must dissolve and erode to create 1m of topsoil, in effect the persisting impurities retained by the surface. The current pale colour of topsoil found in central Anatolia results from its having been mixed into the subsoil by millennia of tillage; erosion has expanded since the advent of mechanised agriculture, so that the present soil is much reduced from its early profile.

Marl occurs as hills, plateaux and plateau scarps, and plains. Plains soils are classed as agricultural lands. Marl soils that are too steep to play a role in rainfed agriculture, although they may support grazing, are generally present between KP 617 - 647. Adverse impacts affecting marls including the following:

- visual impact: the marl leaves a whitish trace across the landscape where the subsoil has been exposed;
- soil erosion: marl erodes easily – in areas near Turkey's coast marl can rotate as deep landslides;
- loss of soil productivity.

Marlacious hills are important to the Turkish economy, where they support uses such as grazing, wildlife habitat, beekeeping and watershed management.

According to the criteria in Section 3 these impacts will be of local extent. They are reversible through both management intervention and natural recovery so while they may extend beyond the short-term, in the longer term they will reduce to a moderate level for much the same reasons as were described above for tuff.

As with tuffaceous lands, an important mitigation will be to reduce the construction corridor to as narrow a width as possible. This is possible because marly topsoil on sloping lands is typically thin and requires little area when set aside for reinstatement. Existing shrubs will be set aside for later replanting. Temporary soil erosion control measures (water bars, ditch breakers and runoff barriers) will be installed. Temporary ditch breakers will be particularly important as marls typically contain springs that are likely to drain into the trench from the middle two-thirds of most slopes. When drained, trench water will be pumped either into a filter bag or constructed barrier made of baled hay/straw and filter cloth; in no instance will it

drain onto unprotected soil. In some instances, emerging springs may require lined chutes to convey water from the right-of-way to a safe disposal location.

The specifications for returning tuff to its natural contour and condition also apply to marl and similar considerations to tuff will be applied as regards use of a soils expert and tailoring topsoil removal to the actual thickness present rather than a pre-prescribed specification.

The potential for replanting will be determined by the frequency of natural vegetation prior to construction. If this is low or absent, then replanting is unlikely to succeed – the onsite environmental inspector/soils expert will give a judgement as to the treatment that might be applied, eg mulch ratios, jute matting, etc. In areas where the site is incapable of supporting sown grass or other vegetation, even in the short term, mulch and jute matting will be used to prevent erosion and facilitate growth. Again, the onsite environmental inspector/soils expert will give a judgement to be fulfilled by the construction contractor. If replanting is to be done, it will follow project specifications using a grass mix recommended by local agricultural and forestry expertise. If the season is too late for replanting, the topsoil berm will be protected over winter by seeding it with a fast growing cover crop. It will then be reinstated during the following spring.

Soils - marl on rainfed agricultural lands

Central Anatolia lies near the origin of western rainfed cereal production. Its soils have been tilled for at least five millennia and offer a promising future for continuing production. With care, their condition is likely to improve through the eventual introduction of such practices as no- and low-till agriculture.

As with marly soils, centuries of tillage have so thoroughly mixed the topsoil with underlying layers that much of its distinctive character has reduced through time. Annual tillage has erased traces of soil erosion, presenting a surface largely undisturbed by gullies and rills. This is not entirely accidental. The practice of tillage and seeding prior to the onset of winter rains increases infiltrability, so that a crop surface is already well established before the advent of snowmelt and spring rains. Pipeline construction in valley bottoms between KP 617 and 747 will potentially interrupt this natural sequence of the agricultural calendar, although not necessarily at all locations along this stretch. Potential adverse impacts to rainfed agricultural lands include the following.

- increase of rainfall- and runoff-caused soil erosion;
- increase of sediment and turbidity;
- reduced soil productivity.

According to the criteria in Section 3, these impacts will be a series of major, short-term localised impacts confined to valley bottoms. However, their repetitious nature will lead to impacts at a regional scale. The Reinstatement Plan (see Appendix C2) sets a requirement for arable land (that will address the majority of the impacted areas described here) to be left in a condition suitable for re-planting with crops. Impacts are therefore reversible, and beyond the short-term will be moderate to minor and localised.

Many of the practices described in the previous sub-section apply equally well to rainfed agricultural lands. An important difference, however, will be an intensification of direct consultations between the Project and the farmer. Under such circumstances, the works will be discussed with each landowner and his needs will be incorporated into the construction programme and methods. It is intended that the farmer will play a signatory role in determining whether outstanding issues have been closed out, and whether or not the reinstatement complies with his wishes.

15.2.1.2 Landscape and visual

From the Georgian border to KP 18, there will be a local, major visual impact where the pipeline exposes whitish tuff parent material. This impact will extend beyond the short-term but will be reversible according to the degree of success of the soil reinstatement and recovery. The impact will be mitigated as far as practicable through application of reinstatement specifications described in the impact tables in Supplement 1 of Volume 2 and the RP. However, this will be a major residual impact as standard reinstatement is unlikely to be fully effective where corridor overlies tuff, which will retain its whitish colour and show as a white line across the landscape, particularly in the hills around Posof.

The formation of a conspicuous whitish line across the landscape is also predicted where pale-coloured sandy-skeletal Cryochrept soils overlying tuff or parent material in low-lying areas are exposed during construction between KPs 18 to 40, KPs 100 to 115 and KPs 154 to 197. This will result in a major residual impact where standard reinstatement is unlikely to be fully effective where the Right of Way (RoW) overlies tuff, which will retain its whitish colour and show as a white line across the landscape. The scale of impact declines south of KP 40 and is expected to be moderate to major between KPs 178 and 197 as visibility will depend on the precise location and character of the landscape and the impact is anticipated to be less pronounced in more intensively farmed and vegetated areas. However, the impact will be regional on the basis of its repetition through several landscapes.

As the land rises into the Allahuekber Mountains between KPs 115 and 134, the greater diversity of landform and land cover enhances the visual interest of the scenery and increases its sensitivity to change. Exposure of parent materials along this section of the route will create a highly visible strip, which will be mitigated to some extent on affected grasslands by implementing fertiliser trials using NPK and micronutrients on reinstatement species. However, a major residual impact will still result in this area as standard reinstatement is unlikely to be fully effective where the RoW overlies tuff, which will retain its whitish colour and show as a white line across a highly exposed landscape. This impact will persist in the short to medium-term (from one growing season up to five or six years thereafter) across shallow-soiled grasslands in areas of remote character.

15.2.1.3 Ecology

Botanical species of significant conservation value are present in many sections of the pipeline route. Moderate localised impacts to habitats/flora will occur in sub-alpine meadows found along the following sections: KP0-34; 50-86; 134-178; 484-525; 832-849. Since these impacts will be repeated at several locations across several provinces they can be viewed as being of provincial-national scale in their extent.

However, the impacts are also reversible, so while they may extend beyond the short-term, mitigation will ensure that in the medium term (perhaps 3-5 years), local impacts will reduce to minor and the regional/national extent of impacts will be moderate at most. Key mitigation measures will include:

- pre-construction surveys feeding into site-specific reinstatement plans (see Reinstatement Plan, Appendix C2);
- employment of botanical experts to provide on-site advice and supervision;
- programming works through environmentally sensitive areas to achieve a target of three weeks between topsoil stripping and commencing reinstatement;
- where appropriate, transplantation of certain species.

Areas of particular sensitivity, where moderate impacts are predicted, are further discussed in Section 15.2.2.4.

In order to compensate for the residual ecological impacts associated with the construction of the pipeline and its associated facilities, the BTC Co is committed to an Environmental Investment Programme (EIP), which includes a specific commitment to undertake compensatory habitat creation. Whilst the recreation of some of the complex habitats impacted by the pipeline will prove infeasible (at least in the short term), the commitment does provide a mechanism and resourcing for off-set compensatory measures to be pursued.

15.2.1.4 Noise

The nearest edge of the settlement of Yaylakent in Erzincan Province is located approximately 26m from the centreline of the pipeline. Major short-term noise impacts are expected to occur during all phases of construction at Yaylakent, due to the proximity of the settlement to the pipeline route, although the application of mitigation measures will reduce the potential for disturbance for some phases.

The settlement of Pirdede (Imranli District, Sivas Province) is located approximately 86m from the centreline of the pipeline and is also located adjacent to a crossing of the NGP. Residents in close proximity to working areas will experience similar impacts to those described above. Pirdede is also located within 100 m of piling activities, so vibration impacts could also occur at the nearest properties.

Similar short-term noise impacts are also expected to occur at Keklikoluk (Goksun District, Kahramanmaras Province) during all phases of the pipeline construction and at Mehmetbey (Goksun District, Kahramanmaras Province) during soil stripping, welding/lowering, backfilling, bending and trenching. Blasting works will also give rise to noise and vibration at Keklikoluk.

Similar short-term impacts will also occur to noise sensitive receptors at Kastal (approximately 99 m from the centre of the pipeline and close to a provincial highway crossing) during soil stripping, welding/lowering and backfilling, and during excavation and piling works associated with the highway crossing. Blasting will also give rise to noise and vibration at Kastal.

In addition to all the noise mitigation measures listed in the EIA, in all instances stockpiling of spoil and purpose-built mobile noise barriers will be used to screen nearby dwellings from the construction works to the maximum extent possible. However, for the communities mentioned above, those residents nearest may still be exposed to temporary construction noise levels that exceed 70dB(A). This is based on a conservative assessment that took a noise source to receptor distance as being from the nearest edge of the community to the nearest edge of the construction corridor. To address this uncertainty, the pre-construction programme will therefore make provision for a further assessment (as part of the EMMP) based on the true numbers of receptors affected and accurate separation distances of receptors from noise sources, taking whatever actions are necessary to reduce impacts to an acceptable level. These actions may comprise additional physical barriers to attenuate noise. Alternatively mitigation could comprise compensation through the provision of alternative accommodation for affected residents during certain construction phases.

15.2.2 Residual environmental impacts of Moderate significance

15.2.2.1 Soils

Pipeline construction on soils between KPs 50 to 68 and KPs 610 to 766 will give rise to moderate impacts as soil erosion will be visibly active but with no rill and gully formation evident. These soil types include calcareous soils occupying gently sloping and sloping lands, flood-plain soils, reddish-coloured soils on shallow slopes on valley bottoms, mesic clayey-skeletal shallow xerochrepts on plateau scarps and mesic loamy-skeletal xerochrepts on sloping uplands, which are highly eroded on the scarp.

Mitigation measures to control soil erosion in these areas will comprise the application of a number of environmental specifications described in the Reinstatement Plan (RP) (see Appendix C2), including topsoil removal and storage, subsoil removal and storage and reinstatement of soils; permanent erosion control devices; sediment interception and sediment settling ponds where required by the landowner/occupier; bio-restoration and channel stabilisation.

From KP 291 to 298, impacts will occur on mesic soils on the scarp, as it will be difficult to reinstate to its pre-existing condition using standard techniques. Careful attention to final routing and use of site-specific innovative reinstatement techniques will ensure that the impacts are moderate at most (see RP, Appendix C2).

15.2.2.2 Landscape and visual

General

Moderate localised landscape impacts are expected as a result of tree loss in the Posof Wildlife Protection Area (WPA). However, as the pipeline has been re-routed to avoid dense broadleaf forest, the residual impact is substantially less than the impact of the previous alignment through this area and has been reduced to as low as reasonably practicable. The route now passes to the west of the previous alignment, through an area of sparser, patchy forest. A reforestation and replanting programme, using species appropriate and characteristic of the area, will be undertaken during reinstatement of the pipeline RoW through the WPA. Residual impacts will therefore extend beyond the short-term but can be regarded as being reversible.

In areas with a high water table on weak soils, (from KPs 18 to 34), moderate localised, short-term impacts are anticipated as a result of storage of surface water after passage of construction in depressions in the soil surface. Measures, such as the use of moveable equipment mats will be required throughout the construction period to support heavy equipment. Once construction has been completed, depressions will be graded out during the reinstatement phase, monitored for signs of settlement and ponding and repaired as necessary. The predicted residual impacts can therefore be regarded as short-term and reversible.

Between KPs 68 to 115, the route crosses the Ardahan Plateau, where landscape sensitivity is moderate. The partly cultivated plateau comprises largely grassland with frequent rocky exposures, and with small streams or rivers flowing through wide flat, often marshy, valleys rich in spring flowers. Moderate, localised impacts extending beyond the short-term will occur in this area, as sections of marshy grassland are likely to show signs of construction for several years. However, measures to reduce the impact of heavy machinery including route narrowing and the use of moveable equipment to spread vehicle weight and avoid deep rutting will be employed throughout the construction period. Furthermore, construction will be

undertaken at the driest time of year (July to August) or, where this is not possible, removal/replacement of turfs where the schedule dictates work during wetter periods (April to June). Impacts can therefore be regarded as reversible.

The rolling terrain between KPs 134 to 154 is punctuated by sections of steep and moderately steep land. Disturbance of soils overlying tuff in this stretch will result in an exposed whitish strip. Despite application of mitigation measures, reinstatement is unlikely to be fully effective where the pipeline corridor overlies tuff, which will retain its whitish colour and show as a white line across a highly visible landscape. Residual impacts will, therefore, be moderate and localised and, whilst they will extend beyond the short-term, the impacts can be regarded as being reversible.

South of KP170 and up to KP 178, the route passes along the edge of two very different but equally scenic landscapes – to the south the broad, wild, rolling mountain pastures and to the north the plunging gorge of the Kuyularin Creek and the arid, angular mountains beyond. Localised, moderate impacts are predicted in mountain pastures as shallow soils may prolong the period for re-instatement to be effective. Whilst residual impacts will be reversible, they will extend beyond the short-term.

The route passes through an area that is quite intensively farmed and with low sensitivity landscape between KPs 197 and 240. Moderate to minor impacts will give rise to the formation of a conspicuous whitish line across the landscape where pale-coloured coarse-loamy Entic Dystrandepts soils developed from tuff or parent material are exposed. Reinstatement is again unlikely to be fully effective where the pipeline corridor overlies tuff, although this would be attenuated by the field tapestry, which would conceal it to some extent and break up any continuity of visible impact. The impact will also be less pronounced in more intensively farmed and vegetated areas. The impact will be localised and reversible and in many places may not extend much beyond the short-term.

As the land climbs sharply into the Otlukbeli Mountains, between KPs 439 and 508, the diversity of landform increases with striking broadly rounded and deeply dissected hills, with grassy sub-alpine meadows and montane steppe, used in places for summer grazing. High elevation grasslands in the eastern part of the Otlukbeli Mountains and alpine vegetation in the western part are vulnerable to long-term damage because of their poor shallow soils, and harsh climatic conditions, which will delay reinstatement. High elevation grasslands may therefore prove difficult to reinstate and even with care, the visual impact can be expected to remain up to five years after construction has been completed. Further important mitigation measures to be applied will be narrowing the construction corridor to as narrow a width as possible, use moveable equipment mats to spread vehicle weight and avoid deep rutting, thereby reducing the impact of heavy machinery and implementation of fertiliser trials using NPK and micro-nutrients on reinstatement species. The possibility of undertaking construction during early spring when the ground is still snow-covered and frozen will also be investigated since this technique is used successfully in arctic tundra environments. At such times it may be possible to lift frozen turfs, which is impossible in the summer because of low root mass and friable soils, and replace them with little damage. Generally, impacts will be localised, although if repeated along this stretch they could be viewed as reaching a regional scale. They will extend beyond the short-term but can be regarded as being reversible in the longer term.

From KP 508, the pipeline descends to the flat valley of Ilgar Creek where it crosses electricity transmission lines and a major highway. The landscape is characterised by cropland with river banks covered by dense bushes and trees. Localised, short-term moderate to minor impacts are expected to occur on lower lying cropland where re-vegetation will be easier to achieve than on the higher elevation grasslands in the Otlukbeli Mountains.

Although the natural gas pipeline (NGP) Contractor will reinstate topsoil on the NGP corridor prior to construction of the BTC Pipeline, thin marl soils are unlikely to reinstate to a high standard and visual traces will remain. The NGP reinstatement strategy will provide indirect positive benefits, however, impacts will extend beyond the short-term where exposed marl retains its whitish colour and shows as a white line across the landscape between KPs 568 to 589 and KPs 610 to 674. This will be particularly evident from KPs 610 to 631 due to the surrounding high quality scenery, especially from viewpoints over the Acioz River. However, this impact will be minor to moderate between KPs 589 to 610 and may be reduced in more exposed rocky terrain where vegetation loss may not be so pronounced. As previously described in Section 15.2.1, mitigation measures to be applied in areas where marl occurs will include tailoring topsoil removal to the actual thickness present, implementation of fertiliser trials using NPK and micro-nutrients on reinstatement species with mulching using coir fibre or equivalent and a suitable replanting programme. Impacts will therefore be reversible and their overall duration will be reduced. Even if success in reinstatement is only patchy it will reduce a regional visual impact to more localised ones.

The route crosses the floodplain of the Zamanti River near KP 795 and passes along the western side of the Sariz River valley before crossing the Sariz River at c. KP 879. The wet meadows and marshland either side of the Zamanti River and along the Sariz river valley are extremely sensitive and will show a long-term/permanent scar unless care is taken with heavy machinery during the construction period. The localised, moderate residual impacts on the wet meadows/marshland in the Zamanti and Sariz valleys are reversible and will therefore last no more than 1-2 years after the above mitigation measures are undertaken.

Moderate residual impacts of a similar nature to that described for the Zamanti and Sariz River Valleys are predicted between KPs 924 and 961. The landscape sensitivity of the valley is moderate to high. Although construction will not take place in the wet meadows along the river, access from the main highway across the river valley has the potential to cause visual impact and will be restricted to the absolute minimum of crossing points, with vehicle movements carefully controlled. Loss of juniper scrub and residual impacts arising from thin stony soils will limit the success of reinstatement giving rise to long-term/permanent visual effects. However, the impact on the wet meadows/marshland in the valley will therefore last no more than 1-2 years where the above mitigation measures are applied.

South of KP 832, the pipeline follows a ridgeline for approximately 6km through sparse forests of juniper and oak and montane steppe habitat. The residual impacts along this section of the route have been reduced to moderate-to-minor, following the re-routing of the pipeline to avoid the high landscape quality of the Kirkgecit Valley. Although the precise residual impacts of the route change cannot be determined at this stage, it is anticipated that these will be reversible and localised and may be further reduced following detailed survey of the route change. Prior to the onset of the construction phase, a detailed survey will be undertaken as the basis for developing site-specific mitigation measures.

Pump Stations

Localised, moderate long-term landscape and visual impacts are expected on recreational users in the vicinity of Pump Station 1 (PT1), which will occupy an area of 13.4ha.

PT1 has been located within the rural environment to minimise its impact on residential properties and wooded areas. Therefore, the main visual receptors to visual impact at PT1 will be those travelling between Ardahan and Posof and to visitors using the Posof Wildlife Protection Area for recreational purposes. In addition, because of the mountainous terrain, views of the PT1 will be relatively limited in extent and receptor points will be largely remote and little visited. The removal of any existing mature trees, particularly those that may

provide natural screening, will be minimised. Planting and landscaping around the site perimeter will reverse impacts to some extent as growth becomes established.

Residential properties, for example at Baskoy, with medium distance views of PT3, (KP 444.2), are expected to experience localised, moderate long-term visual impacts. The PT3 site is predicted to be visible for up to c. 4km to the north and south. The landscape value within the vicinity of the PT3 site is considered to be low and landscape impacts will be minimum.

Similar impacts will be experienced at PT4 (KP 738). There will be a relatively large area of visual influence due to the generally flat terrain in which the site is located. The settlement of Alaca, (2km to the east of PT4), will have the clearest views of the station and residential properties on the eastern edge of the settlement will be most affected by moderate long-term visual impacts. The settlement itself will screen views from the west side of the settlement.

The recently relocated Pressure Reduction Station (IPT1) will be located near to the village of Geben and will require a landtake of 6.66ha (comprising 3.17ha of permanent landtake and 3.49ha of temporary landtake). Landscape surveys will be undertaken and landscape plans will be developed that identify detailed measures to reduce both landscape and visual impact at the Pressure Reduction Station. These will be developed by a landscape specialist, based on the building and site layout, alignment and location within the context of immediate and more distant landscape features. Similar mitigation measures as those recommended for the pump stations will be applied including landscape planting by specialists within the site boundary using native trees and bushes; opportunities to retain the existing landform; new landform screening where possible and neutral colours on structural surfaces to blend in with surrounding terrain and vegetation. As with the pump stations, it is anticipated that some visual impacts will be reversible and that over the longer term impacts may be reduced from moderate to minor.

Consultation with local communities during public disclosure will help to further identify mitigation measures that can be adopted to minimise impacts to the communities identified in Section 7.

Block Valves Stations (BVSs)

Nine settlements are located within 500m of the block valve sites, with predicted short-to-medium impacts expected to be moderate. During reinstatement of the pipeline re-vegetation of the perimeters of block valve stations will be utilised to screen them from nearby receptors.

15.2.2.3 Groundwater

The pipeline route passes over three major groundwater resources, which will experience localised, short-term moderate residual impacts during pipeline construction:

- Pasinler Plain (unconfined aquifer) crossed by the route between KPs 259 – 278. Water samples taken from wells close to the route indicate that groundwater quality is Class I;

- Goksun Plain (unconfined aquifer) crossed by the route between KPs 909 and 924. Water samples were taken from wells close to the route over this aquifer indicate that groundwater quality is class I, with the exception of groundwater taken from one well, which was class II;

- Springs on the Erzincan Plateau crossed by the route between KPs 488 to 519. Water quality classification unknown.

Groundwater quality is therefore high in both Pasinler Plain and Goksun Plain unconfined aquifers and suitable for drinking water supply (post disinfection) and water supply for food industries. Springs on the Erzincan Plateau are known to be used for drinking water by settlements in the vicinity of the route. Mitigation measures that will be applied to avoid reducing groundwater quality and conflicting with other users will include no groundwater abstraction within 50m of springs or wells and no permanent facilities or temporary sites (eg fuel storage, pipe laydown or construction camps), to be located within 50m of springs or wells. Groundwater quality will be monitored during construction in these sections. In addition, strict adherence to the mitigation measures contained in the Environmental Management and Monitoring Plan (EMMP) and Pollution Prevention Plan (PPP) will be required. However, where mitigation measures described are applied, impacts are predicted to be moderate, short-term and localised.

Following treatment, there will be a single wastewater disposal location for all treated effluents (see Section 7). The preferred option is for disposal via soakaway (further site investigations at each pumping station site is required to determine if the geological conditions are appropriate). The impacts due to discharge by soakaway will be moderate-to-minor based on the criteria outlined in Section 3. Similarly, the impacts associated with a discharge to surface water will be moderate-to-minor based on the project discharge standard requirements.

The assessment of residual impacts to groundwater has taken into account the considerable uncertainty that exists with regard to the quality and sensitivity of groundwater resources and the means by which wastewater will be discharged. The precautionary approach adopted by the EIA team has required that the 'worst case scenario' be considered at all times. Accordingly, the predicted moderate-to-minor residual impacts should be viewed as representing a worst-case outcome.

The appropriate discharge licenses and permits will be obtained from the relevant Turkish authorities and all aqueous discharges from the AGIs will be designed to ensure the appropriate Turkish and World Bank discharge limits (see Section 3) and any additional permitting conditions are met regardless of which method of disposal is selected.

15.2.2.4 Ecology

Protected Areas

Localised, short-to-medium-term, moderate impacts are expected where the pipeline passes through the Posof Wildlife Protection Area. The residual impact in this area has been reduced from major through the re-routing of the pipeline to avoid dense forest and to reduce significant habitat fragmentation and through the programming of works to avoid sensitive periods (see Attachment 1 to Appendix C1). In addition, the working width in this ecological sensitive area will be narrowed to 8m in patchy areas of dense forest for a total of 300m and the construction works will be limited to a 21-day period from when the area is entered to the completion of reinstatement works. Further mitigation measures to reduce this impact will be identified through site-specific vegetation and faunal surveys, to be undertaken by a qualified ecologist, (appointed as described in the EMMP), prior to construction. In the longer-term (5-10 years from the completion of construction works) impacts may be reversible, such that the long term residual impact is Minor.

Ecologically Sensitive Areas (ESAs)

In ESAs 1 to 5, 8 to 13, 15 to 22 and 25 to 49, moderate, localised residual impacts are anticipated as a result of disturbance to internationally important flora identified during ecological surveys. The degree to which disturbed areas will be recolonised by important flora is uncertain; as a consequence the localised, moderate impacts may be medium to long-term in extent. To reduce the overall impact, the Construction Contractor will ensure that construction planning achieves a 21-day period from the time when an ESA is entered to the completion of reinstatement works (see RP, Appendix C2).

Further site-specific mitigation measures to minimise impacts within ESAs will be identified through pre-construction surveys, which will be undertaken in these areas by a qualified ecologist to provide an accurate map of the location of endangered or threatened plant and animal species. In addition, as the globally threatened plant species, *Scrophularia versicolor*, was recorded within both ESAs 3 and 4 and *Onosma liparioides* within both ESAs 19 and 20, diligence will be exercised in searching between these areas. Diligence will also be exercised in searching inside the construction corridor in ESA 34, 35, 38 to 46 for those species known to occur just outside of the ESA.

