APPENDIX A

ANNEX I REINSTATEMENT SUMMARY PLAN

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TABLES

Table 3-1 Erosion classes

REINSTATEMENT SUMMARY PLAN

1 INTRODUCTION

Reinstatement of project areas disturbed by pipeline construction activities (eg ROW, camps, pipe yards, etc) to the original landscape character is a specific objective aimed to achieve the goal of *no harm to the environment*, and encapsulates benefits that include:

- Improved likelihood of maintaining pipeline integrity against inclement conditions and natural erosion
- Natural landscape and it's tourism resource value are maintained
- Soil fertility for both natural and agricultural environments is preserved, and thereby reduces the risk of desertification is reduced
- Water catchments and the associated water quality are protected
- Bio-diversity of the global genetic pool is sustained

This plan summarises the specific requirements developed for reinstating areas disturbed by the project, and takes in to account the anticipated subsequent development of the SCP project.

The standards for reinstatement are current best practice, and have been developed from international standards and guidelines, and lessons learnt from projects in Europe, Africa, South America, and the Caucasus.

Issues addressed include topographical reinstatement, erosion control, and bio-restoration; and requirements for the extraction, re-use and if necessary the disposal of material excavated from the pipeline trench.

The reinstatement strategy is based on the following principles:

- Areas disturbed by pipeline construction activities will be restored to pre-construction conditions (eg contours) to the greatest extent possible
- There will be no adverse impacts on sensitive habitats outside of the ROW as a result of construction activities, in particular when forming cuts on side slopes
- Soils in disturbed areas will be stabilized, using both temporary and permanent controls, to protect the integrity of the pipeline and minimize potential sediment and erosion impacts
- Topsoil will be handled and stored to retain soil structure, viability of its natural seed bank, and its fertility
- Topsoil and subsoil operations will be carried out in a way which minimizes the risk of soil loss down slopes and into watercourses
- Bio-restoration of disturbed areas will be to conditions similar to the immediately adjacent off-ROW, and will be undertaken in order to:
 - (a) restore the ecology existing before construction, particularly the variety and distribution pattern of plant species, using indigenous flora
 - (b) establish sufficient vegetative cover to minimise erosion and meet the performance target of Erosion Class 3 or better through restoration of the local plant community
- Surplus excavated material will be disposed of in an environmentally acceptable manner

• Reinstatement activities will be monitored until environmental requirements and goals will be achieved

2 DOCUMENTATION

A Reinstatement Plan including Method Statements, inspection plans, and record portfolios for all erosion control and reinstatement works, will be produced by the Contractor for project approval. The documentation will comply with project, ESIA, pre-entry agreement, and any other relevant Authorities' requirements.

The Contractor will make a photographic and or video record of the ROW before opening the ROW and following final reinstatement.

The construction ?ontractor will prepare method statements for project approval specifically addressing:

- Environmentally Sensitive Areas
- Reinstatement of watercourse crossings, including generic methods for all watercourse crossings and site-specific methods statements for significant or sensitive watercourse crossings in environmentally sensitive or special agricultural sections
- Boulder fields
- Temporary and permanent measures to stabilise and control erosion for project affected areas
- Special agricultural areas that support more complex agricultural systems eg canals, and or irrigation systems

3 EROSION CLASSES

Erosion classes are used as the basis for determining erosion targets for temporary and permanent reinstatement. Table 3-1 below gives the definition of erosion classes. The aim is to meet erosion class 3 or better representing moderate erosion.

As a minimum the following standards will be achieved:

- Very low risk of the depth of cover above the pipeline being reduced
- Very low risk of releasing soil off-site (where there is a risk of sediment significantly impacting water bodies sediment interception devices will be installed)
- Low risk of damage to bio-restoration work through washing-out of seeds and plants

An erosion risk assessment has been undertaken of the route. This assessment identified areas of potential erosion and assigned erosion control measures for each area of the route.

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Table 3-1 Erosion classes

Erosion	Verbal	Erosion	Visual assessment
class	assessment	rate	
		(t/ha)	
1	Very slight	< 2	No evidence of compaction or crusting of the soil.
			No wash marks or scour features. No splash
			pedestals or exposed roots or channels
2	Slight	2-5	Some crusting of soil surface. Localised wash but
			no or minor scouring. Rills (channels <1m ² in
			cross-sectional area and < 30cm deep) every 50-
			100m. Small splash pedestals where stones or
			exposed roots protect underlying soil
3	Moderate	5-10	Wash marks. Discontinuous rills spaced every 20-
			50m. Splash pedestals and exposed roots mark
			level of former surface. Slight risk of pollution
4	Lliab	10.50	Connected and continuous network of rills over 5
4	підп	10-50	10m or guillion (> 1m ² in group spectronal group and
			> 30 cm deep) spaced every 50-100m Washing
			out of seeds and young plants. Reserving may be
			required
			Danger of pollution and sedimentation problems
			downstream
5	Severe	50-100	Continuous network of rills every 2-5m or gullies
			every 20m. Access to site becomes difficult.
			Revegetation work impaired and remedial
			measures required. Damage to roads by erosion
			and sedimentation. Siltation of water bodies
6	Very severe	100-500	Continuous network of channels with gullies every
			5-10m. Surrounding soil heavily crusted. Integrity
			of the pipeline threatened by exposure. Severe
			siltation, pollution and eutrophication problems
7	Catastrophic	> 500	Extensive network of rills and gullies; large gullies
			(> 10m ⁻ in cross-sectional area) every 20m. Most
			or original surface washed away exposing pipeline.
			Severe damage from erosion and sedimentation
			on-site and downstream

4 SITE CLEAN-UP

Prior to demobilization the contractor will clean-up all areas affected by construction operations after backfilling and before replacement of soil. In other project areas, the contractor will clean-up immediately on cessation of construction activity. Clean-up includes removal of all plant, equipment and materials not required for replacement of soil and subsequent bio-restoration.