The feasibility of translocating species to appropriate habitat outside of the RoW or construction area will be assessed prior to construction. Where translocation is not feasible, mitigation measures will include narrowing the RoW and removal, nurturing and replacement of turfs containing endangered or threatened plant species within the RoW or at temporary construction areas.

However, as residual impacts cannot be determined precisely for the re-routed section of pipeline that is outside the 500m Corridor at ESAs 12, 24 and 38, field investigations will be carried out prior to construction to determine whether the length of re-route is a continuation of the ESA. Specific mitigation will be developed following field investigations.

ESA 36 (the Zamanti River floodplain) will be crossed with the utmost sensitivity. Additional mitigation measures will be applied to reduce the impact in this area and will include commencing the crossing in August to minimise disturbance to sensitive periods for breeding birds and returning autumn migrants (between April to July). The RoW will also be narrowed to the minimum possible (<10m) and the pipeline strung outside of the marshy habitat and pushed or pulled through the trench. Heavy machinery working on the marsh will be supported on moveable equipment mats. Vegetation containing valuable species will be lifted as turfs, marked, nurtured and kept wet while being stored, and replaced in sequence.

Medium-term impacts to internationally important flora and supporting habitats are predicted for ESA 24. Although, mitigation measures will ensure losses are minimised, disturbance effects may still be detectable after several years due to the fragility of the alpine zone ecosystem along this length of the route. Repetition of moderate impacts in this section of the route will be avoided, as these would constitute a major impact.

Moderate impacts on globally threatened plants are predicted to occur at PT3, which is located on the edge of ESA 19, and may potentially contain a lower density of some globally threatened species. Extra care will be taken at this site to ensure the area affected by construction activities is minimised where practicable and the location of laydown and staging areas will be determined in consultation with expert ecologists to avoid sensitive species as far as practicable. Additional vegetation and faunal (including birds) surveys will be undertaken at this site prior to construction to confirm the presence and abundance of these species at this site. Site specific mitigation measures will be developed based on the findings of these surveys. Any particularly sensitive areas near the PT3 site, as determined by

botanical specialists, will be fenced or clearly demarcated and will be off-limits to all construction personnel.

Impacts from the block valve sites located within Environmentally Sensitive Areas (ESAs) (ie BVS 6, 14, 49 and 50) are predicted to be moderate due to the small area of sensitive habitat affected and the identified mitigation measures. These measures will be adopted to minimise the loss of habitat and sensitive species during construction at these sites (see Section 6).

Important species

The construction activities associated with the crossing of rivers have the potential to disturb breeding fish, birds, mammals and reptiles and damage the aquatic plants that provide breeding and foraging sites. Impacts may be Moderate to Major, where construction is undertaken during the sensitive seasons for these species. Seasonal sensitivities associated with the river crossings will inform the preparation of construction programmes for each of the spreads (within other construction schedule constraints) in line with the seasonal sensitivities table presented in Attachment 1 to the EMMP.

The further mitigation of ecological impacts through the management of construction activities within ecologically sensitive sections of the route is grounded upon two complementary principles:

- Firstly, that existing data on the species and habitats potentially impacted by the BTC Project will be improved through extensive pre-construction surveys. The information derived from the surveys will reduce the levels of uncertainty that have necessitated a largely precautionary approach to the assessment of impacts, whilst providing the basis for robust site and species specific mitigation strategies to be developed and implemented.

- Secondly, that construction works at a significant number of locations along the pipeline route will be programmed according to the seasonal sensitivity of potentially impacted species. Whilst programming flexibility at some locations is contingent upon the results of pre-construction surveys, the principle of avoiding key periods of particular ecological vulnerability will reduce direct impacts to key species as well s ensuring that construction management in key habitats is focused on ecologically derived objectives. The prioritisation of ecological issues will benefit not only key species but also a range of associated species and habitats.

The basis of these principles, and the mechanisms through which further mitigation measures will be implemented, are incorporated within the EMMP, in particular the seasonal sensitivity tables included as Attachment 1 of the EMMP, and the management of revegetation and recolonisation in areas of important flora is further discussed in the RP (Appendix C2).

15.2.2.5 Noise

A total of four settlements and one industrial area will experience short-term, localised moderate residual impacts during construction that will be reduced to as low as reasonably practical by use of various noise mitigation measures, including:

- the industrial area in Erzurum Province is located directly adjacent to the pipeline route between KPs 279 to 282. Commercial properties such as offices may be sensitive to noise during pipeline construction, although these properties will be less sensitive to noise than residential dwellings and schools. Noise impacts are expected to occur during each phase of construction;

- the settlement of Catalbayir (in Erzurum Province) is located approximately 96m from the centreline of the pipeline and will experience short-term noise impacts during soil stripping, welding/lowering and backfilling activities;

- Gozeler in Erzurum Province is located approximately 250m from the pipeline centreline near KP 408 and adjacent to a National highway crossing. Noise impacts are therefore expected to occur at Gozeler during sheet piling associated with the highway crossing;

- Cilhoroz (in Erzurum Province) is located approximately 141m from the centreline of the pipeline and near to a crossing of the NGP. Short-term noise impacts are expected to occur at during soil stripping, excavation works, welding/lowering and sheet piling works associated with the NGP crossing;

- Kirkgecit in Kayseri Province is located approximately 65 m from the centreline of the pipeline. Short-term noise impacts are expected to occur during soil stripping, welding and lowering, backfilling, bending and trenching activities. Blasting works may also be required in this area and are also expected to give rise to noise and vibration impacts at Kirkgecit.

The following mitigation measures will be applied in all five industrial/residential areas:

- use of silenced/low noise construction plant and machinery;
- provision of routine checks and maintenance to ensure that plant is operating efficiently and not giving rise to high noise levels;
- all hours of work will be agreed with the relevant authorities prior to the commencement of works;
- plant and machinery will be sited away from inhabited buildings;
- existing screening, including that arising from the stockpiling of materials and spoil will be utilised wherever possible;
- mobile noise barriers will be used where possible to screen noise impacts to the Industrial Area and Gozeler.

Soil stripping and welding/lowering activities will be short-term activities occurring for one to two days during each phase of construction. However, works at the NGP and the highway crossing near Gozeler will take three to four weeks to complete. Although noise and vibration from potential blasting near Kirkgecit may give rise to annoyance to residents, it is unlikely to cause structural damage to buildings. The Contractor will carry out detailed noise and vibration predictions once the specific blasting methods have been developed. The proposed method of working and mitigation measures will be agreed with the relevant authorities in advance of works taking place. Residents will also be notified in advance of works involving blasting. In addition, the construction Contractor will develop site-specific noise mitigation measures for the duration of these activities, monitor their effectiveness and demonstrate that impacts will be minimised to the maximum extent possible as part of the PPP.

15.2.2.6 Cultural heritage

Nine archaeological sites are predicted to experience moderate to minor impacts during pipeline construction:

- Tasmasor Area (1st-3rd Degree Site[1]) – southern part of site crossed by the route;
- Cayirca-Beypinari (2nd Degree Site[1]);
- Beypinari-Kahramanlar (2nd Degree Site[1]);
- Koyunkaya Alaouite cemetery (1st Degree Site[1]);
- Cetelik Tumuli comprises two adjacent tumuli (no Ministry of Culture (MoC) classification);
- Archaeologically important site south west of Kilickoy settlement (no MoC classification);
- Meryemcil Castle (1st Degree Site - registered by the MoC) – route passes close to the foot of the hill at this site. The majority of the castle ruins are still standing and could potentially experience structural damage and vibration impacts during pipeline construction;
- Islamoglu (Kirteke) Mound is a settlement mound located on the edge of the 100m Corridor. Part of this site has been registered by the MoC as a 1st Degree Site, with the remaining registered as a 3rd Degree Site;
- Gokdere (3rd Degree Site[1]).

A further nine sites have been identified for intensive preconstruction archaeological surveys. These are located in the following areas: Tetikom; Hoyugu; Tasinonu; Algiz; Yerlesimi; Yesilkaya 2; Minnetpinari; Tasoluk - Kovici and Maltepe - Guney.

However, the residual impact cannot be determined precisely for these sites at this stage, since the extent of the sites is not fully determined. Archaeological investigations will therefore be undertaken prior to construction, as part of the Cultural Heritage Management Plan (see Appendix C7), to establish the full extent of each of the sites. This will determine the need for further archaeological action. Site-specific mitigation measures will be developed following site investigations. The Koyunkaya Alaouite cemetery is expected to be avoided by the route, as one objective of these investigations is to identify a route away from the site, to the north of the current BTC Pipeline alignment and the NGP.

In addition, investigations will determine whether Islamoglu Mound extends into the Working Corridor and may experience impacts during pipeline construction.

As site investigations are expected to provide for appropriate archaeological actions to be undertaken in order to minimise impacts to the site, the ultimate scale of impact is likely to be minor. Furthermore, the Tasmasor Area has already been disturbed during construction of the gas pipeline and the NGP reinstatement strategy may provide the potential for a positive impact and improve the setting of the site.

Throughout pipeline construction in the vicinity of these sites, construction activities will be carried out under the supervision of an archaeologist authorised by BOTAŞ. If blasting is required, then it will be conducted in such a way that it does not pose a threat to the integrity of buildings still standing on the Meryemcil Castle site. To avoid vibration impacts, percussive piling will be not allowed within 100m of the site. The construction Contractor will adhere to the requirements of the Cultural Heritage Management Plan during construction through these sites.

[1] These sites have not yet been registered by the Ministry of Culture and are provisionally assigned this classification

The residual impacts outlined above relate to known sites of archaeological importance. However, the assessment of potential impacts to buried archaeological deposits has also considered the implications of currently unrecorded sites and features that might be revealed during the construction phase. While it is likely that additional archaeological resources will be encountered, the watching brief and archaeological response provisions, contained within the CHMP, provide appropriate mechanisms for ensuring that mitigation measures are effectively implemented. The ongoing management of the uncertainty associated with unrecorded archaeological deposits will be the responsibility of the Archaeological Management Consultancy and the BOTAŞ Project Archaeological Inspector, working through the archaeological specialist appointed by the Contractor.

15.2.2.7 Residual impacts associated with the Contractors' intended approach

A number of issues have been identified by the EIA process as requiring specific resolution during construction planning. The contracting philosophy for the BTC Project is grounded upon standard commercial contracting principles that invites the Contractor to propose specific solutions to a range of issues and challenges, including precise method and timing of works, materials procurement, workforce mobilisation etc. It should be stressed, however, that the permissible tendering flexibility inherent in this philosophy is contingent upon the Contractor fully complying with the requirements of the Contractual Documentation, including the EIA and its associated Environmental and Social Management Plans.

As a consequence, detailed proposals with regard to a number of issues (in particular waste management, traffic and transportation management and aggregate winning) will only emerge following the selection of the preferred tenderer. In parallel to the tender assessment process, the BTC Project is collating provisional information on potential aggregate sources, waste disposal facilities and construction haulage routes, to enable the Project to be able to assess the acceptability of received proposals.

Owing to this element of current uncertainty, the EIA has stressed the importance of the Management Plans as the key vehicles for delivering appropriate and effective measures for managing, controlling and mitigating environmental and social impacts associated with these activities and issues. In this regard, on the basis that the Management Plans will be rigorously implemented and enforced, a conservative approach has been adopted in identifying the level of significance of identified impacts in this EIA.

Whilst this planned uncertainty has not affected the robustness and integrity of the EIA process, the *potential* for residual impacts remains pending the resolution of these issues. The implementation and maintenance of the provisions of the Management Plans will be a key contract management priority and will be informed by internal and external performance monitoring and audit.

15.2.3 Significant residual social impacts: most important

This section describes the significant residual social impacts that, based on professional judgement and feedback from consultation, have been identified as being most important: These comprise:

- impact on livelihoods close to Pump Station 1 (PT1);
- unplanned disruption to infrastructure and services provision;
- tensions due to the limited number of employment opportunities.

The numbers of people likely to be affected by these impacts are predicted to be small, and, with the exception of the impact of PT1, the duration of the impact will be short-term (no greater than the duration of construction activity). However, due to the poverty in which many individuals live and the consequent implications of any reduction in their livelihoods or quality of life, any reduction in household livelihoods is considered to be significant.

15.2.3.1 Impact of Pump Station 1 on local livelihoods

The proposed PT1 is located near the rural settlement of Sogutlukaya in Ardahan province, resulting in the permanent acquisition of 13.4ha of land and an additional 12ha of land (over a 32 month period) for the temporary construction of a campsite. One hectare of land will also be permanently acquired for a gendarme station that will be located nearby PT1, on a site selected in consultation with local residents. These areas of land are currently used for communal grazing purposes.

Due to the concern raised by the residents over the last six month, the potential impact in Sogutlukaya will be considered significant until figures on the extent (and quality) or alternative grazing land are known and the compensation package is available for evaluation (refer to Section 7 for a more detailed discussion of this impact).

15.2.3.2 Unplanned disruptions to infrastructure and services provision

The mitigation measures identified for infrastructure and services will, if implemented correctly, prevent any planned significant negative impacts both during and post construction. However, in a project of this size it is likely that there will be instances when infrastructure or services (eg roads, irrigation channels, water supply, electricity supply) are disrupted without notice or prior planning. Such disruptions could affect people living over large areas and, although temporary, there is a possibility that an unplanned disruption could hinder the income generation and subsistence activities of those affected. Any impacts incurred are unlikely to last beyond the short term.

In accordance with the requirements of the Construction Impacts Management Plan and Community Liaison Management Plan, the Contractor CLO will notify authorities of affected settlements regarding occurrence of unplanned disruptions, as well as expected duration of disruption and measures to be taken to rectify incident. A Complaints Procedures will also be operated to allow for reporting and resolution of any grievances. Where appropriate, compensation will be provided for any losses incurred. This will assist in preventing any serious impacts on the ability of those affected to maintain their livelihoods and to prevent them becoming a source of tension with the Project.

15.2.3.3 Management of employment expectations

Unemployment levels in rural Turkey are high. The number of people who will gain employment on construction of the pipeline and associated AGIs (approximately 5,000), although substantial, is low when compared to the population of the directly affected settlements and surrounding area. Residents in directly affected settlements that are unsuccessful in their job applications to work on the pipeline construction, or within the camps, may become frustrated when they do not gain employment. It is also likely that residents of settlements just outside the directly affected project area will be frustrated that they will not get priority access to jobs despite their relative proximity to the pipeline route. District centres in the area may also anticipate greater employment opportunities than actually exist. These unmet expectations could create resentment towards those who succeed in getting jobs, and also towards the Project. Although unmet expectations could be widespread, ranging

from local to regional and possibly national, tensions developing around this issue are likely to be localised.

The disclosure process of the EIA and a wider communication strategy regarding employment opportunities will assist in managing expectations regarding employment opportunities, thereby reducing this impact. The community liaison team will also have a key role to play in managing any tensions, should they arise. These measures are described in more detail in the Employment and Training Management Plan and the Community Liaison Management Plan (Appendix C8).

15.2.4 Other significant residual social impacts

This section describes the significant residual social impacts, which, although important, have a higher degree of assurance regarding the effectiveness of the proposed mitigation measures. These relate to health and safety of local residents and livestock, social and cultural disturbance to local residents and grievances over land compensation.

Health risks

There is a minor residual risk that the existence of construction camps and the interaction of the workforce with local residents might either introduce new diseases to the country or the region, or might increase the rate of transfer of disease. The likelihood and severity of this will depend upon the health of the workforce and the level of interaction with local settlements. To minimise health risks, all personnel will undergo health screening. No-one suffering from a transmittable disease will be allowed to work on the project. Thereafter, all employees will be immunised, if required, and will be involved in on-going health programmes, including regular check-ups (see the Disease Awareness and Prevention Strategy in Appendix C8). Based on these mitigation measures, any incidents of disease are likely to be highly localised and will continue for the short or long tem, depending on the nature of the illness.

The likelihood of increasing levels of sexually transmitted diseases is considered to be low due to the conservative nature of rural settlements and government regulation of licensed brothels, including regular health checks for all sex-workers. However, the Project will act to further minimise the risk through health awareness raising with the workforce and local settlements (in the vicinity of construction camps), and making condoms freely available from the camp doctors (See Disease Awareness and Prevention Strategy in the Community Safety Management Plan, Appendix C8).

The likelihood of the Project exacerbating health problems in the area is therefore considered to be low.

Safety of local residents and BTC workers

Construction working areas and higher traffic loads will pose safety hazards to local residents, particularly small children and BTC workers. While considerable mitigation measures have been put in place to address such impacts (eg safety briefings, traffic control measures, driver training, fencing), there will be a residual, although small, likelihood that accidents could occur. Continued attention to mitigation measures will be critical to prevent any injuries from occurring. These are detailed in the Community Safety Management Plan in Appendix C8. As part of induction training, all workers, including contractors and sub-contractors, will be trained in Project Health, Safety and Environment (HSE) policies and procedures.

Social and cultural disturbance

It is critical that the social and cultural values of all settlements neighbouring the pipeline route and construction camps be respected. Extensive mitigation measures are in place to ensure that this occurs. As such there is only a low likelihood of any residual impacts occurring. Any incidences that arise from a breach in rules and procedures will be rapidly resolved. Any associated tensions are thus only expected to persist for the short term, although the potential for long-term damage to relations is however recognised.

A complaints procedure will be operated by the community relations team to allow for the reporting of grievances and their rapid resolution by the Project. On-going community liaison with project-affected settlements will also be undertaken, as well the enforcement of the worker Code of Conduct. Should additional construction camps be required, these are to be located at least 5km from settlements identified as having resistance to construction camps, wherever possible. These measures are detailed in the Employment and Training Management Plan and the Community Liaison Management Plan in Appendix C8.

Grievances over land compensation

The pipeline will require the purchase and use of land that is used predominantly for agriculture and grazing, or in some instances, forestry lands. Where this land is communal, or where there is uncertainty regarding land titles, there is the potential for complications to occur in the expropriation process. The land acquisition process will address such issues in detail through a series of mitigation and monitoring measures. Therefore, the potential residual impacts are reduced. An overview of the land acquisition process (OLAP) is provided in Appendix C9.

However, experience from previous expropriation in Turkey suggests that there may be disputes and disaffection between the Project and some landowners and users on the pipeline route. These could result from perceived or actual instances of disagreement with regard to the compensation process. This could cause resentment and possibly tension between the Project and affected landowners. Such tensions are only expected to last until an acceptable settlement is reached between the parties concerned.

The nature and scale of these negative residual impacts will depend on the quality of implementation of the land acquisition and compensation process, community relations, and the Complaints Procedures.

15.2.5 Residual social benefits

The negative residual impacts identified in Section 15.3 need to be balanced alongside the positive impacts that will be brought by the Project. The positive impacts of a project such as BTC are generally concentrated at the national level through the economic and strategic benefits that the project brings. The EIA process and associated work carried out by the Project have focused on identifying the areas where the Project can bring more local benefits. The main areas of benefit that are predicted stem from health awareness training, clarification of land tenure, the employment and resourcing strategies and the benefits resulting from the EIA consultation process. The Project will also look for formal and informal ways of linking project infrastructure needs into existing infrastructure and service plans, thus resulting in long-term benefits for local residents.

The benefits associated with the Project occur on the local, regional and national level and, with the exception of employment during construction, will endure both for the long-term and

permanently. Temporary employment will, however, result in indirect benefits, which are long-term and permanent in nature.

Direct and indirect employment creation

The greatest positive socio-economic contribution that the BTC Pipeline Project can bring to local settlements is direct employment and the stimulus that local purchasing can bring to the local economy. Employees will directly benefit from secure, although short-term, income and will gain skills and experience that may assist them in seeking other employment. Local settlements will further benefit from the money spent by the work force.

In response to the high priority placed on this by the local people and their representatives, the Project has committed, wherever possible, to preferential use of local workers and purchase of local goods and services. The key issue in determining the level to which this boosts local economies are the total number and duration of employment opportunities, the source of the workforce (local, Turkish, international) and the degree of local procurement undertaken. Whilst this will be determined with the Contractor during contract negotiations, the Project expects that:

- the vast majority (target of 90%) of the unskilled workforce will come from settlements directly affected by pipeline construction;
- a high proportion of the semi-skilled workforce (target of 80%) will come from the districts and provinces through which the pipeline passes;
- a high proportion (target of 80%) of the skilled workforce will be Turkish nationals.

Approximately 5,000 people will be directly employed by the Project, approximately half of whom will be unskilled and therefore from project affected settlements. Half of these unskilled workers will be employed on the pipeline spread for approximately two month's duration each, and the others will be employed at the construction camps and pump stations for up to 2.5 years. By ensuring that recruitment takes place at a number of locations along the route, more people will have an opportunity for employment, thereby spreading economic benefits more widely.

For more details, see the Employment and Training Management Plan in Appendix C8.

Enhanced recruitment and contracting practices

The Project has committed to developing, publicising and implementing strategies for recruitment and purchasing. These strategies will emphasise transparency and integrity through: the timely and widespread provision of information on employment and supply opportunities and procedures; establishing and reporting on targets; and putting in mechanisms for third party oversight.

It is considered that this will set an important precedent in terms of the way in which recruitment, employment, contracting and purchasing is managed. This could potentially have a significant positive residual impact on future employment and sourcing practices in the regions in which the Project occurs, and possibly more widely.

For more details, see the Procurement and Supply Chain Management Plan in Appendix C8.

Enhanced local experience and employability

There will be benefits in terms of the additional experience and skills gained by construction and operational workers, resulting in an enhancement of future employment prospects. This

will apply to all workers, being of greatest significance for those participating in skills development programmes and for those skilled workers who will be employed for longer periods. The potential to benefit from these enhanced skills depends to some extent on the ability of workers to find other construction jobs where their experience is valued. Professional (office-based) workers are likely to have enhanced employment prospects, as they will gain and/or enhance skills suitable for positions in other industries.

Skills developed by local businesses through contracting and procurement processes will enhance their ability to respond to other international tenders. These will include overall business management skills such as quality assurance and project management. The scale and distribution of this positive impact will depend on the number of contracts given to local contractors.

For more details, see the Employment and Training Management Plan and the Procurement and Supply Chain Management Plan in Appendix C8.

Land tenure clarification

A minor positive residual impact will be the clarification of land tenure status of those lands without legal title deeds that are crossed by the pipeline (within the 28m corridor). In order to award expropriation payments, such legal clarification is required. This includes the ownership rights of heirs who have not registered their inherited rights to land, and customary ownership rights.

Clarifying land tenure status allows owners to use their land as collateral against which they can loan money to invest in improving their future livelihood. It also helps to prevent future conflicts arising over land rights.

Increased capacity to interact with development projects

The consultative process associated with this Environmental Impact Assessment has engaged stakeholders from the international to the local level, including residents from potentially affected settlements, local authorities and NGOs. It is expected that this consultative process, and its extension into the implementation phase of the project, will deliver benefits to stakeholders in terms of building understanding of the project planning process and capacity to interact with development projects.

Improvements to infrastructure and service provision

Benefits for local settlements will be realised should the Project and other parties be successful in linking Project infrastructure needs into existing infrastructure and service plans (eg road upgrades, sewerage treatment, waste management and water supply), thus resulting in long-term benefits for local residents. These opportunities are particularly strong in relation to settlements close to pump stations that have very limited infrastructure. Efforts by the Project to link infrastructure in this way will serve to build relationships with residents and prevent any resentment from the settlements towards the Project.

Improved health awareness

Mitigation measures will result in the training of all workers employed on the BTC Project (international, national and local) in health and safety (including hygiene and STD awareness). In addition, the Project is committed to working with district and provincial health authorities in awareness raising on health issues for settlements close to construction camps and pump stations (via posters, leaflets, through health clinics, community meetings

and availability of condoms from the camp doctor, without charge). These efforts will deliver significant benefits in local settlements in terms of raising awareness of important health issues.

For more details, see the Community Safety Management Plan (Disease Awareness and Prevention Strategy) in Appendix C8.

15.3 RESIDUAL IMPACTS AT THE MARINE TERMINAL

15.3.1 Introduction

This section describes the residual environmental and social impacts of the BTC Marine Terminal. As described previously, significant environmental residual impacts are those that have been evaluated as Moderate or Major, according to the criteria established in Section 3. With regards to the significant social residual impacts, these are divided into those that are viewed as most important and those that are still significant but viewed as readily amenable to management. With regards to both environmental and social impacts, the evaluation of significant impacts stems largely from uncertainty factors and a cautious assessment. The following descriptions have therefore also set out how uncertainty will be addressed and managed.

15.3.2 Residual environmental impacts of Major significance

Major, long-term, localised visual impacts are predicted to the residents of Sahil Sitesi. Although a series of landscaping mitigation measures are proposed that will soften the overall impact, such measures will not obscure the major structures (ie the tank farm and jetty) and the visual presence of large tankers at the jetty.

The assessment was based on a fairly conservative application of the significance criteria, which has not yet been tested in consultation with the affected community. Before and after photomontages have been prepared for the disclosure phase (and are shown in Section 12) so that views of the affected communities on impacts to visual amenity can be gauged more clearly and further mitigation measures can also be explored.

15.3.3 Residual environmental impacts of Moderate significance

15.3.3.1 Visual impacts

Moderate, long-term, localised visual impacts are predicted to the residents of Golovasi, Hamzali, Kurtgulagi, Incirli and Karatepe. In addition, moderate impacts are also predicted for the recreational users of the BOTAŞ beach.