In pre-developed areas (either for agriculture or industry) the cleaned-up condition will be equivalent to, or better than, the condition prior to construction.

Waste materials will not be left, or buried or disposed of in any way on any project area, except for:

- on-site incineration
- excess soil and rock
- waste disposed of at approved waste disposal sites that will have been selected the project and that have been approved by the relevant authorities to undertake such operations

5 INTERIM REINSTATEMENT OF THE ROW

The pipeline construction contractor will reinstate the full width of the BTC ROW as the base case.

Should the SCP installation follow directly from the BTC pipeline, full reinstatement will only be carried out on sections that will not be disturbed by SCP construction activities. Interim reinstatement will be carried out over the remaining portion of the ROW to cover the period between installation of the two pipelines. If there is a delay of more than 12 months between carrying out interim reinstatement and the start of SCP construction, the whole of any section which is subject to potentially severe or very severe erosion will be fully reinstated. Final reinstatement of the joint land would be the responsibility of the SCP project.

In environmentally sensitive areas the contractor will backfill and reinstate the ROW as far as practicable, immediately after installation of the pipeline.

Temporary reinstatement procedures will vary depending on the erodability of each particular area. Some of the specific tools used for interim reinstatement are described in Section 7.5.

The following briefly describes the activities for land in each of the erosion classes in Table 3-1.

5.1 LAND IN EROSION CLASSES 1, 2 AND 3

The erosion risk on land in these classes is low and interim control measures will be limited to those necessary to maintain class 3. After installation of the BTC pipeline, the subsoil will be replaced in the trench. Topsoil will be stored according to requirements set out in section 7. Temporary erosion control measures will be installed and functional until the SCP is installed except in cases as described above.

5.2 LAND IN EROSION CLASSES 4, 5, 6 AND 7 (EXCEPT BOULDER FIELDS)

The subsoil will be returned to the areas from which it was excavated and compacted while topsoil will continue to be stored. The land will then be covered with erosion matting and any other temporary erosion control measures required will be installed.

By the time the SCP is installed, the mat should have deteriorated sufficiently so as to present no hazard to the following construction operations. Any residue of the mat after the second pipe is installed will be buried within the subsoil and below the topsoil and will decompose.

5.3 BOULDER FIELDS

The high density of stones within the boulder fields will generally be sufficient to protect the land against erosion, so no special measures are envisaged. Method Statements will be produced by the Contractor to meet erosion control targets.

5.4 WATERCOURSES

Interim reinstatement does not apply to watercourse crossings - after installation of the first pipeline, stabilisation work will commence so that the 25 metres to either side of the watercourse will be reinstated within 48 hours.

For each crossing the contractor will minimise the environmental impact by installing appropriate measures to prevent sediment entering the watercourse.

6 REINSTATEMENT OF LAND OTHER THAN ROW

6.1 LAND AT CONSTRUCTION SUPPORT FACILITIES

Temporary construction facilities include worker camps, pipe dumps and hydrotest water treatment areas. Reinstatement of the land will commence upon removal of individual facilities. Disturbed areas will be reinstated to a condition as good, if not better than that that existed prior to establishment of the facilities, and will be to the satisfaction of the owner/authority.

In environmentally sensitive areas, the original conditions and character will be restored as far as practicable.

6.2 WASTE DISPOSAL SITES

The contractor will close, cap, and landscape all waste disposal sites prior to demobilisation, unless otherwise agreed with the project. With the exception of waste soil/rock sites, this will be in accordance with the relevant requirements of the European Community relating to the management of waste disposal facilities. Bio-restoration will be undertaken as necessary to ensure the site blends with the local environment. (See Section 10).

Sites that are used only for the disposal of excess soil and rock will be closed, capped and landscaped Each site will be vegetated as necessary to meet the erosion control requirements and to blend in with the local environment.

6.3 ROADS AND ACCESS TRACKS

Existing roads will be reinstated to their original condition or better following completion of construction activities.

New and upgraded roads or tracks and other project areas in Environmentally Sensitive Areas will be removed and the land reinstated to its original condition, unless otherwise agreed following consultation with all interested parties.

7 REINSTATEMENT PROCEDURES

The following subsections discuss activities that will take place prior to and during reinstatement of the disturbed areas.

7.1 TOPSOIL REMOVAL AND STORAGE

Topsoil, containing the seed bank, is defined as the top layer of material on the land surface capable of supporting plant growth. Maintenance of topsoil quality, particularly its structure and the integrity of its seed bank, are vital to both bio-restoration and erosion control.

Principles for removal and storage include:

- The width to be stripped of topsoil will be the working width required to construct and install the BTC pipeline but excludes the area that will be used to store topsoil. The contractor may apply for relaxation to this requirement where the ground is solid rock (ie no soil at all) taking into consideration the local conditions, pre-entry agreements and the need to satisfactorily reinstate the pipeline route. Any modification will be agreed with the project prior to works being carried out
- Where excavation is necessary, the depth of the topsoil will be established and up to 300mm of topsoil will be stripped and stored in a dedicated place. Topsoil below 300mm will only be removed if this is specifically required
- Topsoil will be stored in a manner that minimizes its loss and or degradation. Degradation of structure occurs when over-compacted by vehicles, while fertility and viability degradation occur when the topsoil is mixed with less fertile subsoil
- Topsoil stacks will be placed to ensure that they:
 - Are stable, and not subject to slumping or washout
 - Drain freely and do not pond water
 - Provide reasonable access across the ROW
 - Maintain aerobic conditions
- Stockpiles will be seeded where necessary to prevent weed growth
- Topsoil will not be used for bedding or padding material, or for trench breakers/plugs
- During handling, damage to topsoil structure will be avoided
- Topsoil handling under rainy conditions will be avoided for soils with a high clay content or specifically wet conditions

7.2 SUBSOIL REMOVAL AND STORAGE

Subsoil will be managed so that it does not contribute directly or indirectly to excessive erosion. The following principles apply for removal and storage of sub-soil:

- Subsoil will be excavated from the pipe trench and, in some cases, additionally from cutting of benches on sides of slopes
- Subsoil will be stored separately from topsoil, and will not be mixed
- Subsoil will be returned to the excavated area, as far as practicable

- Subsoil which cannot be re-used, ie returned to the trench or corridor ROW, will be placed in stockpiles
- Stockpiles will be stable from collapse and drain freely
- Drainage will be provided to manage appropriately the water and sediment loads running off the subsoil stockpiles (eg gaps, flumes, etc)
- Disposal of excess subsoil is discussed in the section 7.3

7.3 TRENCH EXCAVATION AND PIPELINE PADDING

The creation of excess excavated material will be minimized as far as practicable. Excess material will be recovered and re-used to the greatest extent possible.

Fill materials will not be imported unless it is demonstrated that:

- such fill is technically necessary and/or
- online processing is technically infeasible or uneconomic; and that
- suitable backfill cannot be provided by excavation techniques

Priorities for managing excess material are as follows:

1st priority: ROW Re-use:

Where generated spoil is suitable for use as a construction material it will be re-used on the ROW for project infrastructure works materials; stability, erosion control, worker camps, AGIs, etc.

2nd priority: ROW / Project-Area Disposal:

- Use in project areas eg simulation of rock streams / glaciers in adjacent areas, hillside contour blending
- Localised increase in finished surface height of ROW
- Increase in finished surface height of AGIs

All disposal/re-use in the project areas will be done without environmental impact to off-project areas.

3rd priority Off ROW Re-use:

Transfer to third Party for re-use purposes as raw or semi-finished materials, eg crushed andesite that may be suitable for road construction materials or for rail ballast.

4th priority: Off ROW Disposal:

Potential disposal sites have been identified, and an operating permit will be required in case they are selected by the contractor. The contractor will plan, develop, operate and reinstate those sites to international standards. Alternatively, the contractor may propose other sites for approval. The contractor will be responsible for the technical and environmental assessment of such sites and for obtaining regulatory approval for alternative sites.

In principle, excess material will not be disposed of in the following area:

- in environmentally sensitive areas (except with prior project approval)
- in areas adjacent to special agricultural sections
- in watercourses or valley bottoms

- in windrows over the pipe
- on side slopes below benches or ridge cuttings where the side slope exceeds 45°
- where they will potentially interrupt concentrated overland flow
- in such a way as to cause unacceptable landscape (visual) impact
- on any open area where the slope exceeds 30°

Sites for the disposal of excess excavated material will, in general, comply with the requirements for 'Inert' waste disposal sites. However, provided a number of conditions are met, a reduced specification for the design of the site may apply. Conditions include the requirement that the site be stable and appropriately drained, with only natural materials deposited; and the transport vehicles do not transport other type of waste.

7.4 REINSTATEMENT OF SOILS

7.4.1 Reinstatement of subsoil

Two situations are considered: standard reinstatement and special reinstatement.

• Standard reinstatement

On return of the subsoil to the trench or ROW, the subsoil will be compacted to levels similar to the adjacent undisturbed area. The depth of subsoil after settlement will not be above the level of the surrounding ground. After the subsoil has been returned and the land levelled, the subsoil will be ripped to a depth of 350-400mm, rendered to a loose and workable condition and contoured in keeping with the adjacent undisturbed ground.

• Special Area reinstatement

Special Area Reinstatement is applied where it has been necessary to cut a bench into the hillside in order to lay the pipe and the intention is to restore the original contours by filling-in the bench, thereby removing any visual impact in the landscape. Locations where this is required relate to defined environmentally sensitive areas and special agricultural areas.

Upon completion of reinstatement of subsoil, disturbed areas will be inspected jointly by the contractor and the project for slope stability, relief, topographic diversity, acceptable surface water drainage capabilities, and compaction.

7.4.2 Reinstatement of topsoil

Topsoil will not be mixed with spoil material during replacement. Only topsoil (and equivalent materials as permitted by this specification) will be re-spread over the surface. Topsoil will not be used for bedding material in the trench, and topsoil from unstripped/undisturbed areas will not be used to cover adjacent disturbances. Topsoil will not be handled under wet conditions or at times when the ground or topsoil are frozen.

All disturbed areas will be subject to final grading; however, measures will be taken prior to seeding to ensure disturbed areas remain in sufficiently rough condition to protect the stability of topsoil after its re-distribution and to promote vegetation growth.