The landscaping mitigation measures, however, will not be able to obscure the major structures but will reduce the visual impact to as low as reasonably practical. From some views, impacts may be reversible in the longer term as planting takes effect. As described in Section 15.3.1, the assessment criteria used are precautionary and conservative. Consultation with local communities during public disclosure will help to identify further mitigation measures which can be adopted to minimise impact to the communities identified.

15.3.3.2 Impacts to terrestrial ecology

Ecological impacts from the construction of loading lines

Although ecological surveys of the tank farm site have been carried out, ecological surveys of the loading lines have not been undertaken to date. Such surveys are proposed prior to construction in order to identify any rare or noteworthy species. As the presence of such species is unknown at present, the construction of the loading lines has the potential to cause minor to moderate impacts to flora and fauna at the site. If such species are discovered, however, relevant mitigation measures will be put into place in order to minimise impacts to sensitive species, therefore the overall impacts is likely to be minor.

Impacts to reptiles

A number of nationally and internationally important species of reptile were identified at the terminal site. As reptiles demonstrate varying degrees of mobility, there is the potential for short-term and localised, minor to moderate impacts to reptiles during construction of the tank farm and the loading lines. It is anticipated that any impacts to reptiles will only occur during construction and will not last during operation as any displaced animals will move to similar adjacent habitats.

15.3.3.3 Impacts to coastal processes

The presence of the proposed BTC jetty structure has the potential to cause minor to moderate impacts to coastal processes. Longshore drift in the vicinity of the proposed jetty occurs in a northerly direction as evidenced by the build up of sand on the southern side of headlands and other coastal structures in the area. The volumes of sediment movement are relatively small. The solid causeway structure is likely to trap some sediment, preventing northerly drift, potentially starving the BOTAŞ beach to the north of the proposed jetty which may result in a slight decrease in size.

Monitoring of seabed levels and shoreline morphology will be conducted to determine the extent of changes on coastal morphology caused by the structure. If changes are viewed to be significant, remedial action will be undertaken to replenish the existing BOTAŞ beach. Although impacts are currently predicted to be moderate at most, appropriate mitigation measures (adopted where necessary) are likely to reduce the overall impacts to minor.

15.3.4 Most important significant residual social impacts

This section describes the significant residual social impacts that, based on professional judgement and feedback from consultation, have been identified as being most important. These include impacts on livelihood due to decreased access to fishing grounds and possible tensions due to the limited number of employment opportunities.

15.3.4.1 Fishermen livelihoods

Based on findings currently available, the predominant residual impact associated with the BTC Marine Terminal concerns decreased access to the fishing grounds that are currently used by residents of Golovasi and Sahil Sitesi. Based on the findings of the recently completed studies this impact is understood to be local in geographical scope and will endure for the long-term (ie for the life of the Project). The mitigation measures will include compensatory measures and the prioritisation of local residents for employment (see Employment and Training Management Plan and the Procurement and Supply Chain Management Plan in Appendix C8). Increased opportunities for wage labour, as a result of the on-going industrialisation in the Gulf of Iskenderun and surrounding area, are also expected to help mitigate against the loss of access to fishing grounds. The compensation process will

include an internal and external monitoring programme to ensure that the compensation package is successful. Where appropriate, actions to address any feedback received will be taken.

However, it is expected that residual impacts will occur irrespective of such mitigation measures. This is largely the result of the following:

- unskilled jobs associated with the Project are limited and will not be allocated exclusively to fishermen. Therefore, not all impacted fishermen are likely to secure employment on the BTC Project;

- while the majority of the employment brought by the Project will be limited in duration to the construction period (up to 30 months), the restricted fishing areas will be out of bounds for the full life of the Project (40 years). As a result, compensation measures will need to address the long term loss of a source of livelihood;

- additional developments in the Iskenderun Gulf compound the residual impacts associated with the BTC Jetty, particularly those that require their own Security Exclusion Zones. This issue is addressed separately in Section 16 as a cumulative impact. Such increased industrialisation, will, however, offer additional opportunities for wage labour in the area.

Loss of fishing as a form of livelihood (as a result of both general industrialisation in the area and decreased access to fishing grounds due to the BTC Marine Terminal area) is also likely to impact on fishing as a 'way of life'. The potential residual impacts associated with this change include decreased cohesion of the family as a working unit and, in the event that households no longer have reason to work together (as they did on the fishing vessels), this could impact on the sense of community and support networks within the affected settlements. In spite of local employment strategies and other mitigation measures, this residual impact is considered an unavoidable impact of increased industrialisation, of which the BTC Project is a part.

15.3.4.2 Management of employment expectations

Unemployment levels in rural Turkey are high. The same applies to the settlements neighbouring the proposed marine terminal. During construction, approximately 400 workers will be employed and approximately 100 workers will be employed during operation. Although local residents will be prioritised for unskilled employment, and semi-skilled workers from districts within Adana province, these employment totals are very low compared to the population of the directly affected settlements.

Expectations of employment featured prominently during the consultation process and helps to explain why the concerns of directly affected settlements (eg decreased access to fishing grounds; increased traffic levels; potential land take for terminal facilities) did not undermine overall support for the marine terminal. Although the mitigation measures include proposals to manage community expectations regarding employment, local residents have expressed disappointment regarding limited employment opportunities at the existing terminal.

The concern therefore exists that inability to deliver on these expectations could damage relations between the Project and some local residents. This could be further compounded by possible tensions among some local residents regarding the high standards of living enjoyed by workers in the construction camp, as already experienced in relation to BOTAŞ residents (employees and their families) within the existing BOTAŞ Marine Terminal.

The disclosure process of the EIA and a wider communication strategy regarding employment opportunities will assist in managing expectations regarding employment opportunities, thereby reducing this impact. The community liaison team will also have a key role to play in managing any tensions, should they arise. These measures are described in more detail in the Employment and Training Management Plan and the Community Liaison Management Plan (Appendix C8).

15.3.5 Other significant residual social impacts

This section describes the significant residual social impacts, which, although important, have a higher degree of assurance regarding the effectiveness of the proposed mitigation measures.

These include:

- a minor risk of increases in communicable diseases, due to interaction of construction workers and local residents;
- a minor risk of accidents (involving humans and/or livestock) as a result of construction activities, both within the BOTAŞ property and along access roads;
- unplanned disruption to infrastructure and service provision;
- impacts of in-migration to the project area.

These residual impacts (with the exception of in-migration) are similar in nature to those described in the pipeline residual impact section. The following differences should, however, be noted.

- Regarding health risks, increased industrialisation and population mobility in the project area is expected to have increased the resistance of local residents to communicable diseases.
- Regarding risks of accidents, construction activities (excluding construction traffic) will be confined within secure, off-limit areas within the BOTAŞ property, thus reducing the risk of accidents to local residents and livestock.
- Regarding impacts on infrastructure, the absence of large-scale irrigation networks within the marine terminal project area reduces the extent of this impact compared to that of the pipeline. However, a potential overload on existing services and accidental or planned disruption to utilities during construction, remains a residual risk in a project of this scale.

With regards to in-migration, the absence of large-scale in-migration to settlements neighbouring the existing BOTAŞ Marine Terminal indicates that a sudden influx of job seekers to the Project area is unlikely to occur as a result of the BTC Project. What is likely, however, is a gradual influx of job seekers to the Iskenderun Gulf area as a result of on-going industrialisation. The project area may therefore experience in-migration as a result of this general influx to the wider project area.

The potential impacts of in-migration are directly related to the capacity of the existing services and resources to support an increased population, and the ability of the resident population to adapt to any changes to standards of living and sources of livelihood. An overview of conditions in the project area indicates that the existing services and resources are not sufficient to meet the needs of either the current or additional populations. These impacts

will vary in duration (short-term, long-term or permanent) depending on the length of time that job seekers remain in the project area and the amount of time taken to improve services and create employment opportunities in the project area.

By way of mitigation, the Project will actively seek to discourage in-migration in search of employment or other project benefits (eg provision of local goods). This will be done primarily through the publication and implementation of the employment and purchasing strategies. Specifically, the following will be announced: preference for local labour; no recruitment at the construction camps for work site (recruitment centres to be publicised) and no purchase of goods at camp locations or work sites. For more details on these measures, see the Employment and Training Management Plan and the Procurement and Supply Chain Management Plan in Appendix C8.

Turkish citizens are, however, free to move within their own country and any migration to the project area cannot thus be prevented. A residual risk of in-migration therefore remains, along with the associated risks of decreased standards of living and increased competition for sources of livelihood in the project area.

15.3.6 Residual social benefits

The negative residual social impacts of the Project need to be balanced alongside the positive impacts that will be accrued. The positive impacts of a project such as BTC are generally concentrated at the national level through the economic and strategic benefits that the Project brings.

Residual socio-economic benefits at the local level are predicted to be as follows:

- limited direct and indirect employment creation;
- enhanced recruitment and contracting processes;
- enhanced local procurement and supply;
- enhanced local experience and employability;
- increased capacity to interact with development projects;
- improvements to infrastructure and service provision;
- improved health awareness.

These impacts are in line with those identified for the pipeline as a whole and are explained and expanded upon in Section 15.3.4.

15.4 SUMMARY

Managing the residual environmental and social impacts will be the main focus of ongoing environmental and social management throughout the lifetime of the BTC Project. The Environmental and Social Management and Monitoring Plans establish the principles and set out the frameworks for achieving this. However, these will apply not only to the impacts summarised in this section but also to the many environmental impacts evaluated as Minor to ensure that these are also properly managed and that they do not become Moderate or Major impacts. Similarly, these management and monitoring plans also apply to other social impacts identified in Section 6 and 12.

Table 15.1 summarises the key areas of residual impact, together with proposed Project actions. Also included are current areas of uncertainty that, if properly managed, will result in Minor impacts, but still contain an element of uncertainty and require further action beyond this EIA to fully address them.

Table 15.1 Key Areas of Residual Impact and Proposed Project Actions

ISSUE	PROJECT ACTIONS
Soils in certain sections of pipeline route	• engage soils expert • pre-construction surveys • enhancement of certain reinstatement measures • focus for post-reinstatement monitoring and aftercare
Landscape in certain sections of pipeline route	• same actions as stated above for soils
Landscape at Marine Terminal	• disclosure consultation feedback to assess further mitigation opportunities
Water quality and abstraction	• pre-construction surveys to identify suitable soakaway sites • risk assessment studies for groundwater aquifers • long-term monitoring • drawdown pumping trials • longer term monitoring
Biological environment at ESAs and other important sites	• timing and duration of works • pre-construction surveys • species transplantation • post-reinstatement monitoring and aftercare
Construction noise at certain settlements	• pre-construction surveys to establish true work-site to residence separation distances • re-assess noise exposures • re-assess attenuation effectiveness of purpose-designed noise barriers • further action in consultation with affected residents • monitoring
Flare noise at Marine Terminal	• investigate noise abatement design options • commissioning phase noise monitoring
Archaeology	• pre-construction investigations in accordance with CHMP • construction phase watching brief in accordance with CHMP
Quarries and aggregates extraction	• Contractors to quantify requirements • Contractors to identify licensed sustainable sources • formal EIAs and approvals for new sources (and reinstatement plans) • monitoring
Solid waste management	• Contractors to quantify volumes to type • Contractors to identify disposal locations on basis of licensed facility suitable for waste type • Contractors to identify disposal locations on basis of capacity to accept project waste without conflict with other users
Impacts associated with PT1	• further assessment required to determine significance of impact. • possibility of securing additional grazing land for residents

ISSUE	PROJECT ACTIONS
	of Sogutlukaya to be explored. • compensation procedures to be carried out. • internal and external monitoring to be carried out.
Unplanned disruption to infrastructure and service provision	• in accordance with the requirements of the Construction Impacts Management Plan and Community Liaison Management Plan, BOTAŞ CLO to notify authorities of affected settlements regarding occurrence of unplanned disruptions, as well as expected duration of disruption and measures to be taken to rectify incident. • operation of Complaints Procedures to allow for reporting and resolution of any grievances. • where appropriate, compensation for losses incurred will be provided.
Management of employment expectations	• distribution of the employment strategy (including details on extent and duration of employment) to all project affected settlements, at least one month prior to the date of recruitment. • the employment strategy to be publicised to sub-governors of districts along the pipeline route and in Adana and Yumurtalik districts. All governors in Turkey will also be informed.
Health risks	• develop and implement a Disease Awareness and Prevention Strategy in liaison with government health authorities and other expert health organisations in Turkey.
Safety of local residents and BTC workers	• on-going attention to the mitigation measures detailed in the Community Safety Management Plan and the BP HSE policies and procedures. This includes community liaison meetings (including women and children's meeting), securing the worksite and Project HSE training for all workers**.**
Social and cultural disturbance	• enforcement of worker Code of Conduct. • operation of Complaints Procedures to allow for reporting and resolution of any grievances. • on-going community liaison with project affected settlements. • if additional construction camps are proposed, these are to be located at least 5km from settlements identified as having resistance to construction camps, wherever possible. • all grievances to be addressed and resolved according to the Project procedures.
Grievances over land compensation	• completion of additional studies currently underway to clarify impact of BTC jetty on local fishing activities • if considered appropriate, compensation for decreased access to marine resources to be provided. • internal and external monitoring to be carried out.
Fishermen livelihoods	• completion of additional studies currently underway to clarify impact of BTC jetty on local fishing activities. • if considered appropriate, compensation for decreased access to marine resources to be provided. • Internal and external monitoring to be carried out.
In-migration	• distribution of the employment (including details on extent and duration of employment) and purchasing strategy to

ISSUE	PROJECT ACTIONS
	all project affected settlements, at least one month prior to the date of recruitment. • the employment and purchasing strategy to be publicised to sub-governors of districts along the pipeline route and in Adana and Yumurtalik districts. All governors in Turkey will also be informed.

16 CUMULATIVE IMPACTS

16.1 INTRODUCTION

16.1.1 Definitions of cumulative impacts

The IFC Procedure for Environmental and Social Review of Projects [Ref 1] states that environmental assessment includes consideration of:

> *"… cumulative impacts of existing projects, the proposed project and anticipated future projects."*

With regard to qualifying the spatial and temporal relationships of the subject project activities (i.e. those for which the assessment is being performed) and potential future projects, the Procedure states that:

> *"Assessment of cumulative impacts would take into account projects or potential developments that are realistically defined at the time the environmental assessment is undertaken, where such projects and developments could impact on the project area".*

EC Guidance on EIA [Ref 2] states that:

> *"The assessment of …cumulative impacts …. should not be thought of as a separate stage in the EIA process. Indeed the assessment of such impacts should be an integral part of all stages of the process."*

Cumulative impacts are generally impacts that act with others in such a way that the sum is greater than the parts. This is not always the case - sometimes they will simply be the sum of the parts, but that sum becomes significant. In general, several types of cumulative impacts of relevance to the BTC Project can be defined. These are outlined in Box 16.1 below.

Box 16.1 Types of Cumulative Impacts Relevant to the BTC Project

***Accumulative*:** the overall effect of different types of impacts at the same location (for example, fugitive dust emissions, construction noise and construction traffic).

***Interactive*:** where two different types of impact (which may not in themselves be important) react with each other to create a new impact (that might be important) (eg water abstraction from a watercourse might exacerbate the impacts caused by increased sediment loading).

***Additive*:** where impacts from the primary activity (ie the construction of the BTC Pipeline) are added to impacts from third party activities (eg other major projects in the vicinity of the BTC Project which are already occurring, planned or may happen in the foreseeable future).

It should be noted that the IFC Procedure defines cumulative impacts in the sense of additive impacts of the primary activity and third party activities.

16.1.2 Overview of methodology

The approach taken in the EIA and reported in Section 6 of the EIA Report facilitates the identification of the first two types of cumulative impacts. The linked tables and maps (presented in the Supplements to Volume 2) detail environmental and social baseline, potential impacts, mitigation measures and residual impacts as they occur along the route. There were three principal reasons for taking this approach:

- It enables all the impacts occurring at a particular location to be identified.

- The mitigation measures can be easily transferred to the 'alignment sheets' used by the Contractor in construction planning and design – in this way, mitigation measures identified in the EIA process are carried through to the construction specifications in an efficient, geographically-focused way that lends itself to the management of cumulative impacts.

- It allows cumulative impacts on, for example, a particular settlement or on a particular ecological resource to be readily identified. This will assist in focusing future consultation with stakeholders along the route. It also allows the ready identification and presentation of impacts where there is an interaction between different environmental aspects.

Similar considerations applied in the treatment of the proposed BTC Marine Terminal so that, for example:

- air quality impacts due to BTC Marine Terminal operation took account of all other major influences on air quality;

- fisheries and livelihood assessments of the BTC Jetty security exclusion and manoeuvring zones considered other developments within a 10km radius of the proposed BTC offshore Marine Terminal.

The approach adopted was underpinned by the application of the same assessment criteria to the various environmental and social aspects as are presented and described in Section 3.

The remainder of this section of the EIA Report deals with additive cumulative impacts, as set out in the IFC Procedure, which states that an EIA includes consideration of the cumulative impacts of "existing projects, the proposed project and anticipated future projects".

The basic approach used in the assessment was to look at potential cumulative impacts at several levels as follows:

- **Global Level:** the assessment of cumulative global level impacts has focused on greenhouse gas implication. The BTC Project will emit CO_2 and this has been quantified in terms of its contribution to global anthropogenic emissions.

- **Regional:** the BTC Project will be one of several linked and similar energy projects in the Western Caspian, South Caucasus and Eastern Mediterranean region. The assessment has looked at these from a macro socio-economic and environmental perspective, drawing on a separate piece of work entitled 'BP Azerbaijan: ACG, BTC and Shah Deniz Projects – Economic, Social and Environmental Review in the National and Regional Context' [Ref 3].

- **National Scale:** the assessment has addressed certain cumulative environmental issues (especially those with a transboundary consideration) and cumulative socio-economic issues within a national context.

- **Route level/marine terminal area level:** impacts were examined systematically in two phases:
  (i) screen other projects with which there is the potential for cumulative impacts;
  (ii) to scope those environmental and social aspects for which there is the potential for cumulative impacts between BTC and other projects.

The approach is described further in Section 16.5.1.

Further information on the methodology applied to each level of assessment is provided in the sections that follow.

16.2 GLOBAL LEVEL CUMULATIVE IMPACTS

The Project will contribute to global warming through emissions of so-called greenhouse gases (GHGs). The GHGs of relevance to the BTC Project are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), all associated with combustion processes. The concept of a global warming potential (GWP) has been used to enable different GHG to be compared to each other and expressed in CO_2-e (Carbon dioxide equivalents). The GWP factors reflect the different extent to which gases absorb infra-red radiation and the differences in the time scales on which the gases are removed from the atmosphere. The GWP is used in the National Communications required by the UN Framework Convention on Climate Change (UNFCCC).

The Kyoto Protocol has adopted GWPs (with 100-year time horizon) as the basis for defining equivalence between emissions of different greenhouse gases during the 2008-2012 commitment period. Emissions of greenhouse gases (CO_2-e) are thus given by using the GWP as weighting factors for the emissions of carbon dioxide, methane and nitrous oxide:

$$CO_2\text{-e} = \text{carbon dioxide} + 21\ (\text{methane}) + 310\ (\text{nitrous oxide})$$

Although GHG emissions will occur during construction, the bulk of emissions will occur during the operational phase of the Project (see Appendix B2, Air Quality Modelling). The main sources will comprise:

- Exhaust from pump drivers at the four pump stations. This will comprise a total of 448 776 tonnes per annum (tpa) of CO_2 when the pipeline is operating at full capacity (and assuming no downtime). Once allowance is factored in for emissions of methane and nitrous oxide,CO_2-e emissions will comprise a total of 450 000 tpa.

- At the BTC Marine Terminal, there are two principal sources of GHG emissions. The enclosed groundflare will, at full capacity with no down-time, emit 152 450tpa CO_2. Tanker traffic within the vicinity of the Jetty is estimated to account for a further 1200tpa CO_2. These emissions combined are estimated to comprise a total CO_2-e of 154 000 tpa.

Total GHG emissions from the Project, when operating at full capacity with no down-time, will therefore comprise approximately 604,000tpa CO_2-e. The Government of Turkey (State Institute of Statistics) forecasts national GHG emissions in year 2005 (when BTC operation is scheduled to commence, but at reduced throughput) of 578.5 million tpa CO_2-e [Ref 6]. The

UNFCCC forecast world-wide GHG emissions in year 2010 (when BTC operation is scheduled to have reached full capacity) of 38 262 million tpa CO_2-e [Ref 7].

Based on the Government of Turkey's forecast for 2005, the BTC Project GHG emissions represent some 0.10% of Turkey's total CO_2-e emissions; this represents a Minor to Moderate impact when judged against the threshold criteria established in Section 3.8.7.

In international terms, the BTC Project in Turkey will contribute approximately 0.0016% of UNFCCC's forecast of global anthropogenic emissions of CO_2-e. While this can be regarded as an insignificant figure in itself, the Project has sought to minimise CO_2-e emissions (and those of other greenhouse gases). Efficiency (resulting in least CO_2-e emissions per unit of power generated/fuel combusted) was a key factor in selecting pump drivers. While the enclosed ground flare at the marine terminal comprises a significant source of CO_2-e, the alternative was to emit VOCs at a level deemed inappropriate in the context of local air quality.

16.3 REGIONAL LEVEL CUMULATIVE IMPACTS

The assessment of regional level cumulative effects on the natural and social environment pertains to all regional activities directly and indirectly related to the BTC Project. This includes the development of the Azeri-Chirag-Gunashli (ACG) fields and other oil fields in the Caspian, the construction of the overall transportation system and the shipment of the product through the Mediterranean Sea (see Figure 16.1). Geographically, this includes the Caspian, the Caucasian belt and Southern Russia, the Black Sea and Turkey. Existing pipelines in the region, although not included as part of this ultimate assessment, are indicated in Figure 16.1 and are described in Sections 16.3.3 – 16.3.7. These include the Blue Stream Natural Gas Pipeline (NGP), the Northern Route Export Pipeline, the Western Route Export Pipeline, the East Anatolian NGP and the BOTAŞ Oil Pipeline.

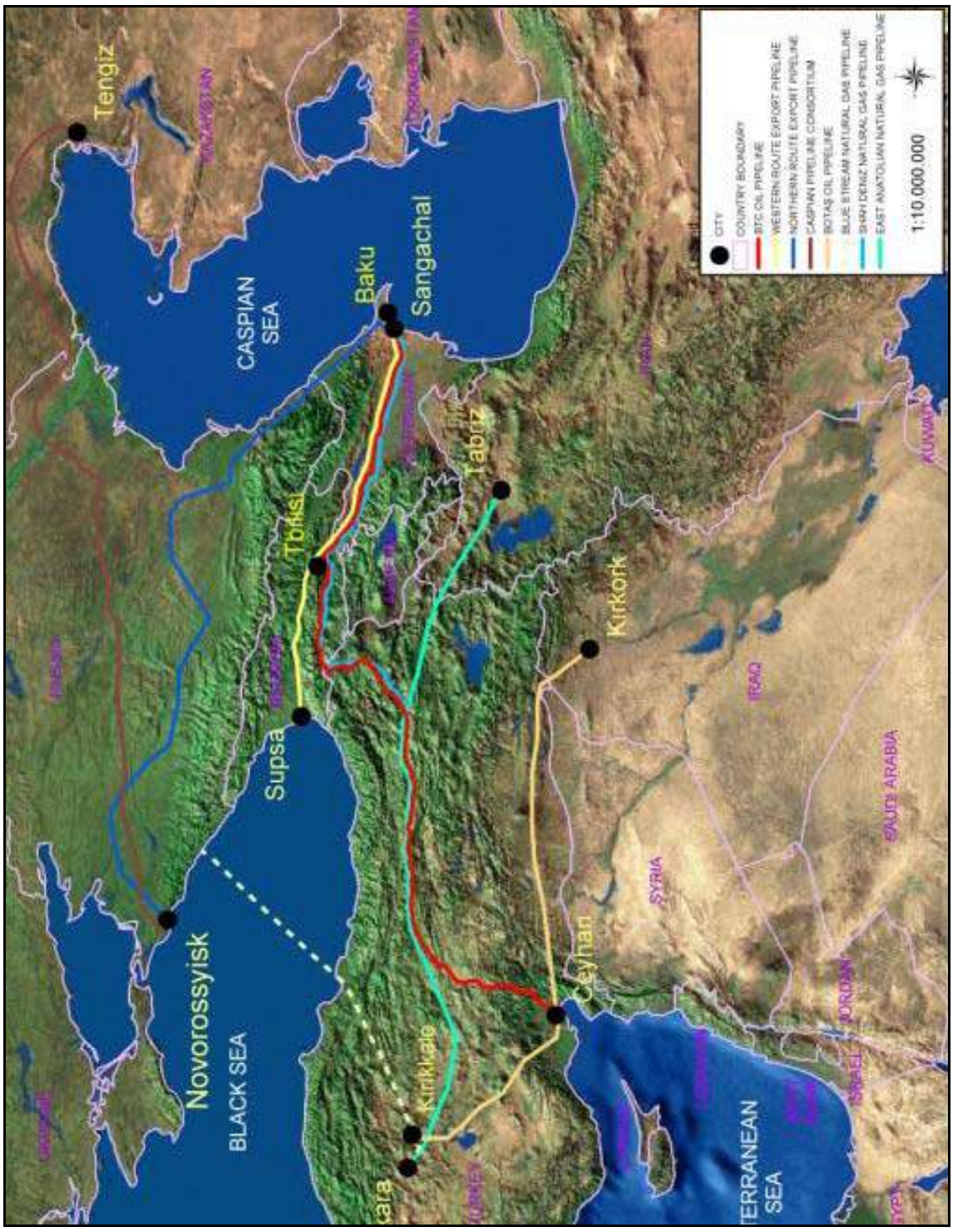


Figure 16.1 BTC Pipeline in Relation to Other Export Pipelines in the Region

16.3.1 Azeri-Chirag-Gunashli (ACG) development

The ACG Project consists of the development of the Azeri Chirag and shallow water Gunashli oil fields, offshore off Azerbaijan. One production platform (Chirag 1) is currently producing approximately 120,000 barrels of crude oil per day, which is transported by offshore pipeline to the Sangachal Terminal for processing, then primarily exported via the Western Route Export Pipeline (WREP) to Supsa on the Black Sea coast of Georgia and then by ship to international markets. A portion may also be exported by the Northern Route Export Pipeline (NREP) to Novorossisk on the Russian Black Sea Coast for further shipment. The future expansion of the ACG Project consists of three elements described below:

- Phase 1: Development of offshore;
- Phase 2: Full Field Development of the ACG field;
- Phase 3: Development of the Deep Water Gunashli field.