7.5 TEMPORARY EROSION CONTROL MEASURES

7.5.1 General

Temporary erosion control measures to be installed to maintain stability, minimise erosion and washout, and protect watercourses include:

- Flow breakers, or plugs of material (hard and soft), will be left in or installed at appropriate intervals, for trenches on longitudinal slopes to prevent scouring of the trench bottom
- Water bars will be constructed on the ROW as necessary to control surface water runoff and erosion. Water bars will be designed to simulate the slope contour and direct and diffuse surface water away from the disturbed area
- Flumes or other similar methods will be used to allow drainage and migration of water where cross drainage is necessary (ie where slopes require cutting
- The ROW will be monitored for:
 - Subsidence of the pipeline trench
 - Slope wash
 - Slumping and soil movements
 - Loss of stored topsoil, subsoil or cuttings
 - Status and success of re-vegetation
 - Areas of disturbed ground off the ROW

If it is necessary to demobilise from any route section due to the onset of winter weather, temporary erosion control measures required to stabilise the ROW during the entire demobilisation period will be installed where appropriate.

7.5.2 Erosion matting

Erosion matting will be installed to provide an immediate protection to the slope against erosion, prevent washing-out of seeds and enhance the micro-climatic conditions in the soil for plant germination and growth.

Once installed, erosion mats will be regularly inspected for degradation and installation integrity. Mats will be maintained and replaced as required to achieve reinstatement objectives.

7.5.3 Sediment control

Where the ROW intersects or is parallel to an environmental receptor (eg watercourse, wetland, water body or other sensitive area), sediment controls will be installed to prevent sediment and runoff significantly affecting the receptor. Sediment control will be used and maintained until ROW has been stabilized and meets project requirements.

Sediment interception devices include:

• Silt Fences – installed in areas of low sheet flow

- Straw Bale Barriers installed in areas where small amounts of temporary sediment interception are required
- Filter Berms installed where there is a requirement to temporarily retain runoff water after a storm event, allowing sediment to settle
- Sediment Traps installed as required in the following locations: at outlets of ROW drainage systems; at the outlet of any structure which concentrates sediment-laden runoff and above a storm water drain which is in line to receive sediment-laden runoff

7.5.4 Soil-cuttings control

Side casting of soil cuttings is the traditional method of managing soil excavated from the ROW and trench. Wooden fences will be installed in areas of side slope and ridge construction to retain these cuttings within a reasonable project footprint during construction, and will aid reinstatement of the ROW. Fences will be designed for the anticipated loads to minimise risks to workers and the environment, and will be removed during final reinstatement of the ROW.

7.6 PERMANENT EROSION CONTROL DEVICES

Permanent erosion control measures to be installed to maintain stability, minimise erosion and washout, and protect the environment are outlined in this section.

7.6.1 Diverter berms

Diverter berms are placed across the slope of the ROW to intercept runoff and convey it to a safe outlet. Berms are constructed according to a detailed specification.

7.6.2 Berm outlets

Water outlets will provide disposal of runoff generated along the ROW. The runoff itself will be managed so as not to cause soil erosion or sediment transportation.

Water outlets will be installed at the end of each diverter berm. These outlets will effectively dissipate the energy of run off from the ROW before taking the water to a disposal point to minimise environmental impact.

7.6.3 Gabions

Gabions and gabion mattresses are used where there is a requirement to form large flexible but permeable structures such as; retaining walls, revetments, and weirs for earth retention. Gabion walls may be constructed and utilised for permanent recovery of the right of way and prevention or stabilisation of landslides that endanger stability of the land.

Gabions structures will be designed and constructed in accordance with the manufacturer's specifications and project approved method statements.

7.6.4 Trench breakers

Trench breakers are installed within the trench at locations along the pipeline route where the natural profiles, drainage patterns, and backfill materials cause the trench to act as a drain. They

may also be required at bases of slopes adjacent to water courses and wetlands and where drainage needs controlling.

7.7 WATERCOURSES

International best practice will be used for constructing watercourse crossings. For significant crossings, in environmentally sensitive or special agricultural sections, special section designs and method statements will be developed and implemented to ensure site-specific environmental and social issues are considered appropriately.

The disturbed portion of the watercourse, the bed and banks, will be returned to preconstruction contours where possible, with backfill over the pipe at least as scour-resistant as the original bed material. Watercourse banks will be stabilised within 48hrs of backfilling.

Erosion and sediment control devices will be installed and maintained until re-vegetation is sufficiently established.

Where unstable channels exist downstream of a pipeline crossing, bed stabilisation work will be carried out appropriate to minimise the risk of bed erosion compromising the integrity of the pipeline.

Watercourse crossings will be inspected regularly until adequate stabilisation has been achieved. After which , routine inspections will be made approximately every three weeks until the end of the maintenance period.

8 **BIO-RESTORATION**

8.1 OBJECTIVES

The objectives are to

- 1) Restore ecological character the variety and distribution pattern of plant species, that existed prior to construction
- 2) Establish sufficient vegetation cover to reduce erosion to Erosion Class 3 or better through restoration of the local plant community

The long-term cover will be the native flora. The strategy for achieving its restoration is to use the natural seed bank contained within the topsoil, supplemented with seeds and transplants of local species as necessary.

8.2 TARGETS

Original percentage cover will be estimated from the contractor's photographic record of the route, or, in case of doubt, by reference to adjacent undisturbed areas. Against this record appropriate targets and timeframes for achieving established growth will be set in agreement with the specialist bio-restoration contractors. Photographs should preferably be taken during spring or summer time.

'Established' means showing an initial healthy growth that would be expected for a particular species. This will minimise surface erosion and provide a sustainable, self-generating plant community under a range of conditions.

Soil, slope, perspective, and climatic conditions all affect rates of growth. Aftercare (watering, weeding, further application of fertiliser, etc) will be carried out during the maintenance period in order to meet the re-vegetation targets.

The bio-restoration progress for each section of the route, and other project areas, will be reported quarterly against the performance criteria agreed. Where the criteria are not met, or it appears that they will not be met within the reasonable timeframes, corrective action will be taken, that may include watering, weeding, over-seeding, fertiliser application, replacement of failed trees, etc.

8.3 SCHEDULING

Bio-restoration work will be carried out during appropriate growing seasons. Sowing or planting will be scheduled for a period that is likely to be followed by sufficient rainfall to promote germination and establishment.

8.4 PROCEDURES FOR BIORESTORATION

Preliminary procedures for seeding and planting have been developed by the project as guidance to the construction contractor. The procedures developed account for the various habitat types such as meadows, as well as specific locations or species that are encountered along the route. However, these are optional and may be developed or substituted for other procedures by the construction contractor. Procedures developed include guidance on:

- Seed storage
- Seed bed preparation
- Seeding/planting rates
- Seeding/planting methods eg trenches, pit planting, slot planting
- Soil additives eg fertilizer
- Watering requirements
- Use of erosion matting
- Optimum planting/seeding times

9 SPECIAL AREAS

Special Areas will be considered separately within the reinstatement plan being developed through method statements. Special areas include:

- **Boulder fields** These comprise two types:
 - (a) very stony areas with boulders or cobbles strewn over the ground with no apparent pattern with patches of soil between on which grass vegetation is found
 - (b) areas of dense stone cover with no or very sparse vegetation and the boulders arranged in streams aligned downslope (rock glaciers) or other types of patterned ground

- Side Slopes & Cuttings at environmentally sensitive locations or special agricultural areas, it is desired that the side slope be restored, as far as practicable to the original contours
- **Special agricultural areas** where canals, or irrigation channels, etc are to be encountered these are to be addressed through land use / system method statements

10 RESTRICTING ACCESS

In order to prevent rutting, subsequent erosion problems, damage to riparian areas, and induced access amplifying eg illegal logging, measures will be taken to prevent unauthorised use of the ROW as a roadway. Access will be blocked, at specific locations defined by the project .

11 HANDOVER AND POST-CONSTRUCTION MAINTENANCE

Before the construction contractor relinquishes responsibility for the reinstated areas to the operating company, the project will:

- carry out a final inspection of all project areas to agree with land owners that the preagreed standards of reinstatement have been met
- should any shortfalls exist the project will carry out remedial work to the satisfaction of the landowners

During the contract maintenance period the project will be responsible for maintaining the standard of reinstatement and ensuring that the stated erosion class and bio-restoration targets are met.

APPENDIX B POLICY AND LEGAL FRAMEWORK

ANNEX II GETTING HSE RIGHT

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APPENDIX E ANNEX I LANDSCAPE ASSESSMENT AND MANAGEMENT PLAN

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Attachment 1: Figures

Attachment 2: Characteristics of Recommended Plants

Appendix E Annex I

Landscape Assessment and Management Plan

1.1 LANDSCAPE ASSESSMENT STUDY

A Landscape Assessment Study was undertaken by Paata Shanshiashvili, a Georgian Landscape Architect, during April – May 2001. The aim of the study was to conduct a field survey of landscapes during the spring months and of the main visual receptors within the Zone of Visual Influence (ZVI) of pipeline construction and permanent pipeline facilities, based on the Preferred Route Corridor from the Georgia-Azerbaijan to Georgia-Turkey border. The ZVI defines the area from which construction activities and facilities can be viewed.

In order to identify the potential impacts on landscape of the construction and operation of the pipeline, the visual survey of landscapes was performed by applying methods of Field Reconnaissance and Expert Assessment (field viewing/ranking).

1.2 METHODOLOGY

The methodology is driven by the following ethical-esthetical criteria:

- natural visual image should be safeguarded wherever possible
- traditional environment including its visual character contains a historic-cultural sense of place and should be conserved during development as far as practicable
- esthetical harmony is a "built in" desire of human kind and that is why rules of composition and sense of beauty should be fully incorporated into any development plan

For the purpose of the field survey, the proposed pipeline corridor was divided into 5 sections:

- Akhaltsikhe
- Bakuriani/Tabatskuri
- Tsalka
- Tetritskaro
- Gardabani

LVU – is a landscape visual (spatial) unit that can be directly observed as a whole from any point within the unit.

LVS – is a landscape visual system. The LVS is determined by the physical geographical characters of the landscapes (e.g. natural boundaries such as mountain ranges and river valleys).

Along the proposed corridor 74 critical points were identified and more than 30 analytical spots points were selected within the LVS. For analytical purposes, more than 100 digital photographs along with video footage were taken from these points. Critical points are virtual points of the pipeline route that are selected to indicate what the pipeline will look like in the field. Most of

the points are visually connected to existing landscape features such as a river or road. Critical points are identified and marked on support maps prior to the field survey.

Critical analytical spots are spots of the landscape within the Landscape Visual System (LVS) that depending on the physical geographical character of landscapes usually extends far beyond the pipeline corridor. The analytical points serve as locations for the visual survey and are studied during field reconnaissance for individual viewing and ranking, with the aim of assessing the ethic-aesthetic potential of landscapes within the LVS.