16.3.2 Shah Deniz Project and the South Caucasus Pipeline

The Shah Deniz Project involves the extraction of gas from offshore deposits in the Caspian Sea and exporting the gas to Turkey through Azerbaijan and Georgia. The gas will be used in Turkey to power energy plants in currently underdeveloped areas. A total of 8.2 billion m^3 of gas per year over a 30 year period will be extracted. Of these, 1 billion m^3 per year will remain in Azerbaijan, 0.6 billion m^3 per year will be delivered to Georgia, whilst the remaining 6.6 billion m^3 per year will be delivered to Turkey.

The gas will be pumped through the South Caucasus Pipeline (SCP) from Azerbaijan through Georgia to a delivery point in Turkey from where it will be distributed to users in Turkey by BOTAŞ.

16.3.3 Northern Caspian oil fields and the CPC Pipeline

Whereas the Shah Deniz and ACG projects originate from the Southern Caspian offshore fields, significant hydrocarbon production takes place in the Northern section of the Caspian Sea in Kazakhstan and Russia. Existing oil fields such as the onshore Tengiz facilities in Kazakhstan and large offshore fields both in Kazakhstan and Russia have the capacity to increase the current oil and gas production in the region. The expectation is to grow this production to 700,000 barrels per day by 2010. Tengiz crude oil is transported by a variety of means, including pipeline, rail and barge. Principal destinations include the Black Sea ports of Odessa, Feodosia and Batumi.

The operators of the Tengiz oil field have, however, recently commissioned the CPC (Caspian Pipeline Consortium) Pipeline. At full regime, this pipeline will have the capacity of transporting approximately 1.5 million barrels of crude oil per day. The pipeline ends at Novorossyirsk on the Black Sea from which crude oil is either shipped to Western markets on oil tankers through the Bosphorus or piped to European refineries through the Central European pipeline systems. It is expected that the CPC pipeline will be used for export from other oil fields in the Northern Caspian Sea, currently in their early stages of development.

16.3.4 Blue Stream Natural Gas Pipeline

The Blue Stream Natural Gas Pipeline (NGP), currently under construction is a gas export system from the Russian Federation to Turkey. The project relies on the construction of a sub-sea pipeline through the Black Sea. Its aim is to provide Turkey with a reliable supply of natural gas to meet the expected increased demand for power generation.

Currently published figures indicate that the Blue Stream pipeline will carry approximately 16 billion m^3 of natural gas per year from Russia to Turkey.

16.3.5 The Western and Northern Route Export Pipelines (WREP and NREP)

Two pipelines were initially constructed by the Azerbaijan International Operating Company (AIOC) to export oil from the early production activities carried out by the consortium in the Caspian. The pipelines, known as the NREP and WREP are currently in operation and transport 10,000 and 115,000 barrels of oil per day respectively.

The BTC Pipeline will be constructed mainly along the same route as the WREP within Azerbaijan. There will be no cumulative impacts as a result of the NREP and BTC Pipeline Projects in Turkey.

16.3.6 East Anatolian Natural Gas Pipeline (NGP)

With respect to the section of the BTC Pipeline in Turkey, the proposed pipeline runs parallel to the existing East Anatolian NGP for about 40% of the route in the central section between the cities of Erzurum and Sivas (see Figure 16.1). The NGP was constructed by BOTAŞ between 1999 and 2001 and commenced operations in September 2001. The NGP transports gas in Turkey from Dogubeyazit to Ankara.

16.3.7 BOTAŞ Oil Pipeline

The Iraq-Turkey Crude Oil Pipeline System transports the oil produced in Kirkuk and other areas of Iraq to the existing BOTAŞ Ceyhan Marine Terminal. The pipeline system, with an annual transport capacity of 35 million tonnes, came into operation mid 1977. The capacity of the line was increased to 46.5 million tonnes per annum through the First Expansion Project, the construction of which was started in 1983 and completed in 1984. With the completion of the Second Pipeline, which is parallel to the first one, the annual capacity reached 70.9 million tonnes as of 1987.

16.3.8 Assessment of regional impacts

As stated earlier, the assessment of regional level cumulative impacts has been carried out as part of a wider regional study [Ref 3]. The assessment, commissioned by BP on behalf of the BTC Co, provides advice (to BP and other interested parties) on steps required to enhance the sustainable development opportunities presented by the projects and to minimise any risks that they present.

The Review concluded that the ACG development, BTC and South Caucasus projects will have a significant effect on the development of Azerbaijan and Georgia primarily because of their size in relation to the rest of the economy. Due to the strength and size of the Turkish economy, the relative contribution of these developments will be smaller. The extent to which the projects contribute to sustainable development depends largely on the decisions taken by the government, especially concerning revenue use. The Review concluded that the major economic and socio-economic implications of the projects are expected to be in Azerbaijan and Georgia.

Poverty and inequality, corruption, human rights and conflict are issues in each of the three countries to varying extents. There are initiatives by governments and the international community to reduce poverty, to bolster human rights and to resolve the several 'frozen' conflicts in the region. There is scope for the projects to contribute positively to these issues, by applying high standards to the way in which projects are designed, built and operated and by engagement in the wider processes. Several important steps have been taken in the design stages of the projects in relation to construction, operations and engagement.

From a regional environmental perspective, the Review concluded that the projects would facilitate the large-scale introduction of international standards for health, safety and environmental protection.

16.4 NATIONAL LEVEL CUMULATIVE IMPACTS

16.4.1 Environmental

Overall emissions of NO_X in Turkey are 911,000 tonnes per annum. NO_X is a transboundary pollutant in that it contributes to acid deposition and, when mixed with Volatile Organic Compounds (VOCs), ground level ozone formation. The BTC Project in Turkey adds an increment of 0.09% to this total and therefore makes a negligible contribution in terms of cumulative impact.

Owing to the use of low sulphur fuel gas, emissions of SO_2 from pump stations are minimal. SO_2 from the BTC Marine Terminal (principally on-site tanker inert gas plant) is 7 tonnes per annum. Overall emissions of SO_2 in Turkey are 1,347,000 tonnes per annum (1999) and SO_2 is also a transboundary pollutant contributing to acid deposition. The BTC Project in Turkey adds an increment of 0.000006% to this total, and therefore makes a negligible contribution.

Since the BTC sources will be spread out along a >1,000km pipeline and that acid deposition problems for vulnerable habitats is not a commonly reported issue in Turkey, this is unlikely to contribute even in a minor way to existing problems.

16.4.2 Socio-economic

The cumulative socio-economic impacts resulting from the BTC Project, South Caucasus Pipeline (SCP) (also referred to in Turkey as the Shah Deniz Gas Pipeline) and other proposed development projects (or those currently under construction) will, if well managed, provide an overall increase in wealth and access to livelihood opportunities for the national population. Hence, the effect will be positive. The main national-level benefits will be improved infrastructure and increased government revenues from transit of oil and gas and taxes, all of which should contribute to reducing the national debt and increasing opportunities for investment and employment. Realisation of these major projects will also enhance Turkey's strategic geopolitical positioning.

In addition, provided local workers are used wherever possible, the skills base within the national population should increase, providing a more skilled workforce for future projects and increasing employment opportunities for those benefiting from skills enhancement either within Turkey or abroad. Furthermore, if goods and services are sourced locally (ie within Turkey), the effects on indirect employment and cash flows into the local economy should be beneficial. However, for these benefits to impact more than the project affected settlements, effective 'trickle down' has to occur in terms of revenues generated into the national economy. Whether or not this takes place will depend on the management decisions taken by the Turkish Government.

16.5 ROUTE LEVEL CUMULATIVE IMPACTS

16.5.1 Introduction and assessment criteria

The previous sections of this EIA have addressed the construction of the BTC Project. However, the Project is being constructed in close proximity to a number of proposed projects. Clearly there is potential for a large number of planned developments in the vicinity of the BTC Project, many of which will be small and inconsequential in the context of potential cumulative impacts associated with the BTC Project.

In determining where to focus the attention of the cumulative impact assessment of the BTC Project in combination with other projects, a screening approach has been adopted whereby the following criteria have been applied:

1. Distances have been set for different environmental and social aspects for which there is a reasonable likelihood for overlap between the BTC Project and one or more of the identified projects in terms of their construction footprint, including for example, noise footprint, operational air quality footprint, local workforce requirements, expropriation of land etc (see Table 16.1 below). For screening, the largest separation distance was taken as the starting point to identify other projects for the cumulative impact assessment.

2. A search was then carried out to establish which projects were of significant magnitude and complexity so as to require Ministry of Environment approval, and thus an EIA. Setting this as a criterion had the added advantage that data from third parties would be available for the proposed project where EIAs had been completed.

3. Proposed or planned projects, which may be developed sequentially to the BTC Project, were also investigated. However, such projects were generally in an early stage of conceptual planning and would be required to accommodate the BTC Project as part of the existing planning baseline. Nevertheless, reference to such potential sequential impacts is made in this section where the cumulative effects are likely, or are perceived to be significant.

4. Finally, respective project schedules were examined, particularly for overlapping construction phases, where impacts to many aspects are often concentrated and more difficult to manage.

Table 16.1 Spatial Criteria for Screening and Scoping Cumulative Impacts

Aspect	Spatial criteria for geographic separation between two projects/ receptor zones within which cumulative impacts might be experienced
Soils	• 100 m separation.
Landscape and visual	• As for soils for pipeline construction. • 2km for large scale prominent operational AGIs.
Water Quality/ Watercourse disturbance	• A stream connecting both projects up to a separation of 4km.
Groundwater	• Projects in the same unconfined aquifer up to a 4km separation.
Ecology	• 500 m for fauna disturbance. • 100m for habitat damage.
Noise	• 1km separation.
Air Quality	• Dust – 250 m separation. • Operational emissions (eg of NOx) – 2km separation.
Traffic	• Shared access roads through same community – ie road used by BTC Project and other projects for access – up to 10km separation between projects.
Cultural Heritage	• Both projects impact the same receptor – reasonable separation criteria of 200m.
Construction Camps	• If more than one construction camp is located within 5km of a settlement.
Resource Ownership or Resource Use	• For pipeline projects, if land within a 2km radius of a single settlement is intersected (and expropriated) by more than one development. • For other projects, if land belonging to a single settlement is expropriated for more than one development – up to 10km separation between projects, or: • If resources owned or used by a settlement are impacted upon by more than one development - up to 10km separation between projects.
Employment	• If a settlement falls within the employment sourcing area for more than one development - up to 10km separation between projects, for unskilled labour and within the same district or province for semi-skilled and skilled labour.
Infrastructure and Services	• For pipeline projects, if a settlement falls within a 4km corridor of more than one pipeline project. • For other projects, if a settlement falls within the area of impact of more than one project – up to 10km separation between projects. • Shared access roads through same settlement – ie road used by BTC Project and other projects for access – up to 10km separation between projects.
Community Relations	• For pipeline projects, if a settlement falls within a 4km corridor of more than one pipeline. • For other projects, if a settlement falls within the area of impacts of more than one project - up to 10km separation between projects.
Safety of Residents	• Shared access roads through same settlement – ie road used by BTC Project and other projects for access – up to 10km separation between projects.

For SCP-BTC cumulative impacts, the above criteria were applied conservatively by adding a 1km margin to all the separation distances to allow for modifications to the final route of the SCP during detailed design, since the conceptual route is based on a 2km corridor. The above

separation distances also applied to off Right of Way (RoW) activities such as construction camps and laydown areas.

Based on the relative locations of these developments, the following combination of projects is likely to result in cumulative impacts with BTC:

- construction of the BTC Pipeline and the SCP (including the SCP Custody Metering Station);
- construction of the BTC Pipeline, SCP and Koroglu Dam;
- construction of the BTC Pipeline, BTC Marine Terminal and other developments within a 10km radius of the proposed terminal, comprising Sugozu Power Plant and Sanko Holdings Petrochemical Plant.

These are discussed in more detail in the following sections.

In addition to its use as a screening aid, Table 16.1 has also been used to scope potential impacts. For example, the cumulative impact assessment may look at two projects in combination but would not necessarily look at all the environmental and social aspects. For example, if the projects are further than 10km apart then the only socio-economic aspects worthy of consideration would be employment, procurement and, possibly, infrastructure provision, whereas for a separation of 100m all aspects would be examined for which receptors are actually present. Thus, for example, the cumulative impacts of construction camps are considered for the BTC Marine Terminal and other developments in the area as more than one construction camp falls within a 5km radius of a settlement. However, this overlap does not occur for the BTC Pipeline, SCP and Koroglu Dam and not part of this cumulative assessment.

16.5.2 Existing projects in the immediate vicinity of the BTC Project

The East Anatolian NGP was constructed by BOTAŞ between 1999 and 2001 and commenced operations in September 2001. The NGP transports gas in Turkey from Dogubeyazit to Ankara. As the NGP is in existence, it forms part of the environmental baseline in which the BTC Project will be constructed and was assessed as such in the EIA. Locations and/or circumstances where the existence of the NGP could affect the potential impacts of the BTC Project are reported in the Impact Tables presented in Section 6 and Supplement 1 of the EIA Report.

Similarly, the assessment of the BTC Marine Terminal (see Sections 12 and 13) has taken account of the existing BOTAŞ Marine Terminal and other coastal development in Iskenderun Bay that form the current baseline.

The cumulative impacts assessment reported in this section of the EIA Report therefore focuses on the interaction of the BTC Project and *"**potential** developments that are realistically defined at the time the environmental assessment is undertaken, where such projects and developments could directly impact on the project area".*

16.5.3 Construction of the BTC Pipeline and the SCP

16.5.3.1 Details of the proposed SCP development

The South Caucasus Project involves extracting gas/condensate from offshore deposits in the Caspian and exporting it through the SCP to Turkey, via Azerbaijan and Georgia. Some gas will be taken in Georgia, with the remainder going to users in Turkey via a tie-in to the NGP near Horasan. The gas will be distributed by BOTAŞ. The route corridor of the SCP in Turkey, and its relationship to BTC, is shown in Figure 16.2.

SCP is at the conceptual design stage and this has produced a centreline based on a 2km design corridor. This is viewed as an adequate allowance for altering the route of the pipeline to avoid currently unknown constraints, which could comprise geohazards, ecology, archaeology or social. What this does mean is that SCP's centreline could move up to 1km closer to BTC. This has been allowed for in the screening and scoping exercise described above. Detailed design is yet to proceed and this will lead to a final working corridor. The approximate length of the route in Turkey is 224km. As well as the pipeline itself, there will be a Fiscal Metering Station 1km inside the Georgian border and a Compressor Station at approximately KP40.

The following issues are of relevance to potential cumulative impacts with the BTC Pipeline.

- The construction phase for both will be broadly concurrent (see Table 16.2). This does not mean that BTC and SCP construction will simultaneously proceed in the same direction (the worst case for some potential cumulative construction impacts although the best case for potential seasonal ecological constraints). However, since the detailed construction schedules have not been developed, this cumulative impact assessment assumes the worst case.

- There will be an off-take from the Fiscal Metering Station to supply the BTC pump station (PT1) nearest to the Georgia border. Its construction will be broadly concurrent with that of BTC and SCP.

- Two further off-takes, to supply gas to Ardahan and Kars, will be provided at a later date outside the construction timescale of BTC and SCP.

- Off-takes will comprise small diameter pipelines of 6 to 8 inch diameter. Typically these require a working width of 7-11m depending on such matter as terrain and presence of woodland/sensitive areas.

- On average there is a 20km separation between BTC and SCP.

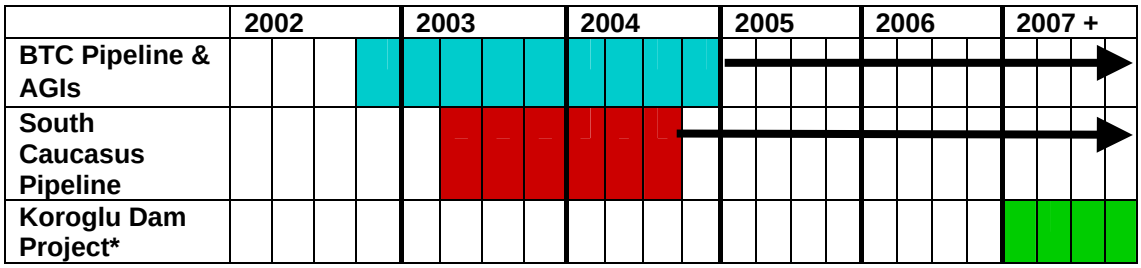
- There are two sections where the routes come especially close together: from the Georgian border to the Fiscal Metering Station and at around KP 104-108, northeast of Kars (see Figure 16.2). The basic principle is to maintain a 250m separation between the final centrelines. Where this is not possible, near the Georgian border, the separation will be at least 30m to ensure that corridors do not overlap.

- The section between the Fiscal Metering Station and the Georgian border will not be constructed concurrently with BTC. This section will be completed to the same schedule as the SCP in Georgia (ie it will follow by one year). Prior to SCP gas being available, flow in the Turkish section of SCP will be in reverse, using gas from the NGP to supply PT1 for BTC operation.

- There will be a single construction contract and construction will most likely be with two spreads (along with work crews at the Fiscal Metering and Compressor Stations). Construction camp locations are some way from being decided but the most likely locations are one at the Compressor Station site near Hanak and another near to Horasan or Sarikamis.

Table 16.2 provides a summary of the schedule details for the BTC Pipeline, SCP and the Koroglu Dam Project (the latter is discussed in Section 16.5.4).

Table 16.2 Summary of Schedule for BTC Pipeline, SCP Pipeline and Koroglu Dam Project



* The construction schedule for the Koroglu Dam has not yet been finalised, but is unlikely to begin within the next 5 years.
** Arrows indicate project operation

16.5.3.2 Cumulative environmental impacts

Introduction

There are only two locations where the two pipelines will run in close proximity (within 2km):

- at the border between Turkey and Georgia (KP0-KP2);
- at the provincial border between Ardahan and Kars (KP104-KP108).

At the border crossing, the distance between the two pipelines has been defined by the BTC Co as 30m. Both pipelines will separate after the Custody Metering Station, located approximately 3km from the border. Hence, there will be a length of approximately 3km of the BTC Pipeline Route, which will be paralleled by the South Caucasus Pipeline. A 4km length of BTC Pipeline runs parallel to the SCP pipeline, separated by a distance of approximately 500m at the provincial border between Ardahan and Kars.

Although known or likely construction camp locations are sufficiently separate to exclude direct environmental cumulative impacts, the planning of materials and labour acquisition, transportation implications and the capacity of services and facilities will be a consideration both within this assessment and within the Contractors' mobilisation planning.

Construction impacts

The main potential cumulative impacts that could occur during construction are summarised in Table 16.3.

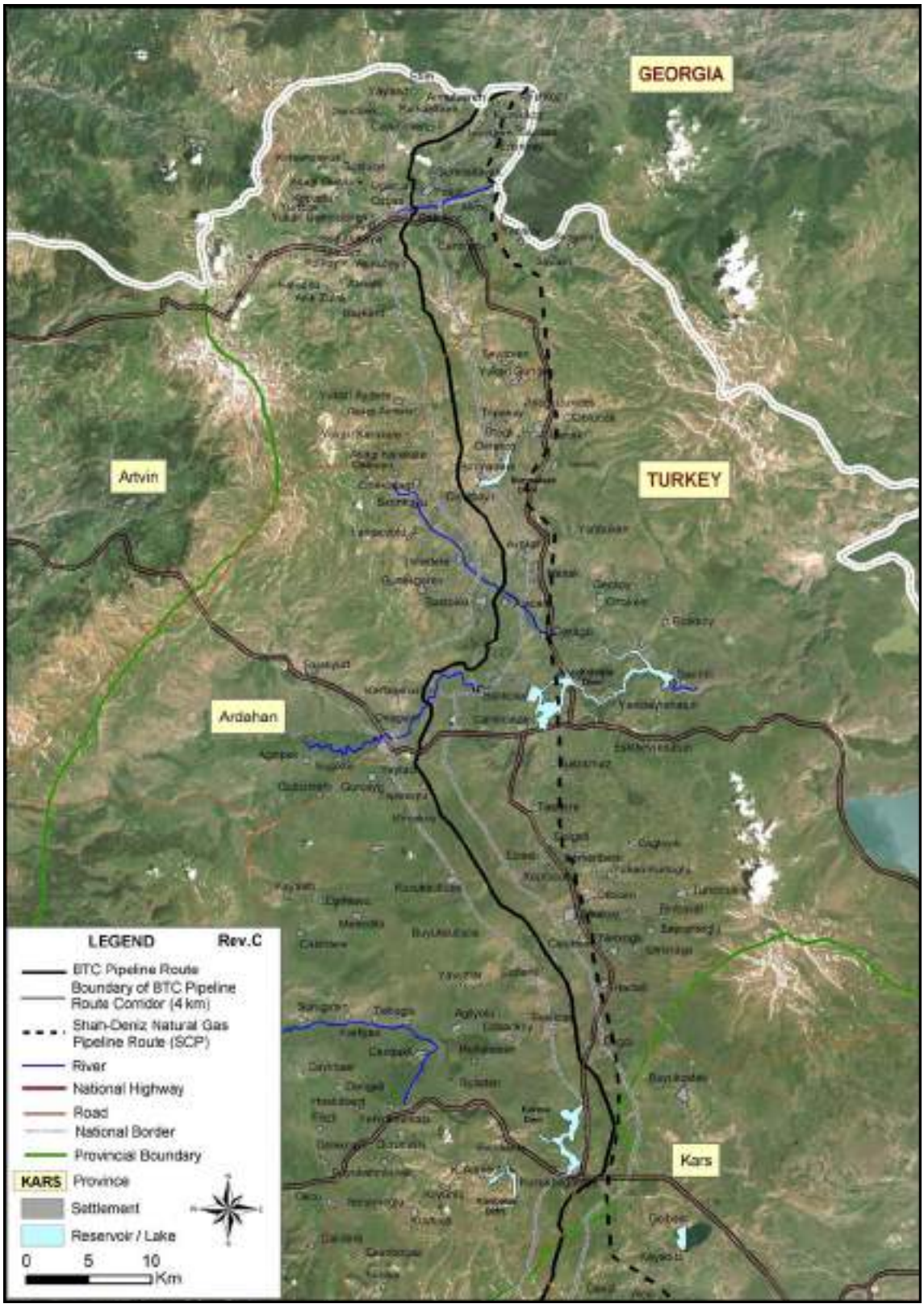


Figure 16.2 Location of BTC and SCP Pipeline Routes

Table 16.3 Cumulative Construction Impacts of the BTC and SCP Pipeline Routes

BASELINE	BTC RESIDUAL IMPACTS	CUMULATIVE IMPACTS
Map Number 1 KP 0-1.89		
Soils Between KP 0 – 2, soils are classed as Mesic Clayey-skeletal to Loamy-skeletal Typic Xerochrepts, are shallow, stony, and have a pale-brown to brown surface.	Where tuff is exposed potential major impacts on soil productivity could result (see also Section 15).	Should SCP expose tuff, leading to reduction in soil productivity, cumulative impacts would be major.
Landscape and Visual From entry point south of the Georgian border, landscape is unremarkable comprising gently rolling hills with market gardens and some grazing land. Field boundaries are well marked with mature hedges and wooden fences and some drystone walls. The route crosses c. 1km of irrigated agricultural land and pastureland. Terrain shows a steady increase of elevation from the Georgian border (elevation 1,232m) to base of mountain ridge about 10km south west (elevation 1,900m). It rises through steeply dissected ridges before becoming more undulating. Landscape sensitivity is relatively low.	Visual impacts will be generally short-term and minor due to the temporary nature of construction activities, though any remaining traces of the route will be visible to the residents of Turkgozu settlement.	Minor on the basis that SCP is reinstated to the same standard as BTC. Cumulative impacts are predicted to be minor.
Ecology Route crosses the Posof Wildlife Protection Area (KP10 - KP15), established primarily for the Caucasian Black Grouse (*Tetrao mlokosiewiczi*), a globally threatened species classified as Data Deficient and also a restricted range species. This section of the route crosses through cultivated land and scattered areas of deciduous forest. This area also supports a range of species including the Eurasian Brown Bear *(Ursus arctos)*.	Short-term disturbance as pipeline passes through only sparsely forested areas.	Where the SCP parallels the BTC Pipeline (ie at a distance of less that 100m) cumulative impacts will be minor, if the seasonal sensitivities and working method constraints adopted by the BTC Pipeline are equally applied to the SCP Project. If the construction activities of the two projects occur concurrently, major cumulative impacts can be expected unless close inter-project co-ordination and management is established. At greater separation distances, moderate cumulative impacts may occur through disturbance to two parts of the Reserve at the same time as refuge options for displaced wildlife would be restricted. It is essential, therefore, that the staggering of works be considered as part of overall joint working and cooperation.