The landscapes in each section were studied by applying a visual systems model to characterise the spatial structure, visual component/element diversity and visual degree of existing modification/domination. Characteristics of such a systems model include: character of spatial structure, visual diversity (structural diversity, quantity of components and elements), visual degree of modification of spatial structure, components and elements e.g. natural, modified, naturalized, artificial, etc.) and visual domination of space, components and elements.

According to the model, the spatial structure of landscapes is made up of LVU's that form higher spatial aggregates or LVS. The main characteristics of the spatial structure are:

- physical dimensions hierarchy (levels) and density of LVUs
- visual closure
- types of visual connections

The LVU is a spatial unit that reflects dual (discrete and continual) nature of space and is structured as a totality of observation points (i.e. not a single view from a specific point) demarcated from other groups of points.

The methodology is used for the following purposes:

- To identify the ZVI for the proposed pipeline construction and permanent facilities; and
- To define the:

landscape character types; landscape sensitivity; and visual intrusion within the ZVI.

The "landscape character types" within the ZVI are defined with respect to the visual/space structure, the visual diversity and the visual degree of modification. The classification takes into account relevant, inter-related factors such as topography/geomorphology, types of vegetation cover, hydro-graphic network, historic-cultural features and traditional landscape contexts, extent of anthropogenic elements and land-use patterns and scenic/aesthetic quality.

Critical angles of visual perception are optically defined. For example, if the object in horizontal section is so wide and close to the observer that it occupies a view of 120 degrees or more, and if in vertical section the object is so tall and close to the observer that occupies 45 degrees or more, then it can be stated that the observer will have a view full of visual domination. Table 0-1 shows angles that are optically defined by the size of objects and the distance between observer with respect to typical perception fillings.

The following tables show the criteria used to determine the visual intrusion and visibility of the LVUs.

	Full Visual Domination	Partial Visual Domination	Limit of Visual Importance	Limit of Good Visual Legibility	Limit of Practical Visibility
Horizontal Angle	> 120 ⁰	120 ⁰ – 40 ⁰	40 ^o - 18 ^o	1 ^o	5'
Vertical Angle	> 45 °	45 [°] - 18 [°]	18 [°] - 5 [°]	1 ^o	5'

Table 0-1 Horizontal and vertical critical angles of visual perception

Table 0-2 Integral closure matrix

	LVU Closed	LVU Partially Closed	LVU Closure Does Not Exist
Background	Effect of Full Visual	Effect of Full Visual	Effect of Full Visual
Closed	Closure	Closure	Closure
Background	Effect of Full Visual	Effect of Partial	Effect of Partial
Partially Closed	Closure	Visual Closure	Visual Closure
Background Closure Does Not Exist	Effect of Full Visual Closure	Effect of Partial Visual Closure	Effect of Visual Closure Does Not Exist

The landscape sensitivity is assessed through measuring the ethic -esthetical potential related to the scenic quality, naturalness (unspoiled character) and historic -cultural (traditional) context.

The visual intrusion is identified for major static receptors such as settlements, individual dwellings and industrial/agricultural complexes and dynamic routes of visual perception e.g. highways, roads, railways.

1.3 DESCRIPTION OF CONDITIONS

The existing landscape character types within the ZVI along the Preferred Route Corridor are defined in relation to visual/spatial structure, visual diversity and visual degree of modification as a result of human interaction (e.g. settlements, infrastructure, farming practices). The classifications take into account relevant inter-related factors comprising topography/ geomorphology, types of vegetation cover, hydrographic network, historic-cultural features and traditional landscape contexts, extent of anthropogenic elements, land-use patterns and scenic/ aesthetic quality.

The hierarchical model of the spatial structure of the landscapes is formed by LVUs at the lower level and by LVS made up of different LVUs. In the majority of cases, landscapes have a complex, multi-level spatial structure that conditions discrete character of the ZVI. The ZVI of the Preferred Pipeline Corridor in some cases coincides with LVU and mostly is "knitted" within the LVS.

1.3.1 Gardabani section

The LVS in the Gardabani section has a single level spatial structure and includes two subsections: the urban fringe of Rustavi and the Gardabani plain and grassland subsection.

The Gardabani subsection extends from the Georgia-Azerbaijan border to the vicinity of Rustavi. The spatial structure is characterised by prolonged and compact LVUs mainly of between 450m to 2,000 m in size, but with a maximum size of over 2,000m that have mostly partial visual closure and 2 types of visual connections (visual connections with next LVU, visual connections with remote LVU). The LVU density is low. The degree of visual modification is very high. The scenic/aesthetic quality is low.

Major visual receptors include inhabitants of Kalinino, Pabeda, Gardabani, Jandara, Keselo, and Nasarlo, agricultural workers, and drivers and passengers of cars and trains. These receptors are within the ZVI of pipeline construction works and above ground facilities.

The Rustavi subsection extends from the vicinity of the Krtsanisi farm to the vicinity of Rustavi. The spatial structure is characterised by prolonged and compact LVUs of 450 to 2,000m and more than 2,000m of maximum size that have mostly partial visual closure and 2 types of visual connections (visual connections with next LVU, visual connections with remote LVU). The LVU density is low. The degree of visual modification is very high. The scenic/aesthetic quality is extremely low.

Major visual receptors include inhabitants of Akhali Samgori, Rustavi, and Karajalari, agricultural workers, and drivers and passengers of cars. These receptors are within the zone of potential visual intrusion of pipeline construction works and above ground facilities.