BASELINE	BTC RESIDUAL IMPACTS	CUMULATIVE IMPACTS
Noise The settlement of Turkgozu (KP1) is located approximately 500 m east of the BTC Pipeline and 250 m east of the SCP pipeline. The settlements of Armutveren and Kumlukoz are located approximately 500m to the east of the BTC Pipeline and within 1.5km of the SCP pipeline.	Appropriate mitigation measures will ensure that impacts are minimised. Impacts are anticipated to be minor.	Mitigation measures will include staggered construction and additional mitigation in the form of acoustic screens. Cumulative impacts are predicted to be minor. It should be noted that the major noise impact to the village of Turkgozu would arise from the extended construction period associated with the SCP Custody Metering Station.
Map Number 4 KP 48.7-67.9		
Water Resources Potential impacts to watercourses are limited to the Cotsuyu River, which is crossed by the BTC Pipeline at KP50. The SCP pipeline then crosses the river approximately 5km downstream. The Cotsuyu River is an important ornithological area.	Construction of the river crossing will be avoided between April and the end of July in order to avoid bird breeding season, therefore only resulting in minor impacts.	The SCP crossing is also anticipated to result in minor impacts (assuming appropriate mitigation is adopted). The BTC crossing will not result in any incremental impact.
Groundwater The route passes over an unconfined aquifer (KP50). The same unconfined aquifer is also crossed by the SCP pipeline approximately 10km to the east.	Mitigation measures are designed to prevent significant impacts during construction. As such, impacts are predicted to be minor.	The impacts from the SCP project are also predicted to be minor, therefore overall impacts are predicted to be minor.
Map Number 7 (KPs104-108)		
Soils Sandy-skeletal Cryochrepts occurring on slopes at high elevations and comprising young, shallow soils. They are typically stony and have a pale brown to brown surface. They support upland grassy meadows.	Minor impacts except where tuff is exposed and soil productivity is reduced, in which case Major impacts would occur (see also Section 15).	SCP will double the size of the impact zone. Major impacts will result where tuff is exposed.
Ecology Aygir Lake, a large oligotrophic lake located about 8km east of Buyukbogatepe and c.8.7km west of the route is an important ornithological site supporting Velvet Scoter (nationally-threatened), one of Turkey's rarest breeding birds. The breeding status of these birds on, or around, this lake is unknown, but breeding is possible.	Minor disturbance impacts only will result since the most sensitive area will be avoided.	Although SCP passes closer to the site, cumulative impacts are predicted to be minor
Archaeology and Cultural Heritage Buyuk Bogatepe flat settlement lies within the 100m corridor (north of KP 108). Although no architectural remains were discovered, Roman ceramic shards were found on the surface at this site. This may, therefore, have been a rural Roman settlement. This site has not yet been registered by the MoC and is provisionally assigned the 3rd Degree site classification (see Section 5).	Pre-construction investigations will establish the full extent of the site; however it is currently expected that there will be only minor impacts, which will be restricted to temporary disturbance of the wider setting of the site.	Minor impacts since SCP is further from the site than BTC.

Generally the construction impacts will be minor and manageable. Where there is the potential for congestion and related impacts from construction traffic to settlements near or en route to the two pipelines, construction phasing will be carefully considered in order to minimise disturbance impacts. In particular, the settlement of Turkgozu is located in close proximity to the BTC Pipeline as well as the SCP pipeline and SCP metering station. The BTC Pipeline will be a minor factor in the overall cumulative impact of the three developments and as such, the predominant impact will be managed by the SCP Project.

Both projects will require natural resources, especially water and construction aggregates. Generally the projects are sufficiently separated that water abstraction will be from different watersheds and groundwater zones. The potential for cumulative impacts is, therefore, small.

Both projects are still developing construction aggregate requirements in terms of precise types, volumes and sources. The BTC Project is working on the basis that sites will be licensed and the Project can use the resource at a rate that will not compromise existing users. Should the Project require its own quarries, it will conduct EIAs and make formal applications for approval to the Turkish authorities. On the basis that the SCP operates to a similar standard the scope for cumulative impacts is small.

As well as requiring raw materials/natural resources, both projects will generate construction spoil and various other solid wastes. BTC wastes will be managed within the framework of the Waste Management Plan, but inevitably some wastes will require disposal. Implementation of the management plan sets a requirement that suitable waste disposal facilities will be identified. One criteria for their use is that the volume of BTC waste going to any one disposal location shall not exceed or compromise the capacity of the site.

The objective of this exercise will be to ensure there is no conflict with other users. BTC and SCP are likely to be relatively significant producers of waste and this may raise potential conflicts over waste disposal capacity. This will be addressed through an appropriate degree of collaboration in identifying suitable waste disposal sites.

The one area of Major cumulative impact is to soil. Managing the residual implication of the construction and reinstatement of the pipeline in tuff soils is described in Section 15. Although these impacts will endure beyond the short-term they will be reversible and may eventually be reduced to a Moderate level of impact.

16.5.3.3 Cumulative social impacts

Land ownership and use

There are four points along the BTC Pipeline and SCP routes where land belonging to a settlement will potentially be impacted upon by both pipelines. As highlighted previously, this is calculated based on a 2km radius to the east of the BTC Pipeline and 3km to the west of the SCP. Where this overlap occurs, the following settlements in Ardahan and Kars have been identified:

- In the vicinity of the border crossing, from KP1 to KP5, land belonging to Turkgozu, Armutveren, Kumlukoz, Incedere, Kayinli, Kalkankaya and Eminbey.

- At KP 45-50, land belonging to Avcilar, Hanak and Alaban.

- From KP 85 to KP 110, land belonging to Haskoy, Calabas, Haciali, Cobanli Dagci, Kucukbogatepe and Buyukbogatepe.

- AT KP 225-230, land belonging to Degirmenler and Azab.

Bearing in mind that construction of the BTC and SCP will be broadly concurrent (with the exception of the stretch between the Fiscal Metering Station and the Georgian border), the potential impacts associated with this additional expropriation include:

- larger area of disturbance to agricultural activities;
- creation of uneconomical units of land;
- decreased land productivity due to inadequate restoration measures;
- increased potential for a deterioration in community relations due to dissatisfaction with the land expropriation and compensation process.

However, both projects will be complying with World Bank standards on expropriation and compensation. Their respective land acquisition processes will therefore incorporate measures to address the social and economic impacts associated with land take. Internal and external monitoring will also be carried out, including procedures for addressing any feedback received, where appropriate. The consultation process inherent in these Plans will also ensure full understanding of the expropriation and compensation process, and will allow the affected owners to reach a mutually agreed compensation arrangements. This will assist in mitigating possible tensions associated with this process.

A positive cumulative benefit associated with expropriation for both pipelines is the additional clarification of land tenure status for land without legal title deeds (a common occurrence along the BTC Pipeline route). In order to award expropriation payments, such legal clarification is required. Clarifying land tenure status allows owners to use their land as collateral against which they can loan money to invest in improving their future livelihood. It also helps to prevent future conflicts from arising over land rights. During consultation, numerous land owners/users expressed eagerness regarding the compensation payouts, as this represented an opportunity to depart from low productivity agricultural activities.

Employment and provision of goods and services

Along the length of the BTC Pipeline and SCP, there are a number of locations where settlements fall within the sourcing radius for both pipeline projects. Preferential employment for unskilled labour (for both projects) is, however, most likely to go to those settlements whose land is expropriated by both projects. This is a factor of both distance and international standards of best practice, which encourage companies to maximise benefits to those most affected by a development.

However, numerous settlements meet other criteria for preferential employment for both projects, although the focus is more likely to be on semi-skilled and/or skilled employment. This includes: 1) settlements within a 10km radius of both projects; and 2) settlements within the districts and/or provinces traversed by both pipeline projects.

Other cumulative benefits include increased cash flow into the local economies (and associated knock-on effects) and opportunities for the provision of goods and services. In addition, workers who have experience on more than one project will be more attractive to future employers, and opportunities for training and learning new skills for those employed will be extended. These, together, will have a combined positive impact on the health of the local economy.

Increasing the extent and duration of temporary employment has a number of potential negative cumulative impacts. These include: 1) workers giving up their normal employment (formal,

self-employed or informal) for perhaps higher paid temporary employment during construction of the pipelines, resulting in a possible loss of longer-term livelihoods; 2) wage levels could increase where there is a shortage of labour, making for example the contracting of seasonal cultivators too expensive for local landowners; and 3) increased spending power of employees may temporarily increase the cost of local and regional supplies. These cumulative impacts are not expected to have a significant impact on local settlements.

Infrastructure and services

In accordance with international standards for best practice, measures will be adopted by both the BTC and SCP Projects to ensure that negative impacts to infrastructure and services are prevented or kept to a minimum. This includes: 1) commitments to self-sufficiency (in terms of service provision); 2) restoration measures to ensure that infrastructure, such as roads, are restored to at least their pre-construction condition; and 3) adequate warning for planned disruptions (where appropriate, this will include compensation, as determined in the land acquisition process). However, with projects of this scale it is likely that there will be instances when infrastructure or services are disrupted without notice or prior planning. Settlements that fall within the 'area of impact' for both the BTC Pipeline and SCP are therefore vulnerable to this occurring for both projects, whether simultaneously or staggered over time. This has implications for impacts on livelihoods as well as the cumulative 'nuisance factors' (traffic, noise, dust, disruption to infrastructure, construction workers along the working width etc) and resultant deterioration in community relations for both projects.

As discussed in earlier sections, unplanned disruptions to irrigation channels can have widespread impacts for numerous settlements beyond those located within the area of overlap for both projects. By way of mitigation, the community relations team for the BTC Project will identify all areas where irrigation networks could potentially be impacted by the BTC and Pipeline and SCP. These areas will be flagged for the construction teams and community relations teams of both projects. Specifically, the BOTAŞ CLO will notify authorities of affected settlements regarding occurrence of unplanned disruptions, as well as expected duration of disruption and measures to be taken to rectify incident. A complaints procedure will also be operated to allow for reporting and resolution of any grievances. Where appropriate, compensation will be provided for losses incurred, as determined by the land acquisition process. These settlements will also receive specific focus during the monitoring activities undertaken by the BTC Project.

Safety of residents

Cumulative safety risks during construction could potentially result from shared access roads and associated traffic hazards and from the dangers associated with an open trenching. In accordance with World Bank requirements, BOTAŞ (and the Construction Contractor) will be required to compile and implement a Traffic Management Plan (TMP) that addresses, among other issues, the safety risks associated with the construction traffic for the SCP. However, the mitigation measures included in the BTC TMP and Community Safety Management Plan are considered sufficient to address the cumulative traffic hazards of both projects.

Once the access roads for the SCP have been identified, the community relations team for the BTC Project will identify those areas of overlap and ensure that the affected settlements receive the required safety awareness training including specific meetings for women and children. This is particularly important in areas not accustomed to heavy traffic loads. These areas will be flagged for the construction teams and community relations teams of both projects. These settlements will receive specific focus during the monitoring activities undertaken by the Project.

In areas where the working widths of both pipelines are within 500m of one or more settlements, protective barrier fencing (sufficient to impede young children) will be erected along the full length of the relevant sections of trenches. Settlements within this area of potential impact will also be targeted for safety awareness training. In areas of danger to livestock, stock-proof fencing will be erected.

Community relations

As already highlighted in this section, a deterioration in community relations could occur as a result of the cumulative impacts associated with the BTC Pipeline and SCP. This would most likely be a result of: 1) dissatisfaction with the land expropriation and compensation process; 2) cumulative nuisance factors; and 3) unmet expectations regarding employment.

The cumulative employment associated with the BTC Pipeline and SCP is expected to increase the number of people employed and thus, the extent to which expectations are met. However, in instances where settlements (or individuals) in these 'areas of overlap' do not gain employment (or their expectations are not fully met), the potential exists for high levels of frustration and resentment towards those who succeed in getting jobs, and also towards the Project. This cumulative impact will be mitigated in part by the Employment Strategy for the BTC Project. This includes procedures for widespread publication of the extent and duration of employment opportunities, including notification of the priority to be given to project affected settlements. It is intended that this will assist in ensuring realistic expectations regarding employment on the BTC Project.

16.5.4 Construction of the BTC Pipeline, SCP and Koroglu Dam

16.5.4.1 Details of the proposed Koroglu Dam

The proposed Koroglu Dam is located within Ardahan province, approximately 8km east of the BTC Pipeline (in the vicinity of Kartalpinar) and is intersected by the SCP (see Figure 16.3). The dam is part of the Kura Project initiated by the General Directorate of State Hydraulic Works (DSI), the aim of which is to provide electricity to the region and to form a series of irrigation water reservoirs. The project will produce 443.4 GW of electricity annually and is predicted to increase crop yield in the Ardahan Plain.

The construction of Koroglu Dam will require the expropriation of 138ha of land. This is comprised of 2ha of residential land, 68ha of agricultural land and 68ha of forested land. Four settlements will require resettlement: Cayagzi, Altas, Balikcilar and Olcek. No date for construction (and thus resettlement) has yet been set, although it is unlikely to begin within the next five years (see Table 16.6for schedule summary).

The proposed location for the construction camp is within the dam area that will later be submerged. It is likely that the camp will be located near the dam wall, in the vicinity of Sevimli settlement. No additional access roads will be constructed for the Project. The Ardahan-Posof road, and local settlement roads will be used for construction vehicles. The project is expected to source unskilled labour from 'local settlements', although the specific sourcing areas and employment totals have not yet been defined.

16.5.4.2 Cumulative environmental impacts

The scope for cumulative impacts from the SCP and BTC Pipelines and the Koroglu dam is small as a result of the following factors:

- the BTC Pipeline is located approximately 8km west of the Koroglu Dam Project and the SCP;
- the construction phase of the pipelines will not overlap with that of the dam.

As such, no cumulative environmental impacts are anticipated.

16.5.4.3 Cumulative social impacts

Land ownership and use

Cayagzi is the only settlement that has land that will be intersected (and expropriated) by all three developments. In addition: 1) Cayagzi is one of four settlements that are due to be resettled for the construction of the Koroglu Dam; 2) Cayagzi falls just within the 2km radius of the BTC Pipeline; and 3) Cayagzi is directly adjacent (or dissected by) the centreline for the SCP. The significance of the associated cumulative impacts Cayagzi depends on the timing of the resettlement process. Currently, resettlement and construction of the Koroglu Dam has not yet been initiated. Should it occur *after* the construction of the BTC Pipeline and SCP, Cayagzi will experience expropriation of land twice prior to its actual resettlement. However, should resettlement occur *prior* to the expropriation activities for the pipelines, cumulative impacts will not occur, as resettlement will be a once-off activity and all land belonging to Cayagzi (including that required by BTC and SCP) would have been compensated for as part of the Koroglu Dam expropriation process.

However, assuming a worse case scenario, Cayagzi could potentially undergo expropriation activities for all three projects. Although a stringent expropriation and compensation process is expected to be applied to all three projects, there are a number of impacts that cannot be easily mitigated against. These include: 1) social disturbance and upheaval associated with consecutive expropriation processes; 2) impacts on levels of livelihoods due to decreasing land available for agriculture and limited alternative forms of livelihood (the potential for squandering of accumulated compensation therefore exists); and 3) anxiety and tensions developing within the Cayagzi, particularly if resettlement for the dam is authorised, but the date remains uncertain. These potential impacts could result in a highly sensitised population less tolerant of the nuisance factors normally associated with large-scale developments. The potential for outbursts is obviously heightened when a settlement is the recipient of nuisance factors (noise, dust, traffic congestion, disturbance from construction workers, unplanned disruptions) associated with three such projects. This scenario could have an impact on community relations for all three projects.

In order to manage the possibility of tensions developing, the community relations teams for the BTC and SCP projects will need to pay specific attention to Cayagzi. This will need to include regular briefings regarding construction activities, safety awareness meetings, opportunities for constant community feedback regarding concerns and suggestions for improvement, and implementation of measures to address unplanned disruption to infrastructure and services. These efforts will only be required if resettlement of Cayagzi occurs *after* the construction of the BTC Pipeline and SCP.

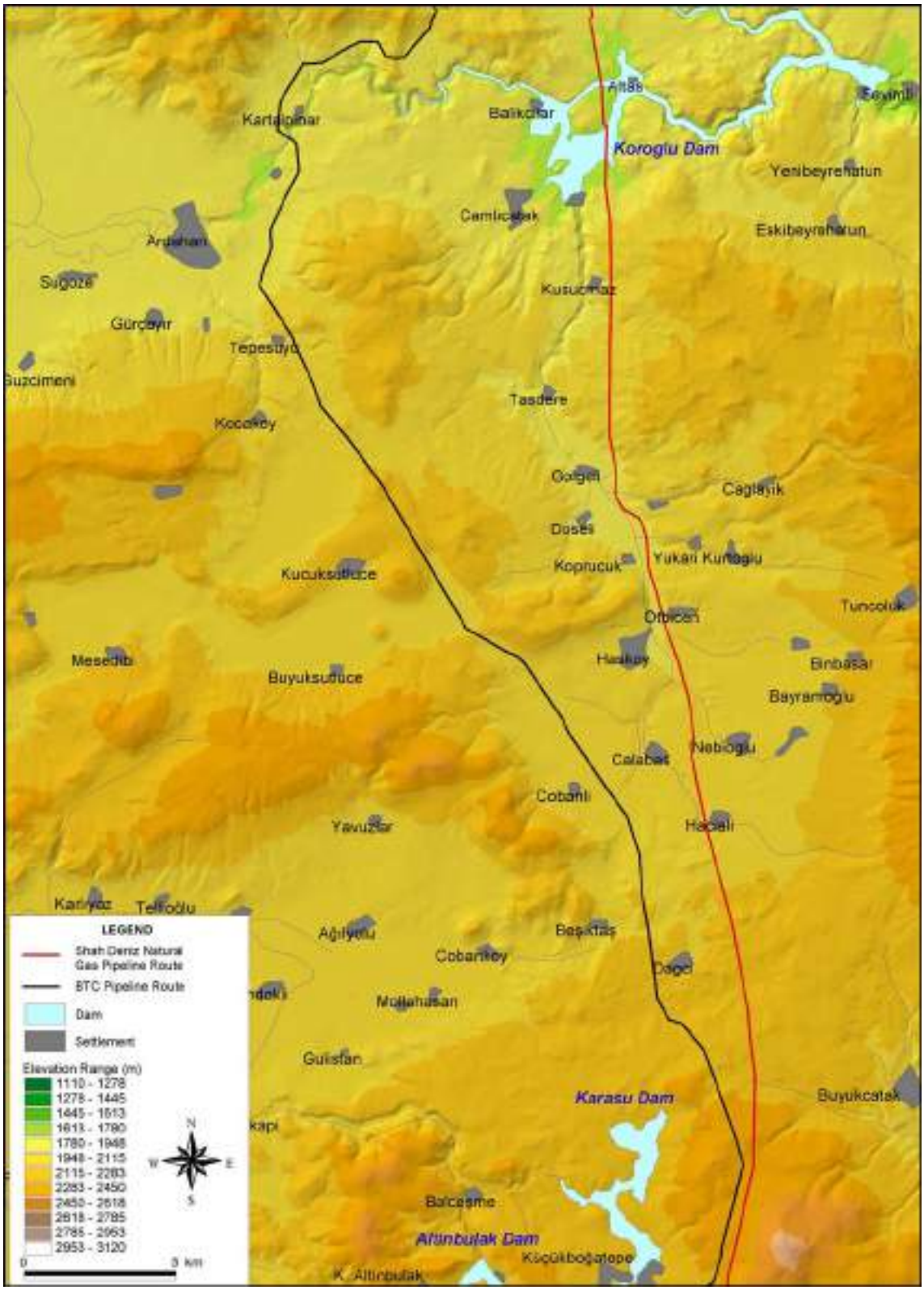


Figure 16.3 SCP (Shah Deniz) Pipeline and Koroglu Dam

Employment and provision of goods and services

Based on an assumed 'sourcing radius' of 10km for unskilled workers, local residents within settlements affected by the BTC, SCP and Koroglu Dam theoretically fall within the sourcing radius for all three projects. This excludes settlements to the east of the SCP, as these fall outside of the BTC sourcing area for unskilled labour. However, Cayagzi is the only settlement that is impacted by all three developments and which falls within the BTC priority area for unskilled labour[1]. Although this settlement thus stands to benefit from cumulative employment opportunities, Cayagzi is due to be resettled outside of this priority area. However, delayed resettlement could result in residents from this settlement securing employment with BTC and SCP projects. Similarly, other dam-affected settlements, which fall within the priority area for semi-skilled and skilled labour (ie Cayagzi, Altas, Balikcilar and Olcek) will also potentially be relocated outside of this 'sourcing radius'.

There are a number of settlements that fall within the expected priority areas for semi-skilled and skilled labour for all three projects (ie intersected districts and provinces) and will therefore potentially benefit from cumulative employment within the broader Project area. Cumulative opportunities for semi-skilled and skilled labour as well as provision of local goods and services are also likely to be experienced on the district and provincial level.

16.5.5 The BTC Pipeline, BTC Marine Terminal and other developments within the vicinity of the proposed terminal

16.5.5.1 Details of the proposed developments

Proposed future developments within a 10km radius of the proposed BTC Marine Terminal are shown on Figure 16.4. Briefly, each development comprises the following:

- **Sugozu Power Plant:** The Sugozu Power Plant is a 1,210 MW low sulphur imported coal fired power plant. Construction of the plant began in November 2000 and is expected to last for approximately three years. The commissioning of the plant is currently planned for November/December 2003. Key facilities include a 600 m jetty for the import of coal from vessels. The jetty is near completion. During the operational phase, the passage of vessels, excluding the tankers, will be prohibited with an exclusion zone of 0.6km^2 (60ha). The construction of the on-shore facilities required the expropriation of approximately 728ha of agricultural land pertaining to Sugozu.

  During the construction phase, a maximum of 4,500 to 5,000 people will be employed, fifty percent of which are from Adana province, and of this, 150 employees are from the surrounding settlements. Non-local employees live in a dormitory near the construction site (Yumurtalik Municipality, 2002). During operation, 250 personnel will be employed. Most of the materials required for construction will be sourced from Adana province. Water demand during the construction phase will be met from existing surface water resources, and from the sea during operation.

[1] The priority areas for sourcing of unskilled labour for BTC pipeline construction and operation is defined as follows.
- Settlements with land that is intersected by the pipeline.
- Settlements that have occupied residences within 500m of the pipeline route
- Settlements within 5km of a main construction camp.
- Settlements within 1km of a construction site (accessible by foot during the working day).
- Settlements that will experience a substantial increase in traffic loads.

- **Sanko Petrochemical Plant:** The proposed industrial complex for petrochemical products will be constructed by SANKO Petrochemical Products Ind. Trade Inc. The plant is located approximately 4.8km west of the proposed BTC Marine Terminal. Although start of construction was initially planned for 1999, this has not yet been realised. The plant will produce raw material for plastics namely, ethylene, propylene, polypropylene, polyethylene granular. Key facilities include a 900m jetty for the transportation of the raw materials produced. During operation of the jetty, an exclusion zone for the safe operation of jetty activities is expected to be enforced. The total extent of this exclusion zone is unknown, although it will cover a minimum area of 1km^2 (100ha).

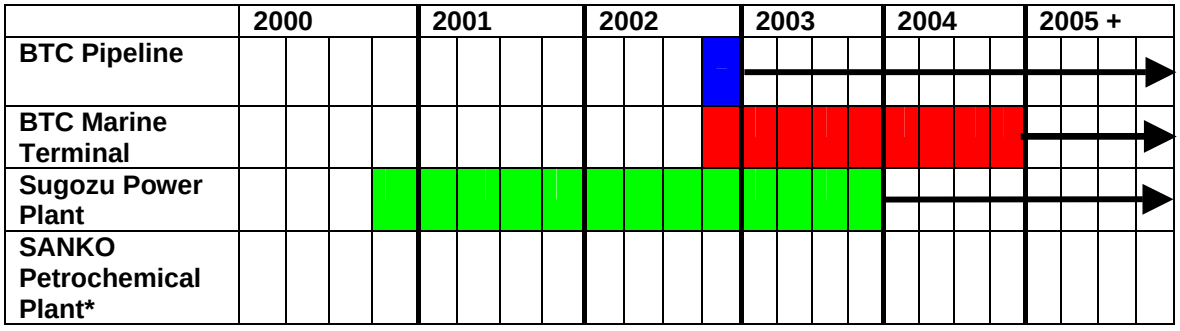
  The total area of land required for the plant is 94ha. This requires the expropriation of 50ha of agricultural land, although it was reported in the EIA to be of poor quality. Residents from Golovasi were among those affected by this expropriation.

  No construction camp is anticipated. All workers are to reside within nearby residential areas (eg Yumurtalik district centre or surrounding settlements). A total of 350 workers will be required for the construction phase and 650-700 workers for the operational phase. Employees will be sourced from settlements most affected by the Project. Thus, residents of Yumurtalik district centre and Golovasi will be prioritised.

  An access road off the Yumurtalik-Ceyhan main asphalt road will be constructed to the site. The length of the road will be approximately 8km. Approximately 34kV of electricity will be generated by the site for its own use. Wastewater treatment plants will also be established for the operational phase. Collection of solid wastes is to be carried out by Yumurtalik Municipality.

The construction and operational schedules for these developments, relative to the BTC Project, are illustrated in Table 16.4.

Table 16.4 Construction and Operational Schedules for Sugozu Power Plant, Sanko Petrochemical Plant and BTC Project



* The construction schedule for the Sanko Petrochemical Plant is currently on hold, reportedly for financial reasons. The EIA Report has however, been approved by the Ministry of Environment.

** Arrows indicate project operation

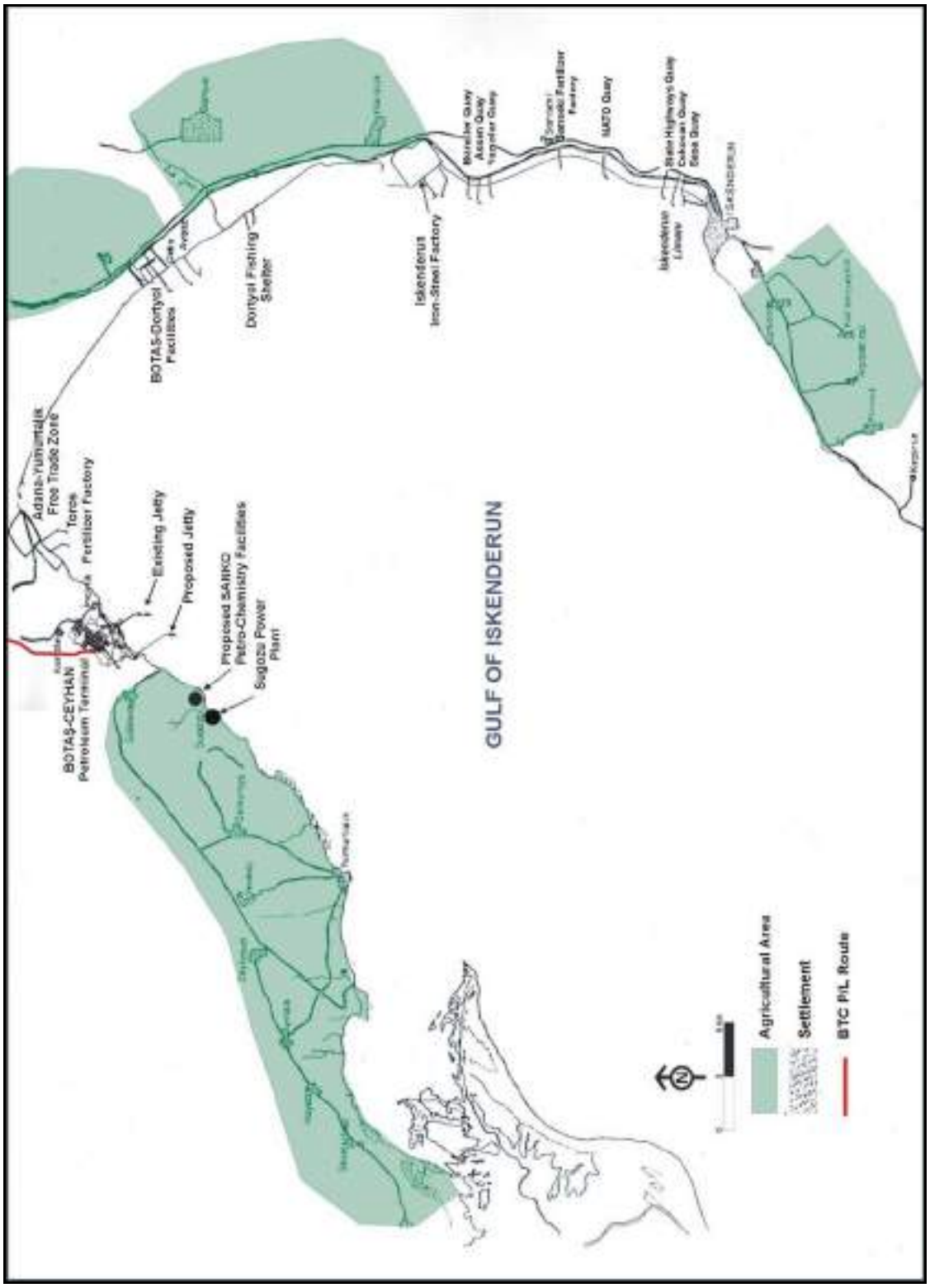


Figure 16.4 Proposed Future Developments Within the Marine Terminal Area

Based on the spatial criteria described in Table 16.1 (with the exception of marine ecology for which a much wider spatial criterion has been used) and project schedules identified above, a number of environmental and socio-economic cumulative impacts are expected. These are discussed in the following sections.

16.5.5.2 Cumulative environmental impacts

Air quality

Emissions of potential concern, from a cumulative impacts perspective, will primarily comprise NO_x and VOCs. Air quality dispersion modelling was undertaken and has considered the potential impacts of all combined sources of emission (see Section 12 and Appendix B2).

The Sugozu Power Plant, which is currently under construction, will be the largest NO_x emitter (93.8%) in the Project area (ie northern end of Gulf of Iskenderun). In addition, local traffic will contribute to total NO_x emissions. The Sanko development is a likely future emitter of NO_x. The BTC Marine Terminal (EGF flare and vessel emissions) will produce approximately 78 te yr NO_x which will constitute less than 0.5% of the total NO_x emissions in the Project area. As such, the scope for cumulative impacts by the addition of the BTC Project is small.

However, if the criteria established in Section 3 for assessing air quality impacts are applied, the worst case annual average ground level NO_x concentration is predicted to be less than 50% of the equivalent EU NO_x standard (annual average concentrations range from 6.9 to 18μg^{-3} against the EU Standard of 40μg^{-3}). As such, the combined emissions from all sources constitute a Minor (<70% of Environmental Assessment Level or 'EAL') impact to long-term ambient air quality.

The existing BOTAŞ crude oil loading facility is the largest VOC emitter in the area comprising 88% of total VOC emissions. In addition, local traffic will also be a source of VOCs along with the future development of the Sanko project. The Sugozu Power Plant can also be expected to emit significant quantities through incomplete combustion. The proposed BTC Marine Terminal will emit a total of 240 tonnes of VOC per year, which constitutes approximately 7% of the total VOC emissions anticipated in the area.

Since the predicted 95th percentile hourly groundlevel concentration of VOC emissions currently exceeds the Turkish Standard on occasions (up to 824μg^{-3} against the Turkish Standard of 140μg^{-3}), the predicted cumulative emissions of VOC constitute a Major environmental impact. It should be noted, however, that the contributions from the proposed BTC Marine Terminal itself constituting a Minor impact only, comprising less than 25% of the EAL.

VOCs and NO_x combine to form tropospheric ozone under certain conditions. While this is a potential problem in the Bay of Iskenderun area, emissions of NO_x and VOCs from the BTC Marine Terminal are dwarfed by those from other local sources; the BTC Marine Terminal will not, therefore, make a substantial contribution to this potential impact to air quality. If there is a cumulative impact to trophospheric ozone, the significant contributors to such a problem will be the existing BOTAŞ facility and the Sugozu Power Plant.

A strategy has already been adopted by the BTC Marine Terminal to minimise VOC emissions and the flare is predicted to meet the NO_x standards. As a result, while the BTC Marine Terminal will make a small incremental contribution to cumulative air quality impacts, that contribution has already been mitigated as far as is reasonably practical.

Construction traffic

At this stage in the planning of the BTC Project, it is not possible to state which roads will be used by construction traffic and hence it is not possible to assess whether there will be any interaction with construction traffic associated with the Sugozu Power Plant. However it is reasonable to assume that the majority of heavy goods vehicle movements (the main source of potential traffic impacts) for the power plant will have diminished substantially by the time that the BTC Marine Terminal construction commences.

The Contractor for the BTC Pipeline Project will be required to formulate a Traffic Management Plan and this will take account of any interaction with the Sugozu Power Plant construction traffic.

Water Resources, Construction Aggregates and Solid Waste

Resource use and waste management all raise potential cumulative impact issues given the ongoing and likely future scale of development on the Gulf of Iskenderun. Much the same issues will result as described in section 16.5.3.2 above, and will require much the same management responses.

Shipping and navigation

The BTC Marine Terminal will be one of several that will add to the degree of marine transport movements into and out of the Gulf of Iskenderun. Lack of data on both the baseline and the other developments precludes any meaningful consideration or quantification of cumulative impacts (including added collision risk) of these developments. However, BOTAŞ has committed to a shipping risk study and this will also consider new proposed developments in the Gulf (see also Oil Spill Risk below).

Oil Spill Risk

Loading of oil at the BTC Marine Terminal Jetty and its transport on tankers out of the Gulf of Iskenderun will add to an existing level of risk in this area of the north-eastern Mediterranean. The incremental level of risk increase will be a function of increased marine traffic and increased inventory of oil. The BTC Project is addressing this risk in two ways.

- As part of the BTC Project Oil Spill Response Plan (see Appendix C6) a tier one response capability will be maintained at the BTC Marine Terminal. The equipment would be able to deal with a typical loading spill (the most likely spill event, see Section 14). It would also be available to make up a local tier two response in the event of a third party spill. The provisions of the OSRP largely mitigate the incremental increase in risk of oil spill due to the BTC Project.

- A marine traffic study will be undertaken to gain an understanding of vessel movement in and out of the Gulf of Iskenderun, and whether there are any currently unknown navigational risks (which in turn could increase spill risk).

Marine Ecology

The Gulf of Iskenderun in general is seeing an increased level of industrialisation around its coastline, of which the BTC Marine Terminal is one development. Each development can incrementally increase impacts to marine ecology in general through habitat loss and degradation and impacts to water and sediment quality.

Although the most important coastal area of nature conservation value (Yumurtalik Lagoons Nature Reserve) is protected, there are still valuable areas outside this, including beaches used by marine turtles to lay eggs. The BTC Marine Terminal will contribute to these problems in only the most minor of ways since, for example:

- it will not occupy sandy beach habitat;
- it has no substantial wastewater discharge to the marine environment;
- the area of seabed habitat affected has no intrinsic conservation value;
- the causeway and jetty structures will provide new habitat substrate and shelter for fish and other organisms.

However, the project will have provision for an Environmental Investment Programme and opportunities, such as marine turtle conservation, will be sought to participate in and contribute to future programmes in the Gulf.

Other environmental issues

The new pipeline will add to the existing landscape and visual impacts of the inadequately reinstated RoW of the NGP for those sections where the two pipelines share a common alignment. Similarly, the construction of the SCP and the BTC Pipeline could potentially give rise to Major, localised short-term cumulative impacts. However, the commitment to rehabilitate and reinstate sections of the NGP will ensure that the cumulative impacts in the longer-term are likely to be beneficial to the visual amenity of the landscapes through which the two pipelines pass. Similarly, close coordination and cooperation between the BTC and SCP project teams would provide a means of ensuring that cumulative construction related impacts are minimised and that the longer term cumulative landscape and visual impacts are Minor. The existing industrial landscape within which the BTC Marine Terminal is to be developed will accommodate the new facility to a far greater degree than would have been the case if the Marine Terminal were to have been located within a largely undisturbed landscape. The cumulative implications of the additional structures form the basis of the impact assessment presented in Section 12.

There are several areas where the combined noise from the parallel construction of the BTC and SCP projects may give rise to localised, short-term Major cumulative impacts. In particular, the settlement of Turkgozu (KP1) is located approximately 500 m east of the BTC Pipeline and 250 m east of the SCP pipeline. The settlements of Armutveren and Kumlukoz are located approximately 500m to the east of the BTC Pipeline and within 1.5km of the SCP pipeline. Jointly implemented mitigation measures will include staggered construction and additional mitigation in the form of acoustic screens and, as a consequence, cumulative impacts are predicted to be minor.

16.5.5.3 Cumulative social impacts

Construction camps

Construction camps and the associated workforce have the potential to result in a number of impacts, both positive and negative, for local residents. However, based on the potential areas of impact of construction camps[2], any cumulative impacts associated with the identified projects

[2] The potential areas of impact of construction camps are considered to be as follows: 1) settlements that fall within a 5km radius of the construction camps and are therefore accessible on foot from the camp; and 2) settlements located within driving distance (assumed to be within a one hour car journey) of the construction camps.

pertain to settlements within driving distance of the construction camps for each of these developments. This is due to the fact that no settlements fall within a 5km radius (ie walking distance) of the BTC construction camp and one or more of the other identified developments.

The larger towns/district centres which have the potential to attract construction staff for purchasing of supplies, entertainment etc include: Ceyhan, Yumurtalik and Adana. Settlements such as Sahil Sitesi and Incirli could also benefit from increased expenditure due to the popularity they already enjoy as tourist destinations. In terms of the specific projects under assessment, this cumulative benefit will occur over an approximate duration of 15 months (the period during which the construction of the BTC Project and Sugozu Power Plant overlap) resulting in an extended duration of employment for construction workers in the area. Given that these identified settlements are either district centres or existing tourist destinations, it is anticipated that they will be able to effectively absorb any supply or service demands placed on it by the visiting workforce.

Land ownership and use

The Iskenderun Gulf area has been identified as an industrial zone, evident in the increasing number of existing and planned developments within a 10km radius of the proposed BTC Marine Terminal, as well as elsewhere along the Iskenderun coast (see Figure 16.4). On completion of three of the planned developments (Sugozu Power Plant, Sanko Holdings and the BTC Terminal), there will be a total of six jetties within a distance of 15km. Each of these jetties will have exclusion zones within which fishing activities and the transit of local vessels will be prohibited. This will result in an overall decrease in the size of the fishing grounds available to local fishermen.

Although the Iskenderun Gulf has experienced a decrease in fish stock since the early 1980s, with current fish stock reported to be low[3], households still depend on fishing as a main source of income. This is due, in part, to limited alternative forms of livelihood (few opportunities for wage labour and low land availability) and the role fishing plays as a 'way of life'. Thus, any further restriction on access to fishing grounds is expected to further undermine the viability of fishing as a source of livelihood. This, in turn, will have implications for people's ability to maintain their existing levels of livelihood.

Although increased opportunities for wage labour is a definite benefit of industrialisation, local residents do not necessarily have the skills needed to gain employment. The concern therefore remains that affected residents will not be able to replace their lost sources of livelihood. Furthermore, opportunities for wage labour are also likely to benefit the younger generation (who are more likely to be able to make the transition from one form of livelihood to another) but does not address the loss of fishing as a way of life, or benefit people in middle age and over.

Industrialisation will also require further expropriation of land for on-shore developments. Golovasi and Sugozu, both within a 10km radius of the BTC Marine Terminal, have had land expropriated for the Sanko Petrol Chemical Plant and Sugozu Power Plant respectively. Although compensation will have been provided, concerns regarding the ability of affected households to secure a long-term livelihood remain. This is due to limited alternative forms of subsistence livelihood and the uneven distribution of land characterising the broad Project area, which could be accentuated by land expropriation.

[3] According to the local authorities and fishermen, the Iskenderun Gulf has a decrease in fish stock, due to increase environmental pollution, trawling and over fishing.

By way of response, the Project has committed to assisting in the acquisition of appropriate transferable skills within neighbouring settlements, thereby maximising the potential for securing employment within the wider Project area. A procedure for compensation will also be developed and targeted at registered fishermen who incur a loss of livelihood as a result of the construction and operation of the BTC Marine Terminal. In keeping with World Bank requirements, the compensation process will include procedures for internal and external monitoring, as well as measures for addressing any feedback received. Furthermore, the Project will implement a Community Investment Programme and Social Investment Strategy in order to bring sustainable benefits to settlements most affected by construction and operational activities. However, such efforts will fall short of addressing the cumulative impacts of industrialisation in the Iskenderun Gulf areas, the overall development and associated planning is considered to be the responsibility of the Turkish Government and relevant provincial/district authorities. The impacts of cumulative industrialisation will however be mitigated, in part, by increased opportunities for wage labour in the Iskenderun Gulf area.

Employment and provision of goods and services

Based on an assumed 'sourcing radius' of 10km for unskilled workers, local residents neighbouring the four identified developments[4] theoretically fall within the sourcing radius for all four projects. However, the cumulative impacts of direct employment of unskilled workers is likely to be restricted by the BTC policy on employment of project affected residents[5]. As a result, those settlements that fall within the 10km 'sourcing radius' but who are not included in the BTC priority areas, will not be given preference as unskilled workers on the BTC Project. However, these settlements do fall within the BTC priority areas for semi-skilled workers (ie within Yumurtalik and Ceyhan district and Adana province) and for skilled workers (ie within Adana province and Turkey) and will therefore potentially benefit from cumulative employment within the broader Project area.

Residents from Golovasi, by virtue of their status as project affected residents for both BTC and Sanko Petrochemical Plant, stand to benefit from preferential employment for both projects. Due to the sequential timing of the construction phases, these employment benefits will be extended over a period of almost four years.

Other indirect cumulative benefits include increased cash flow into the local economies (and associated knock-on effects) and opportunities for the provision of goods and services. In addition, workers who have experience on more than one project will be more attractive to future employers, and opportunities for training and learning new skills for those employed will be extended. These benefits, together, will have a combined positive impact on the health of the local economy.

Infrastructure and services

The EIAs undertaken for each of the four projects reported that no significant impacts to infrastructure and services will incur as a direct result of the respective projects. Where local infrastructure and services are not sufficient to meet additional demands, all the projects have committed to being self-sufficient, both during construction and operation. This will be controlled, in part, by the relevant permitting requirements that apply to projects of this scale.

4 The BTC Pipeline (most southerly portion) and BTC Marine Terminal are counted as two separate projects for the purposes of the cumulative assessment.

5 Priority to be given to residents of directly affected settlements where these are defined as follows:

- settlements of Golovasi / Sahil Sitesi, Karatepe and Incirli.
- settlements that experience a substantial increase in traffic loads.
- settlements within a 5km radius of the construction camp (in the case that workers are not housed in an urban centre or within BOTAŞ property).

A policy of restoring or compensating for any damage incurred to local infrastructure is also expected to be enforced for all four projects.

However, with increased industrialisation in the Iskenderun Gulf area, a gradual in-flow of people is expected as job opportunities increase. Any impacts that this causes will depend on whether the broader Project area is able to provide the necessary infrastructure, services and resources needed for the new population totals. An overview of conditions in the vicinity of the four identified projects indicate that the existing services and resources are not sufficient to meet the needs of either the current or additional populations. In the absence of mitigation, this could potentially impact on the levels of livelihood of existing residents.

Although the BTC Project have committed to measures aimed at discouraging in-migration to settlements neighbouring the BTC Project (eg through wide publication of their employment strategy), this will not curtail a general influx of job-seekers to the broader Project area.

Safety of residents

Based on the current road network within the broad Project area, the Sugozu Power Plant, Sanko Petrol Chemical Plant and the BTC Terminal will all use the same access roads. These are the Yumurtalik-Ceyhan main asphalt road and the state road connecting Ceyhan and Adana district centres. Common use of local roads is currently unknown. However, any potential cumulative impacts associated with road use (eg safety risks and traffic congestion) will be mitigated by the sequential timing of the construction phases. Although traffic loads will be staggered, these roads (and neighbouring settlements) will be subjected to a longer duration of traffic disturbance. The significance of this needs to be assessed within the context of on-going industrialisation in the Iskenderun Gulf area. Local and main roads will thus be subjected to increasing construction and operational traffic from numerous developments within the broad Project area.

The community relations team for the BTC Project will ensure that settlements subject to increased traffic loads as a result of the BTC Project will receive safety awareness training and community briefings regarding construction activities. These briefings could raise sufficient traffic and safety awareness among settlements along these shared access roads. In addition, the BTC Project will compile and implement a TMP that addresses, among other issues, the safety risks associated with the construction traffic for the BTC Project.

Community relations

A deterioration in relations between the settlements and neighbouring projects, as a result of cumulative impacts associated with all four projects, could potentially occur. This would most likely be a result of the cumulative loss of access to fishing grounds, in the absence of job procurement or alternative sources of subsistence livelihood.

Each project has settlements within their area of impact that reported a reliance on either fishing or agriculture as a source of livelihood. The community relations teams for the BTC Project will monitor the success of mitigation measures designed to address any loss specific to their development. Similar commitments from the other developments would be beneficial. Following completion of the additional fisheries study currently underway, compensation measures may be awarded to affected fishermen. Procedures for internal and external monitoring associated with compensation related impacts will be implemented.

Although the cumulative impacts of industrialisation are not the responsibility of the BTC Project, it is strongly advised that, in the interests of on-going community relations, attitudes to

cumulative development will be included in the monitoring of community attitudes undertaken by the BTC community relations teams. Where negative attitudes are noted, mitigation measures that focus on cumulative impacts will be considered. This includes for example, joint partnering initiatives with government, other companies and civil society in the Iskenderun Gulf area in order to address the cumulative impacts of industrialisation.

16.6 SUMMARY OF CUMULATIVE IMPACTS

The assessment of cumulative impacts has assessed the potential for the combined effects of existing projects, the proposed project and anticipated projects to impact at the global, regional, national and local level.

At the global level, the Project's contribution to greenhouse gas emissions will occur primarily during operation, when the BTC Project in Turkey would contribute approximately 0.0016% to global anthropogenic emissions of greenhouse gases. At a regional level, the BTC Project, together with the wider ACG and South Caucasus Project, will provide significant developmental benefits to the economies of the region. A proportion of these benefits would accrue to Turkey.

At the national and local level, cumulative impacts are likely due to the parallel development of the BTC, the SCP and other planned infrastructure projects, including the Koroglu Dam and the proposed Sugozu Power plant. At a national level, considerable socio-economic benefit is expected from the inward investment and potential revenues associated with these developments, whilst the application of Turkish environmental and planning control legislation are viewed as providing appropriate mechanisms for mitigating and monitoring any potential negative impacts that might accrue.

At the local (route) level, there exists significant potential for cumulative impacts to arise at specific locations where BTC construction activities are scheduled to take place in proximity to those associated with the SCP. Similarly there are a number of potential cumulative impacts with other development around the Gulf of Iskenderun. To some extent these impacts will be mitigated by the measures already described in this report. Some cumulative impacts will require additional measures. These are summarised in Table 16.5 below.

Table 16.5 Summary of main cumulative impacts and their management

IMPACT	MANAGEMENT
BTC and SCP in combination	
Ecology of Posof Forest	Consideration should be given to the timing and feasibility of constructing either in different years or to stagger work (eg one spread moves south to north and the other north to south).
Groundwater abstraction (if it is required from the same aquifer)	Consideration to be given to ensure that the aquifer can sustainably supply both projects' needs without impacting other users.
Construction aggregate resources and quarries	Consider the requirements and how these will be met from existing and, potentially, from new sources in a way that does not impact other users.
Solid waste disposal	Review volumes and types of wastes arising and where they will be disposed in relation to SCP. This will allow possible existing capacity problems to be identified at an early stage and alternatives to be examined.
Employment and provision of goods and services	Respective employment strategies should be consistent, where appropriate, and feasible. Similar strategies will assist in preventing resentment due to perceived or actual inequalities in the respective strategies.
Infrastructure and services	To review respective requirements (with regulatory input). This will allow possible existing capacity problems to be identified at an early stage and alternatives to be examined.
Safety of residents	Recognition for raising awareness with regard to the two projects among affected settlements and minimising associated risks.
Community relations	Identify aspects of the projects most likely to put strain on relations with local residents. Procedures for managing these aspects to be agreed upon. Likely areas include expectations regarding employment, the compensation process, construction activities and associated nuisance factors. Establish a procedure whereby any grievances or suggestions for improvements submitted by local residents are forwarded to the respective project representatives and dealt with accordingly.
Note: BOTAS will be responsible for the construction management of both the BTC and SCP projects in Turkey. Consequently, cooperation between the two project departments will facilitate project understanding and aid in the mitigation of the above potential cumulative impacts.	
BTC, SCP and Koroglu Dam	
Land ownership and use	Develop an approach for dealing with cumulative impacts relating to the settlement of Cayagzi. In particular, coordinated community relations activities are recommended, as well as strict enforcement and monitoring of measures to address nuisance factors such as traffic, noise, dust, unplanned disruptions etc). Any grievances or suggestions for improvements submitted by local residents are forwarded to the respective project representatives and dealt with accordingly.