1.3.2 Tetritskaro section

The LVS in Tetritskaro section has multi level spatial structure and consists of the Tetritskaro forest subsection and the Kumisi grassland subsection.

The Tetritskaro subsection extends from the vicinity of the village Ivanovka to the vicinity of the town of Tetritskaro. The spatial structure is characterised by compact LVUs of between 0 to 100m and a maximum size of 100-450m that have mostly full and partial visual closure and 4 types of visual connections (visual connections with next LVU, visual connections with next and above LVU, visual connections with next and below LVU, visual connections with remote LVU). The LVU density is high. The degree of visual modification is medium to low. The scenic/aesthetic quality is medium to high.

Major visual receptors in this sub-section include forest workers and drivers and passengers of cars. These receptors are within the zone of potential visual domination of pipeline construction works and above ground facilities.

The Kumisi subsection extends from the vicinity of Tetritskaro to the vicinity of the Krtsanisi farm. The spatial structure is characterized by compact LVUs of between 450-2,000m maximum size that have mostly partial visual closure and all types of visual connections. The LVU density is medium. The degree of visual modification is medium to high. The scenic/aesthetic quality is medium.

Major visual receptors include inhabitants of Samshkvilde, Dagetkhachini, Tsinskaro, Dididurnuki, Pataradurnuki, Jandari, Koda, and Kumisi, agricultural workers, and drivers and passengers of cars and trains. These receptors are within the zone of potential visual intrusion of pipeline construction works.

1.3.3 Tsalka section

The LVSs in the Tsalka section have a multi level spatial structure. The potential ZVI of pipeline construction works along the Preferred Route Corridor covers Tsalka LVS and is discrete.

The Tsalka section does not have subsections. It extends from the vicinity of the village Rekha to the vicinity of the village Ivanovka. The spatial structure is characterised by prolonged and compact LVUs of between 450 and 2,000m with a maximum size of 2,000m that mostly have partial visual closure and 2 types of visual connections (visual connections with next LVU, visual connections with next and above LVU). The LVU density is low. The degree of visual modification is medium to high. The scenic/aesthetic quality is medium.

Major visual receptors include inhabitants of Avranlo, Gumbati, Beshtasheni, Ozni, Ashkala, Djanisi, Oliangi, Kushi, Jinisi, Tsinstkaro, Santa, Edikilisa, Khadiki, Beshtasheni, and Imera, agricultural workers, forest workers and drivers and passengers of cars. These receptors are within the zones of potential visual intrusion and domination of pipeline construction works and above ground facilities.

1.3.4 Borjomi/Bakuriani/Tabatskuri section

The LVSs in Borjomi/Bakuriani/Tabatskuri section have multi-level spatial structures and include the Borjomi/Bakuriani upland subsection and the Tabatskuri upland subsection. The potential ZVI of pipeline construction works along the Preferred Route Corridor covers Borjomi/Bakuriani LVS and Tabatskuri LVS, but is highly discrete. The ethic/aesthetic potential of the landscape section is high and very sensitive.

The Borjomi/Bakuriani subsection extends from the vicinity of the village Tiseli to Tskhratskaro mountain pass. The spatial structure is characterised by compact LVUs of between 100 and 450m size that have predominantly full and partial visual closure and 5 types of visual connections (visual connections with next LVU, visual connections with next and above LVU, visual connections with next and below LVU, visual connections with remote LVU, all types). The LVU density is high. The degree of visual modification is medium to low. The scenic/aesthetic quality is high.

Major visual receptors in this sub-section include inhabitants of Sakire and Tsikhisjvari, agricultural workers in fields, forest workers and drivers and passengers of cars. These receptors are within the zone of potential visual domination of pipeline construction works and above ground facilities.

The Tabatskuri subsection extends from the Tskhratskaro mountain pass to the vicinity of Rekha village. The spatial structure is characterized by compact and prolonged LVUs of between 450 and 2,000m size that have mostly partial visual closure and 4 types of visual connections (visual connections with next LVU, visual connections with next and above LVU, visual connections with next and below LVU, visual connections with remote LVU). The LVU density is medium. The degree of visual modification is medium to low. The scenic/aesthetic quality is high.

Major visual receptors include inhabitants of Tabatskuri, Khando, and Rekha, agricultural workers, forest workers, shepherds and drivers and passengers of cars. These receptors are within the zone of potential visual domination of pipeline construction works.

1.3.5 Akhaltsike section

The LVS in Akahltsikhe section has a multi level spatial structure and consists of the Northern "amphitheatre" (Abastumani/Amagleba uplands) and a Southern (Sapara hills) subsection, the Tkemlana hilly subsection, the Akhaltsikhe/Atskuri plains subsection, and the Vale hilly subsection.

The Abastumani/Amagleba and Sapara subsections are within the areas of potential visual influence of the pipeline construction. The spatial structure is characterised by compact LVUs of between 100 and 450m that have mostly partial visual closure and all types of visual connections. The LVU density is high. The degree of visual modification is low. The scenic/aesthetic quality is medium to high.

There are no major visual receptors in this subsection as fixed points and routes of visual perception are beyond significant pipeline visual connections.

The Tkemlana subsection is spread from River Mtkvari (Kura) in the vicinity of village Tsnisi to the vicinity of the village Tiseli. The spatial structure is characterised by compact LVUs of between 100 and 450m with a maximum size of 450-2,000m that have mostly partial visual closure and all types of visual connections. The LVU density is medium. The degree of visual modification is medium to high. The scenic/aesthetic quality is medium.