IMPACT	MANAGEMENT
Employment and provision of goods and services	Cognisance of the employment of local residents affected by the three projects.
BTC Terminal, Sugozu Power Plant and other major local construction programmes	
Water use, aggregate sourcing and waste disposal	Investigate sustainability of resource with respect to other projects.
Construction traffic	Development of the BTC Traffic Management Plan will entail recognition of other construction programmes in the area, in the course of which potential transport problems jointly raised by the projects (eg road congestion, road improvement needs) should be assessed and acted on.
Operational air quality	Possible cumulative air quality problems include VOC breach of local air quality and potential formation of ground level ozone. While the BTC Marine Terminal will make minor contributions to both of the above, the Project will carry out an air quality monitoring programme. Discuss the possibility of exchanging information with other monitoring programmes so that, in conjunction with the regulators, the extent of any cumulative problems can be properly understood as a precursor to taking some form of appropriate management action.
Marine ecology in the Gulf of Iskenderun – increment by increment degradation	BTC will contribute to this cumulative impact in only a minor way. In the absence of any collaborative effort involving the authorities and other operators, BTC Co will establish the most productive initiatives for nature conservation in the Gulf of Iskenderun in the context of the proposed Environmental Investment Programme for the project.
Employment	Maximise the employment and skills enhancement of local residents affected by all projects, including fishermen impacted upon by decreased access to fishing grounds.
Infrastructure and services	As above
Safety of residents	As above
Community relations	Recognise the cumulative development effects on relations with local residents within Project procedures for managing these aspects. Likely areas include decreased access to fishing grounds, expectations regarding employment, construction activities and associated nuisance factors.

BIBLIOGRAPHY

Ref 1 International Finance Corporation (1998), Procedure for Environmental and Social Review of Projects, IFC, Washington.

Ref 2 EC (1999) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, EC DG XI Environment, Nuclear Safety and Civil Protection.

Ref 3 Shankleman, J; Stevens, P and Blatchford, D. (2002) 'BP Azerbaijan: ACG, BTG and Shah Deniz Projects – Economic, Social and Environmental Review in the National and Regional Context.' Draft Report.

Ref 4 IEA (1997) Energy Policies for IEA Countries, 1997 Review, Paris.

Ref 5 IEA (1997) CO_2 Emissions from Fuel Combustion: A New Basis for Comparing Emission of a Major Greenhouse Gas, Paris.

Ref 6 IPPC (2002) Statistical Evaluation of Greenhouse Gas Emissions of Turkey between the years of 1970 and 2010 (prepared State Institute of Statistics, Ankara).

Ref 7 UNFCCC (2001) Comparison of Greenhouse Gas Emission Projections, Paris.

17 MANAGEMENT AND IMPLEMENTATION

17.1 INTRODUCTION

This EIA has identified a number of measures to minimise and mitigate the potential environmental and social impacts that may arise due to the various project activities. There are two broad categories of mitigation[1] measures that will apply to the BTC Project:

- generic good practice measures, which will ensure that the facilities are built and operated to standards of international best practice;

- specific measures, which will ensure that, predicted impacts are mitigated to acceptable levels.

The effective implementation and maintenance of mitigation measures underpin the findings, recommendations and conclusions of this EIA and represents a key condition of the EIA approval process.

Whilst this EIA document reports the assessment, analysis, findings and recommendations of the EIA process up to the point of disclosure, the integration of environmental consideration into the implementation phases of the development will be an ongoing and dynamic management activity. In this Section, the means by which integrated environmental and social management is to be achieved are described.

17.1.1 Environmental and social management plans

A key vehicle for the delivery of environmental management scrutiny and control is the suite of management plans developed by the EIA team and attached to this main EIA Report as Appendix C. The Management and Monitoring Plans (MMPs) comprise the following:

- an Environmental Management and Monitoring Plan (EMMP);
- a Reinstatement Plan (RP);
- a Waste Management Plan (WMP);
- a Pollution Prevention Plan (PPP);
- a Traffic Management Plan (TMP);
- an Oil Spill Response Plan (OSRP);
- a Cultural Heritage Management Plan (CHMP);
- an Aggregates Management Plan (AMP);
- a Social Management and Monitoring Plan (SMMP).

The management plans represent the technical basis for the development and maintenance of key environmental management systems and procedures during construction and operation of the scheme and will evolve and adapt as the implementation of the pipeline and its associated facilities is progressed.

[1] In this context, mitigation refers to both measures to prevent or minimise negative impacts, and also measures to optimise potential benefits of the Project.

The management plans have been prepared for those who will be responsible and accountable for the implementation and maintenance of the mitigation measures identified by the EIA process. As the Project Proponent, BTC Co has provided a commitment to comply with the requirements of the EIA; as such the plans will provide important information to a range of individuals from boardroom down to site personnel and from members of the proponent organisations through to Construction Contractors and Sub-contractors.

Those accountable for achieving the objectives of the plans should ensure that the required actions for both implementation and monitoring are integrated into wider management processes, thereby ensuring that environmental and social impacts are considered in all relevant project decisions and activities.

As public documents, the suite of management plans also provide a point of reference for regulators, communities and other interested parties who would like to understand the specific activities to be undertaken by the Project as well as the allocation of responsibilities between the different parties to the Project. These management plans will also provide a basis for assessing the environmental and social performance of the Project through external monitoring and will facilitate public scrutiny of those identified as holding responsibility for the actions of the Project.

The management plans are aimed, therefore, at:

- ensuring that the management actions and mitigation measures described in the EIA are successfully carried out;
- establishing the requirements for monitoring the effectiveness of measures implemented; and
- providing procedures for reviewing and amending mitigation measures as required to reach established objectives and targets.

In addition to the effective management of the Project activities, BTC Co are also committed to providing direct benefits to affected communities and environment through focused investment programmes. Section 17.4 outlines BTC Co's environmental and social investment programmes.

Sections 17.2 to 17.3 provide a brief overview of the way in which environmental management of the Project will be carried out.

17.2 PROJECT MANAGEMENT SYSTEMS

17.2.1 BOTAŞ Quality Management System

The BOTAŞ Quality Management System provides the structure for the overall quality management of the BTC Project. Environmental and social management is an integral part of the process of ensuring that the protection of the environment and communities are given a high priority throughout the Project.

BOTAŞ has developed an Environmental Management System, in accordance with the international standard ISO 14001. This will be applied to the BTC Project.

The aim of the EMS will be to ensure that environmental requirements are identified, planned, achieved, maintained and documented and, where appropriate, improved. Specific focus will be

provided through the Management and Monitoring Plans and supporting plans in their current form; these documents are aimed primarily at the construction and commissioning phases of the Project. However, the plans and procedures will be developed for application during the operational phase and, ultimately, through to the decommissioning of the pipeline.

17.2.2 Overview

BOTAŞ is committed to the full integration of environmental and social management requirements within the overall Project Management System to be applied to the construction, operation and eventual decommissioning of the BTC Pipeline and its associated facilities. This commitment is reflected by the close integration of environmental considerations into the planning and design development of the Project to date.

The management and planning of environmental requirements of the BTC Project will be effected through the following:

- The BOTAŞ Quality Management System;
- Management and Monitoring Plans (MMPs) including Project-wide Environmental Management and Monitoring Plan (EMMP) and Supporting Plans, and the Social Management and Monitoring Plan (SMMP) and Supporting Plans;
- Contractor Environmental and Social Management Plans and Procedures; and
- Operational Plans and Procedures including, for example, the Emergency Response Plan and Oil Spill Response Plan.

The relationship between these different components is illustrated graphically in Figure 17.1 and a brief description of the various components is provided in Sections 17.2.3 to 17.2.6 below. An overview of some of the key features associated with the implementation of the various plans is contained in Section 17.3.

The Project–wide EMMP and other supporting management plans for the construction phase are contained in Appendices C1 to C7 and C10. The Project-wide SMMP and other supporting management plans for the construction phase are contained in Appendix C8. Environmental and social management is a process that will continue to be refined as the Project develops through detailed design to construction, commissioning, operation and decommissioning. Consequently, these plans will be ‘living documents’ that will be developed and revised in parallel with developing project design and implementation.

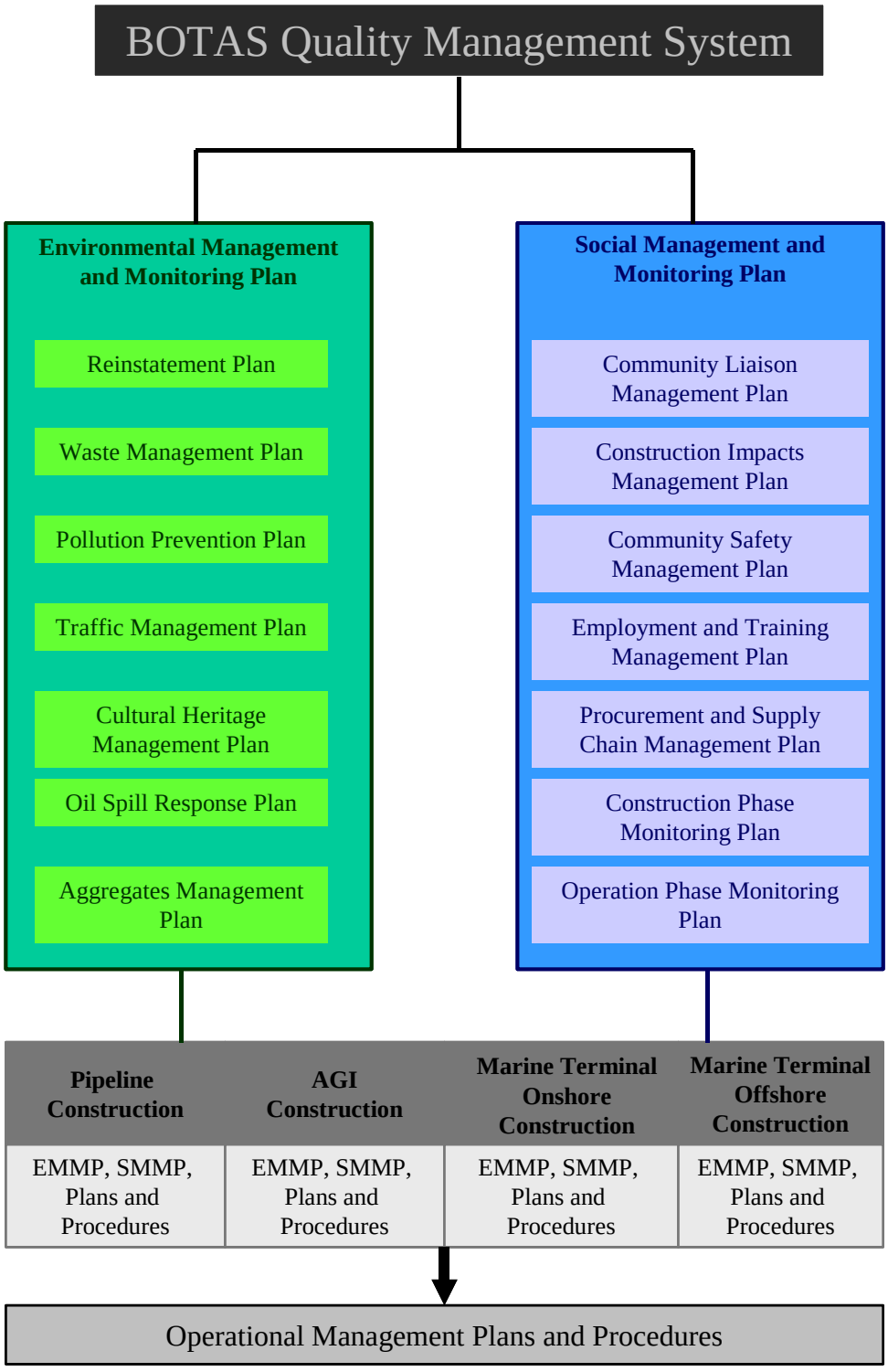


Figure 17.1 Overview of BOTAŞ Quality Management System

17.2.3 Environmental Management and Monitoring Plan

The Environmental Management and Monitoring Plan (EMMP) is an overview document that guides the environmental management and monitoring of all aspects of the BTC Project. This document addresses project wide issues and requirements that shall be adhered to by BOTAŞ and its Contractors in all aspects of the BTC Project. In addition, this document acts as a guide to the supporting suite of management plans and other documentation that together constitute the environmental management framework for the Project. At this stage of the Project the EMMP is primarily aimed at the construction and commissioning phases of the Project. However this document will be reviewed and revised as the Project develops through to the operational phase.

17.2.4 Supporting environmental management plans

This section provides a brief summary of the scope of the various Environmental Management Plans that support and complement the EMMP.

17.2.4.1 Reinstatement Plan

This plan specifies the minimum technical requirements for reinstatement and restoration of areas affected by construction activities excluding areas of permanent land take. The primary aim of the Reinstatement Plan (RP) is that all such areas shall be returned to their pre-construction state. The RP is applicable to the stabilisation and restoration of terrain before, during and after construction of the pipeline Right of Way (RoW), access roads/tracks, Above Ground Installations (AGIs), staging areas and any additional areas utilised during construction of the various components of the BTC Project.

17.2.4.2 Waste Management Plan

The project-wide Waste Management Plan (WMP) identifies wastes which are likely to be generated during the construction of the BTC Project and documents the 'cradle to grave' waste management practices to be employed for their collection, storage, treatment and/or disposal.

The WMP covers wastes generated by construction and related activities including the following sources:

- construction and commissioning of all facilities;
- accommodation both temporary and permanent (used during construction);
- infrastructure such as transport and airstrips / helicopter pads.

The WMP describes how waste will be managed and how the Project will:

- minimise the potential to cause harm to human health and the environment;
- achieve and maintain compliance with Turkish regulations and BOTAŞ environmental goals; and
- reduce operational costs and reduce any potential liabilities that may arise from waste handling operations.

17.2.4.3 Pollution Prevention Plan

The Pollution Prevention Plan (PPP) documents the project-wide measures that are required to avoid and minimise pollution during project activities and to respond to any pollution incidents that occur. Specifically, the PPP addresses the following areas:

- fuel storage and handling;
- protection of surface and groundwater;
- preventing marine pollution;
- controlling dust and other emissions to air;
- controlling noise; and
- spill prevention and control.

17.2.4.4 Traffic Management Plan

The Traffic Management Plan (TMP) addresses the measures that will be adopted throughout the BTC Project to minimise traffic related impacts. Specifically, the TMP addresses:

- relevant traffic management policies and standards;
- potential traffic impacts of the Project; and
- appropriate measures and procedures for mitigating the impacts.

17.2.4.5 Oil Spill Response Plan

The Oil Spill Response Plan (OSRP) documents the responsibilities, procedures and methods of response that will be utilised in the event of an oil spill during the operational phase of the Project.

A project-wide oil spill response framework document has been developed by the BTC Co in order to ensure consistency and the efficient use of resources throughout all three countries. The Turkish OSRP will be consistent with the requirements of this framework document. An outline Turkish OSRP is under development at this stage and will continue to be developed by BOTAŞ during the construction phase of the Project in line with the schedule detailed in Section 12 of the framework document.

17.2.4.6 Cultural Heritage Management Plan

The Cultural Heritage Management Plan (CHMP) documents the way in which potential impacts on Turkish archaeological resources will be managed. An Archaeological Management Framework that will apply to the overall BTC Project, including the Azerbaijan and Georgian components of the Project, has been developed by the BTC Co to ensure that archaeological management is treated in a consistent way in all three countries. The Turkish CHMP is intended to be consistent with this overall Framework.

The Turkish CHMP will specifically address the following issues:

- a phased approach to archaeological baseline study and data collection;
- requirements and procedures for undertaking intrusive archaeological investigations;
- specific management strategies for identified archaeological and cultural heritage sites;
- chance find procedures to be adhered to in the event of an archaeological find during construction activities;
- procedures for the reporting of archaeological finds.

The plan will also be implemented according to a protocol agreed between BOTAŞ and the Ministry of Culture, which is aimed at the maximum protection of cultural resources while ensuring the minimum possible delay to the project works.

17.2.4.7 Aggregates Management Plan

The Project-wide Aggregates Management Plan (AMP) identifies the estimated requirements for construction aggregates, outlines the existing capacity in Turkey to provide aggregates for the Project, identifies the potential impacts of aggregate sourcing and recommends appropriate measures to mitigate them.

The Contractor shall use the Project-wide AMP as the basis for preparing a detailed AMP to identify the actual quantity of aggregates needed per Contract, and will include detailed procedures for the management and mitigation of the potential impacts of aggregate extraction and transportation.

17.2.5 Social Management and Monitoring Plan

The Social Management and Monitoring Plan (SMMP), and the supporting framework for the Overview of Land Acquisition Plan, have been developed to achieve the following overarching objectives:

- build positive, non-dependent relationships[1] between the Project and local communities;
- optimise potential benefits brought by the Project; and
- minimise negative impacts caused by the Project.

These objectives have been developed into a set of principles that have guided the development of mitigation measures. These principles are shown in Box 17.1 below**.**

The overall performance and successful implementation of the SMMP will be measured against the objectives and Key Performance Indicators presented in Table 17.1.

Table 17.1 Overall Objectives for the SMMP and Key Performance Indicators

OBJECTIVE	KEY PERFORMANCE INDICATOR
Build positive, non-dependent relationships between the Project and local communities	Number of lost days due to community disturbance
Minimise negative impacts caused by the Project	Compensation paid as a result of project impacts other than pre-construction land compensation
	Injury or loss of life to community members
Optimise potential benefits brought by the Project	Proportion of unskilled, semi-skilled and skilled to be employed from directly affected communities, district, provincial and national levels
	Number of training days per 100 staff in addition to HSE training
	Proportion of goods and services supplied from districts and provinces crossed by the BTC Pipeline

Measurable targets will be set prior to the end of disclosure, for each of the key performance indicators outlined in Table 17.1 above. These will be agreed between the BTC Co., BOTAŞ

1 The project will aim to prevent dependency building up between the settlements and the Project. The Project will not duplicate or replace the legitimate role of existing governance and development structures.

and the Construction Contractor as a formal condition of contract. These targets will be made publicly available and will be monitored throughout the construction period.

Box 17.1 BTC Co. Statement of Social Objectives

The BTC Co. is committed to delivering mutual benefits to potentially affected settlements and to establishing long-term relationships with these settlements, during both the construction and operational phases. We will:

- minimise potential negative social impacts through identification and mitigation, in particular via the environment impact assessment (EIA) process;
- publish regular updates on the environmental and social aspects of the Project, and conduct regular dialogue with interested organisations;
- maintain regular contact with settlements along the pipeline route through a team of CLOs prior to, during and following the construction period;
- compensate for damage to land and property in a legal, transparent and ethical manner that respects the interests of those involved;
- manage expectations on employment opportunities by providing information on the level and duration of employment requirements;
- seek opportunities to increase employment of country nationals, and in particular those in directly affected settlements, subject to availability of appropriate skills;
- establish recruitment procedures that are transparent, public and open to all regardless of ethnicity, religion or gender;
- provide periodic training to enhance the skills and capacity of both employees and contractors;
- draw up procedures and management plans for all construction camps, in relation to contacts with local settlements;
- provide periodic training on liaison with local settlements to all staff employed by the BTC Co. Project and Contractors;
- establish a community investment programme that delivers mutual benefits to the BTC Co. and communities along the pipeline route;
- seek opportunities for communities to mutually benefit from the activities undertaken, and infrastructure required, by the Project.

The social mitigation measures have been grouped into six supporting social management plans that need to be taken forward in parallel by different parties within the Project and Contractor teams. For each of the plans, the Construction Contractor, BOTAŞ and the BTC Co. have been identified as having primary responsibility.

The plans required to implement the social impact mitigation measures identified during the EIA process are as follows:

- **Community Liaison Management Plan** outlining measures required to prevent negative impacts that could be caused by construction workers and construction camps and also measures required to ensure effective two-way communication with local settlements.

- **Construction Impacts Management Plan** outlining measures required to minimise impacts caused during construction of the facilities.

- **Community Safety Management Plan** outlining measures to ensure the safety of local communities. Many of these measures also appear in the other plans, but are brought together here to provide a focus for their management and monitoring.

- **Employment and Training Management Plan** outlining measures to maximise employment opportunities to project affected communities and the local regions through which the pipeline passes and in which the marine terminal is located.

- **Procurement and Supply Chain Management Plan** outlining measures to maximise opportunities to project affected communities and the local regions through which the pipeline passes to benefit from supply of goods and services required by the Project.

Monitoring Plans for the construction and operation of the pipeline, AGIs, construction camps and BTC Marine Terminal have also been compiled. These plans outline the monitoring actions, responsibilities and timing for key mitigation measures, as well as the targets against which performance will be assessed in each area.

In addition an Overview of Land Acquisition Process (OLAP) has been developed outlining measures require to minimise social or economic impacts arising from temporary or permanent resettlement of affected individuals. This Plan is currently in preparation; the OLAP is presented in Appendix C9.

17.2.6 Contractor management plans and procedures

The MMPs and supporting management plans are project wide plans that specify the standards and requirements applicable to all aspects of the BTC Pipeline Project in Turkey. The project itself is made up of a number of separate stages and components covering a variety of locations and activities. In addition, a number of different contractors will be responsible for the construction of the different aspects of the Project. In order to ensure both consistency in environmental and social performance and the successful application of the project wide standards and requirements in a variety of circumstances, all Contractors will be required to adopt and implement the requirements of the MMPs and supporting management plans as they pertain to the scope of their contract.

In order to achieve this, all Contractors will be required to submit project specific plans and procedures that demonstrate the means by which the commitments made in the EIA and the requirements of the MMPs and supporting project-wide management plans will be implemented in relation to their specific scope of work. Contractor plans and procedures will be reviewed and approved to ensure the requirements of the project-wide MMPs and supporting management plans will be fully met in a consistent manner throughout all aspects of the BTC Project.

17.2.7 Management during operation

The MMPs and supporting management plans are primarily aimed at the construction and commissioning phases of the Project. However, the standards and general requirements outlined in these documents will also apply throughout the operational phase of the Project.

Site-specific operational management plans and procedures will be developed during the design and construction phase of the Project in conjunction with the development of operational procedures. These operational management plans will ensure that all commitments made in the EIA relevant to the operational phase of the Project are fully implemented and monitored. The process of continual improvement will be implemented in accordance with the requirements of ISO 14001.

17.3 IMPLEMENTATION

17.3.1 Introduction

The following sections provide a brief overview of some of the key environmental and social management requirements that will be applied throughout the Project to ensure successful implementation of the various measures as defined in the MMPs and supporting management plans.

17.3.2 Responsibilities

BTC Co is fully committed to meeting the provisions of the EIA. As the Turnkey Contractor and Designated Operator of the BTC Project, BOTAŞ will have responsibility for all environmental planning, mitigation, management and monitoring in Turkey including delivery of all commitments made in this EIA Report and for the development and implementation of the various outline Management and Monitoring Plans presented in Appendix C to this EIA report to the satisfaction of BTC Owners and the Turkish regulators. BOTAŞ management will be responsible for the performance of all its Contractors and for ensuring that all EIA commitments are translated into Contractors requirements and that these requirements, are implemented to the full intent and extent of the original commitment.

Although these plans comprise a series of stand alone documents, the MMPs and supporting management plans will be fully integrated into the BTC Project Environmental Management System. This will ensure:

- ownership of the MMPs and supporting management plans at the highest level;
- appropriate resource allocation to the implementation of the provisions of the EMMP and supporting management plans;
- effective implementation and maintenance of the management control and monitoring systems that are defined by the MMPs and supporting management plans.

The Contractors will be responsible for the implementation of, and adherence to, all the mitigation measures outlined in the EIA, MMPs and supporting management plans. The Contractors and Sub-contractors will be required to adopt the provisions of the MMPs as if it they were their own and to demonstrate to the satisfaction of BOTAŞ that the commitments made in the EIA are being implemented.

17.3.3 Inspection, monitoring and audit

Inspection and monitoring of the environmental effects of construction and operational activities shall enable the effectiveness of environmental mitigation to be evaluated. It will also enable

any unresolved environmental and social problems to be highlighted and for effective solutions to be identified.

Both BOTAŞ and its Contractors shall be required to demonstrate how environmental requirements are being complied with. BOTAŞ will reassure itself that the Construction Contractor is complying with the requirements of the EIA, MMPs and supporting management plans through a programme of site inspections and, more formally constituted, audits by BOTAŞ' representatives. In addition, Contractors will be required to implement an ongoing programme of internal inspections and audits and maintain the full documentation required in the various management plans for independent validation.

The BOTAŞ Community Relations Team will monitor implementation of, and adherence to, the SMMP through liaison with the Construction Contractor and meetings with representatives of affected settlements. The BTC Co.'s Participants' Environmental and Social Relations Team will undertake a quality assurance role and will support BOTAŞ on identified monitoring actions.

In addition to the management structure established for the day-to-day overseeing of the Contractor's environmental and social performance, BOTAŞ will maintain an oversight and audit role for all aspects of the monitoring programme. This will include independent monitoring at selected sites throughout construction to verify the results of contractors monitoring programmes. In addition, compliance monitoring and inspection programmes will be undertaken by independent auditors (on behalf of the BTC Co.), the Turkish authorities, and international financial institutions (IFIs). Contractors will provide access to all sites and all necessary assistance to facilitate monitoring by BOTAŞ or any other approved organisation

17.3.4 Complaints procedure and resolution of problems

BOTAŞ, in coordination with its various contractors, will set up a complaints procedure that will enable any complaints to be made directly to a nominated individual. The complaint will be investigated by the Contractor's *Community Liaison Officer/s (CLO/s),* in coordination with BOTAŞ, and action will be taken as necessary.

All complaints will be recorded on site and the status of response actions will be recorded on a regular basis until corrective actions have been adequately implemented. BOTAŞ shall ensure that clear instructions are given to all Contractors and BOTAŞ personnel regarding the procedure to be followed when a complaint is received and the responsibilities for ensuring appropriate response action is undertaken. BOTAŞ shall ensure that residents living near to construction activities are kept informed of the Contractor's proposed working schedule and are advised of the expected time, duration and aims of the works by the Contractor.

Where problems are identified during inspection, monitoring, audit or due to a complaint, an appropriate course of action to remedy the situation will be agreed by the BOTAŞ Environmental Inspector and/or Community Relations Supervisor and the Construction Contractor. The Construction Contractor will be required to make adequate resources available to undertake corrective action immediately.

17.3.5 Training

BOTAŞ and its Contractors shall develop and implement an environmental management training programme. The training programme shall include initial induction training workshops for all site personnel and more specific training for those undertaking particular activities or tasks or for those with management responsibilities.

The training programme shall ensure that all site personnel:

- fully understand the management and monitoring requirements of the Project and how they shall be implemented on site;
- fully understand the environmental, social and cultural sensitivities of the areas within which the pipeline, marine terminal and other facilities shall be constructed;
- undergo health awareness training;
- fully understand the procedures for responding to the media, unauthorised visitors to the site and enquiries by the public;
- are fully aware of how to respond to unforeseen events and incidents; and
- are aware of the roles of the Contractor staff and the BOTAŞ representatives with respect to environmental and social issues.

17.3.6 Reporting and review

BOTAŞ shall develop and implement a programme of reporting throughout all stages of the BTC Project. Contractors will be required to fully comply with the reporting programme in terms of both timely submission of reports and an acceptable level of detail. It is envisaged that the reporting programme will include the following requirements:

- daily environmental checklist to be completed by all on-site environmental inspectors;
- daily reports detailing any community incidents causing injury or resulting in, or with the potential to result in, delays or a stoppage of the work;
- weekly environmental reports from all Contractors and on-site BOTAŞ environmental inspectors highlighting issues/problems during that week and the measure taken to address them;
- fortnightly reports detailing any disputes that have not been resolved within seven days, as well as a summary of the daily reports;
- monthly environmental compliance reports demonstrating compliance with all relevant requirements of the MMPs and EIA as they pertain to the Contractor's scope of work, highlighting areas of non-compliance and measures taken to address them; and
- monthly reports detailing community liaison activities carried out and any activities planned.

The reporting programme will form the basis for a programme of regular reviews of both Construction Contractor's and BOTAŞ' performance. These reviews will be used to identify areas and strategies for achieving improvements in environmental and social performance.

17.4 ENVIRONMENTAL AND SOCIAL INVESTMENT PROGRAMMES

17.4.1 Overview

The BTC Co. are in the process of developing discrete Environmental and Community Investment Programmes to augment the direct mitigation measures that they are committed to implement within the EIA process. These Investment Programmes and BOTAŞ Environmental and Social Investment Strategy are summarised in the sub sections that follow.

17.4.2 BTC Co's Environmental Investment Programme

17.4.2.1 Background

Whilst significant efforts have been taken to avoid areas of high biodiversity, largely through route selection and careful siting of above ground facilities, it is recognised that there are residual impacts on natural habitats. Direct mitigation measures aimed at the removal or reduction of adverse impacts on natural habitats or their functions will be implemented (detailed in Section 6). Reinstatement practices will also ensure that effects on natural habitats are minimised (Section 6 and the Reinstatement Plan). Furthermore, in line with BTC Company's policy, and to meet the requirements of the World Bank Group Policy on Natural Habitats (Operational Policy 4.04, June 2001), an Environmental Investment Programme (EIP) will be established. The aim of the EIP will be, where possible, to enhance biodiversity either directly in the area of potential impact, or indirectly through offsite projects.

17.4.2.2 Objectives of environmental investments

The primary focus of the EIP will be on Protected Areas (either designated or proposed) and protected species. In addition, areas of high ecological significance outside the protected areas system or other key species will be considered.

17.4.2.3 Investment principles

The EIP is in the process of development. This is being undertaken through consultation with stakeholders to gain an understanding of issues/areas of concern where input would be most valuable. The intention is that potential schemes are developed and implemented in conjunction with relevant stakeholder bodies and the identification of potential partners is underway.

The EIP will be implemented according to the following principles:

- It will take account of the requirements of IFIs and Corporate policies on effects on natural habitats.
- As a minimum, programmes will be aimed at addressing the 'no net loss' principle.
- Proposed schemes will take into account the views, roles and rights of groups, including NGOs and local communities. Consultation has been undertaken on mitigation options and further liaison will be completed to refine strategies.
- Government bodies, NGOs and, potentially, local communities will be involved in the implementation and monitoring of schemes. Monitoring and evaluation will allow assessment of the effectiveness of the scheme and permit refinement as necessary.

- As far as is feasible, proposed schemes will link with other project related investment programmes, in particular the Community Investment Programme. Such an integrated approach would facilitate the success and sustainability of the programmes.
- Schemes will be developed that take into account and balance the socio-economic needs of local communities and the need to protect and enhance biological diversity.
- In developing projects, every effort would be made to avoid duplicating the efforts of other international and local agencies or government departments; opportunities to leverage existing programmes and co-operate with existing organizations will be sought.
- Where applicable, programmes will take into consideration the biodiversity priorities of the Republic of Turkey.
- Clear targets and measurements of success for the Projects will be identified.
- It will be the responsibility of the BTC Company.

17.4.3 BTC Co's Community Investment Programme

17.4.3.1 Background

BTC Co. Corporate policy states that the company will generate "economic benefits and opportunities for an enhanced quality of life for those whom our business impacts,"[3]. To meet this goal, BP (represented by BTC Co.) has committed to designing and implementing a community investment programme in the areas most affected by the construction activities. The BTC Co.'s Community Investment Programme will go beyond the social impact mitigation measures described in Sections 6, 7, 12 and 13 of the EIA Report, and take a step further in order to meet the goal of having a positive influence in the areas in which BTC Co. operates.

17.4.3.2 Objective of community investment

The objective of the Community Investment Programme is to have a positive impact on communities most affected by construction activities by providing direct benefits, and by engaging with and adding value to local communities in a sustainable way.

17.4.3.3 Types of community investment

Currently BTC Co. intends to implement two types of community investment projects:

- **Local Community Projects:** these projects are relatively small in scale and duration but respond to an immediate felt need at the community level. These projects will take place in communities that are also directly affected by the construction activities. BTC Co. will take a phased approach to this and will first target those communities that will see activity during the early work programme within the impact area as defined in the EIA. This phased approach will enable BTC Co. to test the methodology and learn lessons as the programme proceeds. Ideas for potential projects will be based on consultation undertaken during the EIA process, which identified both household and settlement level needs. In addition, BP will consult with locally active NGOs to vet these potential ideas, gain from the experience of NGOs in the region, and identify potential NGO implementation partners.

[3] BP Business Policy "What We Stand For"

- **Sustainable Development Projects:** These projects will form the bulk of the Community Investment Programme. It is anticipated that they will be larger in scale and longer term in duration than the *'Local Community Projects'* and will aim to provide a sustainable development benefit. These projects will take place primarily in communities that are directly affected by pipeline activities, but may be extended to nearby towns or groups of settlements. Ideas for potential projects will be drawn from settlement-level consultations. This will require substantial discussion with active NGOs, international development agencies and government in order to ensure that BTC Co. is neither duplicating effort nor assuming the responsibilities of local or national authorities, but is adding value and/or filling needed gaps.

17.4.3.4 Criteria for community investment

The Community Investment Programme will apply criteria for the selection of both individual projects and partners for the implementation of projects. These criteria draw on international community/social investment best practice and local experience gathered through the implementation of the existing BP programmes in the country.

The criteria for the selection of programmes and projects will include the following:

- **Community needs based:** programmes and projects will be designed and implemented in consultation with communities and other stakeholders experienced in community investment and development in the country. The concerns identified in the EIA will provide the initial means for analysing community needs and priorities.
- **Impact:** programmes and projects should deliver material and measurable social and/or economic benefits to communities directly or indirectly affected by the Project.
- **Sustainability:** whether short-term or long-term in nature, programmes and projects should be designed to deliver lasting social and economic benefits as well as protect and enhance biological diversity.
- **Transparency:** programmes and projects must be transparent and be open to internal and external scrutiny of potential beneficiaries, NGOs and government departments to understand the approach.
- **Prevention of duplication:** in selecting projects, every effort will be made to avoid duplicating the efforts of other companies, international and local agencies or government departments; opportunities to leverage existing programmes and co-operate with existing organisations will be sought.
- **Measurement:** clear targets and measurements of success for the projects will be identified.
- **Best practice:** BTC Co. will aim to set its strategy and select programmes that are 'best practice' in community investment – recognising that this is a new and evolving practice in the region.
- **Local Participation:** programmes and projects should aim to encourage participation and contributions from local communities.
- **Local Implementation:** BTC Co. will encourage, as far as possible, the implementation of development projects by local NGOs etc.
- **Partnerships:** Programmes and projects should encourage the development of partnerships between BTC Co. and a wide range of organisations/civil society.

17.4.3.5 Timeframe for Community Investment Programme

To date, BTC Co. has developed a list of priority settlements and potential short-term projects and has consulted with Turkish NGOs to vet and refine this list. BTC Co. has also allocated appropriate budgets for the Community Investment Programme. The next step is to begin consultation in the priority settlements and to define partners for undertaking particular projects.

BTC Co. has also begun meetings with NGOs and donors in order to define longer-term sustainable development initiatives and identify suitable partners. It is expected that BTC Co. will refine this programme over the coming months. The Community Investment Programme will then be publicised in more detail later in 2002, once feedback on the EIA has been received and further consultation with authorities, NGOs and affected communities has taken place. It is expected that actual investments will begin later in 2002.

Implementation of the Community Investment Programme will follow standard business processes and control procedures for managing project performance and cost. BTC Co. will also ensure that its community liaison officers (CLOs) serve as a local focus to obtain community feedback as the Community Investment Programme progresses.

The Community Investment Programme will be publicised in more detail later in 2002, once feedback on the EIA has been received and further consultation with authorities, NGOs and affected communities has taken place. It is expected that actual investments will begin late in 2002.

17.4.4 BOTAŞ' Environmental and Social Investment Strategy

Respect for the environment, promoting safety of personnel and contributing towards community development are among the strategic aims identified by BOTAŞ General Management in the scope of their Integrated Management System. Within this context, afforestation programmes are planned for all BOTAŞ projects with the BTC Pipeline being the first of such projects planned. The programmes will be carried out in coordination with NGOs specialised in erosion control, soil protection and afforestation projects in Turkey.

With regard to the BTC Pipeline Project, it is planned that for each 250-300km of the BTC Pipeline, a 10ha area will be afforested in the provinces along the pipeline. Sites will be targeted with the aim of maximising access and amenity to the community.

17.5 NEXT STEPS

Following the formal approval of the EIA documentation, those designated as responsible for the implementation of measures management will:

- Review and integrate the relevant management and monitoring activities contained within the EMMP and the supporting management plans into existing management systems;
- Assign appropriate resources for implementation;
- Monitor implementation;
- Review the results of implementation to assess whether they have had a positive effect;
- Amend measures as necessary to meet objectives and contribute to key performance indicators.

18 OVERALL PROJECT ASSESSMENT

18.1 DEVELOPMENT OF THE PROJECT

The BTC Pipeline Project as currently proposed represents the results of several years of feasibility studies followed by 24 months of detailed assessment of a number of alternative technical and routing options to ascertain the preferred arrangement. These studies have included identification of environmental constraints, social concerns and geohazards along the route in order to assess potential risks to the integrity of the pipeline and to obtain relevant baseline data for pipeline design.

18.2 DEVELOPMENT OF THE EIA

18.2.1 The process that has been adopted

An Environmental Impact Assessment in line with current international practice has been undertaken for the Turkish section of the BTC Pipeline Project. The aim of the EIA process has been to ensure that all potential impacts on the physical, biological and human environment that are attributable to the Project are fully investigated, reported and, where necessary, managed.

This EIA has been undertaken and reported as an independent and objective process. In this regard, ERM has worked closely with ENVY, KORA METU, and Veri Arastirma, four specialist Turkish consultancies. Two other EIAs have been undertaken (by others) which assess impacts attributable to the Azerbaijan and Georgia sections of the Pipeline respectively.

In line with the relevant provisions of the Host Government Agreement (HGA), the approach adopted in this EIA is in accordance with World Bank guidelines (Article 8.42, Operational Policy OP 4.01) and EC Directive requirements (85/337/EEC, as amended by EC Directive 97/11/EC).

A feature of the process undertaken for this EIA has been the extent to which it has been underpinned by stakeholder engagement and public consultation. The focus of consultation has been to understand as far as possible how the Project will impact all stakeholders, and to obtain their ideas and opinions on management of impacts in order to influence project design, implementation and follow-up. In this regard, a Public Consultation and Disclosure Plan (PCDP) has established the framework for a structured and accountable programme of ongoing public engagement and participation that commenced in September 2001 and which is anticipated to continue throughout future Project development and implementation.

The EIA team has had the opportunity to work closely with the Detailed Engineering Design Team, with BOTAS and with BTC Co. with the common objective of fully assessing potential impacts and building mitigation into the Project's design.

The mitigation measures and procedures that have been developed as part of this EIA have been transcribed by the Project into Environmental and Social Specifications and together with the Management and Monitoring Plans, these will be included as contractual requirements in the Terms of Reference issued to bidders for the various construction contracts for the Project.

18.2.2 Challenges faced by the EIA process

In common with most Environmental Assessments, the EIA for the Turkish section of the BTC Pipeline Project has faced challenges in a number of areas in terms of the reliability of predicting impacts and in development of appropriate mitigation. These generally centre on the following factors.

- *Uncertainty due to gaps in knowledge of the baseline*. Where these difficulties have materialised, desk data has had to be relied upon as an interim measure and the EIA has as a result identified locations where pre-construction surveys and further data acquisition will be required.

- *Evolving Detailed Design*. Whilst an EIA is generally a process that parallels and interacts with design, it relies on design for certain data to facilitate identification of potential impacts. In a project of the scale and complexity of the proposed BTC Pipeline there are inevitably some outstanding issues that remain to be resolved in terms of the precise nature of project activities. The majority, if not all, of these are construction related and are, by implication, in most instances short-term. These are discussed further below.

  The EIA provides a level of assurance with regard to these impacts in terms of generic mitigation measures and professional judgement on the extent to which they can be mitigated. The measures are described in detail in the suite of Management and Monitoring Plans that are an integral part of the EIA Report.

- *Reliability of impact prediction and effectiveness of mitigation.* In recognition of the level of current uncertainty inherent in the findings, the EIA has stressed the importance of the Management and Monitoring Plans as vehicles for delivering appropriate and effective measures for managing, controlling and mitigating environmental and social impacts. In this regard, on the premise that the Management Plans will be rigorously implemented and enforced, the stated level of significance of identified impacts in this EIA where uncertainty exists, has been conservative (ie significance may be over-stated).

18.3 ISSUES ARISING OUT OF THE ENVIRONMENTAL ASSESSMENT

18.3.1 Issues that have been identified

The EIA has methodically undergone a process of identification of all potential impacts and assessment of their significance against a structured set of criteria that have been specifically developed for this project and which reflect current international practice. All residual impacts and benefits have been identified and summarised to assist decision makers in forming a view of the relative attributes of the Project. These are as follows:

Environmental	*Social*
Soils in certain sections of pipeline route	Unplanned disruption to infrastructure and service provision
Landscape in certain sections of pipeline route	Management of Employment Expectations
Landscape at Marine Terminal	Health risks
Water quality and abstraction	Safety of local residents and BTC workers
Biological environment at ESAs and other important sites	Social and cultural disturbance
Construction noise at certain settlements	Grievances over land compensation
Flare noise at Marine Terminal	Fishermen livelihoods
Archaeology	In-migration
Quarries and aggregates extraction	Impacts associated with PT1
Solid waste management	

18.3.2 Issues requiring finalisation

The EIA recognises that there are a number of activities, mainly construction related, which are not fully defined at this stage and which can only be resolved following selection of the various major Construction Contractors and detailed development of their work plans. These are summarised in Box 18.1.

Box 18.1 Issues Requiring Further Resolution

Waste Disposal

The quantities and types of waste that will be generated during construction and operation are subject to the construction methodology to be employed by the (yet to be selected) Construction Contractors and to ongoing detailed design and vendor selection for particular plant and machinery. The Project is committed to a waste management strategy that is based on minimisation of waste at source, identification of all waste arisings, maximising recycling and re-use, use only of licensed disposal sites with adequate capacity and inspection and audit to ensure compliance in line with Project specifications

Sourcing of Aggregates and other Construction Materials

The Project will require a significant quantity of aggregates, which have been quantified in this Report. The focus will be to minimise the level of transport of such materials by sourcing aggregates and other raw materials locally along the route. The Project is committed to the use of only licensed facilities with sufficient capacity. If new facilities are required to service Project needs, these will be subjected to the formal Turkish approvals process that includes a requirement for prior EIA approval.

Transport and Traffic

Construction of the Pipeline in particular will entail extensive numbers of traffic movements on public roads for the transport of materials and personnel to the pipeline RoW. The Project is committed to maximise the use of rail to minimise the level of increased traffic on public roads and to reinstate any directly attributable damage to public roads. The number of vehicle movements to transfer pipe and materials to the laydown areas has been approximated in this report, the strategy of which ports to use for the import of plant, equipment and materials (and hence the extent to which rail is used and the allocation of vehicle movements to particular road systems) is still subject to finalisation.

In recognition of the level of current uncertainty inherent in the findings, the EIA has stressed the importance of the Management and Monitoring Plans as the mechanism for delivering appropriate and effective measures for managing, controlling and mitigating the environmental and social impacts associated with these aspects of the Project. While this uncertainty has not affected the robustness and integrity of the EIA process, the potential for residual impacts remains pending the resolution of these issues. The implementation of the provisions of the Management and Monitoring Plans will be a key Contractor management requirement and will be informed by internal and external performance monitoring and audit.

18.3.3 Other key issues of the EIA

Protection of Biodiversity

Route selection has focussed on avoidance of environmentally sensitive areas and in this regard it has been successful in minimising impact in these areas. In a limited number of cases avoidance of protected areas has not been possible. For working in all environmentally sensitive areas (whether protected or not) a suite of protection measures has been proposed and has been accepted by the Project, including:

- avoidance of work within all environmentally sensitive areas during times of the year when sensitive habitats and/or species are most vulnerable;
- pre-clearance surveys by specialists prior to construction commencement of the presence of sensitive species: for example, rare species of bat (Schreiber's Long-Fingered Bat), grouse (Caucasian Black Grouse) and bears (Eurasian Brown Bear) during hibernation;
- narrowing of the working width (for example, in the Posof Wildlife Protection Area the working width will be decreased from the standard width of 28m to 8m in places);
- shortening the period that the spread is active in the sensitive area (from the normal duration of 2-4 months down to a target of 21 days in areas of high botanical value);
- adoption of detailed reinstatement measures defined in the Reinstatement Plan, which forms part of this EIA.

Furthermore, in line with BTC Owner's policy, and to meet the requirements of the World Bank Group Policy on Natural Habitats (Operational Policy 4.04, June 2001), an Environmental Investment Programme (EIP) will be established. The aim of the EIP will be, where possible, to enhance biodiversity either directly in the area of potential impact, or indirectly through offsite projects.

BOTAŞ' Environmental and Social Investment Strategy will be informed by the EIA with regard to the priority areas for enhancing biodiversity in the region, particularly in those areas most affected by the Project.

Greenhouse Gases (GHG)

The estimated total of GHG emissions from the BTC Project in Turkey in 2010, will represent 0.0016% contribution to global emissions. While the contribution of these emissions to global warming will be small, the Project has nevertheless sought to minimise GHG emissions. For example, combustion efficiency was a key factor in the selection of the pump drivers.

Assessment of Risk

The EIA has focussed considerable effort at assessing hazards presented by the Project. For example, an extensive Geohazards Study has been undertaken by a group of independent experts, thereby enabling the Project to take full account of geohazards in the design of the pipeline and associated facilities. Hazards have been assessed in terms of risk in the following studies:

- A *Pipeline Environmental Risk Assessment (ERA)* has enabled the design of the pipeline and the location of block valves to be optimised so as to minimise the risk of damage to the environment in the event of a pipeline leak.
- A *Marine ERA* has led to the identification of Yumurtalik Lagoons and turtles as highly sensitive Valuable Ecological Components.
- Oil spill modelling has enabled potential transboundary impacts associated with a range of oil spill scenarios to be assessed, again providing the basis for an appropriate response to be planned in cooperation with the national authorities.
- A Quantified Safety Risk Assessment of Pump Stations and BTC Marine Terminal has been undertaken to optimise safety aspects of the design.

These studies will be used in the development of the BTC Project Oil Spill Response Plan (OSRP).

Protection of Groundwater and Surface Water Resources

The EIA recognises the importance of protection of groundwater and surface water resources for the BTC Pipeline. The focus of the assessment has included the following:

- Input to construction planning with regard to construction discharges, water abstraction sustainability (particularly in regard to hydrotesting and camp supply), water quality issues at crossings or on unconfined aquifers/recharge zones.
- Input to design: for example, specialist studies to determine the appropriateness of licensed operational discharges and supply sustainability.
- A risk-based corrective action approach to dealing with contamination.
- An assessment of the adequacy of engineering measures designed to minimise, detect and respond to leaks along the pipeline route.
- Specification of a groundwater protection strategy which is focussed on delineating all sensitive aquifers along the route, understanding their dynamic characteristics and mapping this information on GIS so as to have a dynamic tool for informing oil spill response planning and execution.

Cumulative Impacts

The assessment of cumulative impacts has identified those areas where synergistic effects may arise from concurrent development. This applies particularly to the following.

- The Shah Deniz Project, particularly in those areas where the two projects will impact the same receptors such as at the Posof Wildlife Protection Area.
- The Gulf of Iskenderun where partial loss of access to fishing grounds (owing to imposition of exclusion zones around coastal facilities), general impacts on coastal

and marine ecological resources and deterioration of local air quality are all issues of potential concern.

The Project will endeavour to engage the other developers concerned, to work with them and the authorities, towards minimisation of the cumulative impacts identified.

Land Acquisition and Resettlement

The Project has developed a land acquisition process, which sets out the policies and principles to be applied in cases where project construction and operation activities will impact on land, other fixed assets, land-based and other livelihoods. This land acquisition process will form the basis of the Resettlement Action Plan (RAP), which is currently in the process of development in accordance with IFI requirements.

Cultural Heritage

The route has been subjected to desk study, archaeological field survey and to extensive consultation to identify all known and readily apparent cultural heritage features of importance. In the process, knowledge of cultural heritage issues along the route have been added to. In response to the findings of this work, the route alignment has sought to avoid these features. In the few areas where this has not been possible further investigations will be undertaken to minimise impacts as far as is practicable. However, the EIA recognises that during construction of the 1076km pipeline there is some probability of encountering artefacts or features of cultural importance. In this regard, the Cultural Heritage Management Plan, which forms part of this Report, provides the framework for identifying chance finds and how work should then proceed.

Employment Opportunities

The only one significant impact (considered highly likely) as a result of the Project is tension due to the limited number of employment opportunities. However, the Project has declared its commitment to working to manage this expectation through consistent and comprehensive communications by the community relations teams.

Sustainable Development

It is a feature of buried pipeline projects that they are, in the main, associated with predictable impacts during the construction phase and, provided reinstatement is properly applied, their long-term impacts are restricted to the above ground installations such as pump stations, valve stations and terminal facilities. Similarly, the direct benefits to affected settlements of such projects are mainly short-term employment during construction and significantly less extensive long-term employment during the operation phase. BTC Co. and BOTAŞ are committed to contribute to the long-term sustainability of Project affected settlements via their Environmental & Community Investment Programmes. The focus and direction of these investment programmes is currently under development.

18.4 THE PROJECT ASSESSMENT STATEMENT

The EIA has systematically and comprehensively examined all identified aspects of the Project with the potential to give rise to environmental or social impacts.

There are a number of residual impacts relating to construction of the pipeline and operation of the AGIs and Marine Terminal. However, by careful management (and in certain cases further studies to remove or reduce current uncertainty regarding their sensitivity) and the implementation of the various mitigation measures set out in this Report, these residual impacts will be managed.

On a national scale the BTC pipeline will bring significant financial benefits to Turkey. There are also a number of anticipated direct benefits for local settlements, particularly during the construction period, in terms of short and (in fewer cases) long-term employment. Community and environmental investment programmes will also benefit certain impacted communities.