Major visual receptors include inhabitants of Giorgitsminda, Persa, Zikilia, Tsinubani, Atskuri, Sakuneti, Tkemlana, Tiseli, agricultural workers in fields, drivers and passengers of cars and trains, and visitors to the southern part of Borjomi-Kharagauli National Park. These receptors are within the zone of potential visual intrusion of the pipe line construction works.

The Akhaltsikhe/Atskuri subsection extends from the River Qvabliani to the River Mtkvari in the vicinity of the village Tsnisi. The spatial structure is characterised by prolonged LVUs of between 450 and 2,000m size that have predominantly partial visual closure and 3 types of visual connections (visual connections with next LVU, visual connections with next and above LVU, visual connections with remote LVU). The LVU density is low. The degree of visual modification is high. The scenic/aesthetic quality is medium (existence of historic cultural context increases the quality of scenery) to low.

Major visual receptors include inhabitants of Skhvilis, Akhaltsikhe, Tskruti, Tsira, Klde, Tsnisi, agricultural workers in fields and drivers and passengers of cars and trains. These receptors are within the zone of potential visual intrusion of pipeline construction works but are mostly beyond the zone of visual domination.

The Vale subsection extends from the Georgia-Turkey border to the River Qvabliani. The spatial structure is characterised by compact LVUs of between 100 and 450m with a maximum size of between 450 and-2000m that have mostly partial visual closure and 4 types of visual connections: visual connections with next LVU, visual connections with next and above LVU, visual connections with next and below LVU, visual connections with remote LVU. The LVU density is medium. The degree of visual modification is medium to high. The scenic/aesthetic quality is medium to low.

Major visual receptors in this sub-section include inhabitants of Vale, Naokhrebi, Tskaltbila, agricultural workers in fields and drivers and passengers of cars and trains. These receptors are

within the zone of potential visual intrusion of above ground facilities and pipeline construction activities, but are beyond the zone of visual domination.

1.4 CONCLUSIONS

Visual intrusion on the landscape as a result of construction activities and the existence of Above Ground Facilities is the dominant landscape impact. The significance of the visual intrusion varies depending on the ethic-esthetic potential of the landscape. The criteria used to determine ethic-esthetic potential and the corresponding potential within pipeline route sections are summarised below.

1.4.1 Spatial structure

The spatial structure of the landscapes along the pipeline route varies significantly. The Borjomi Bakuriani section is the most complex and the Tsalka section is the simplest. The density of LVUs in Borjomi/Bakuriani is 10 whilst in Tsalka it is 1.9. LVUs of large size (from 450 to 2,000m) are only 15% of the total in Borjomi/Bakuriani whilst in Tsalka they are 56% of the total. Six types of visual connections among LVUs occur in the Borjomi/Bakuriani, Akhaltsikhe and Tetritskaro areas whilst only 2 types occur in Tsalka.

1.4.2 Landscape modification

The degree of modification of the landscapes as a result of human activity to date also differs significantly along the route. The Gardabani section is modified to the greatest extent where the landscape is dominated by the Rustavi Power Station and associated infrastructure. The Akhaltsikhe and Tetritskaro sections are less modified and comprise a mix of landscapes modified in varying degrees by human activities. The Borjomi/Bakuriani and Tsalka sections are modified to the least extent and comprise of largely natural landscapes.

1.4.3 Scenic/aesthetic quality

The scenic/aesthetic quality of the landscapes also varies along the route. The Borjomi/Bakuriani Tabatskuri section has the highest scenic value. In the Tetritskaro and Tsalka area the scenic/aesthetic quality is moderate but the area has high potential. The Akhaltsikhe section has moderate scenic/aesthetic quality and moderate potential. The Gardabani section has low scenic value and low potential.

1.4.4 Landscape sensitivity

The most sensitive landscapes are concentrated in the mountainous and forested sections of the corridor. Particularly sensitive landscapes are located in Akhaltsikhe (from the River Quabliani to the Turkish/Georgia border), in Borjomi/Bakuriani/Nariani (from Tiseli village to Rekha village), and in the Tetritskaro forested hills.

The sensitive landscapes have high scenic quality, almost unspoilt visual character and an important historic-cultural context. Therefore, in these areas, the impact of the proposed construction works will be more dramatic.

1.4.5 Visual intrusion

The visually affected LVS of the corridor from east to west is extended throughout Lower Kartli, Trialeti, Tori and Meskheti. The hierarchical model of spatial structure of the landscapes formed by LVUs within the LVS, in the majority of cases have multi level complex character, that conditions the discrete character of the ZVI (ZVI of the Pipeline Corridor in some cases coincides with the LVU and mostly is "knitted" within the LVS).

The extent of the visual intrusion arising as a result of pipeline construction activities varies depending on the nature and relief of the surrounding environment along with the population density in the area. As a result, permanent or temporary visual intrusion is spread throughout the LVS. In particular, major visual receptors are located on the bottom (first) level of the LVS in Akhaltsikhe, Tsalka, Tetritskaro and Gardabani, and on all levels in Borjomi/Bakuriani

1.5 LANDSCAPE PLAN

Environmental assessment and the design of landscaping mitigation measures has taken place in tandem. Feedback and input between the environmental assessment team, the landscape architect and pipeline engineers throughout the project design phase permits sensitive design early in the project and in particular during pipeline routing. This section details general and site specific landscaping recommendations along the ROW and at AGIs.

Visual intrusion along the ROW during construction will be mitigated for through the adoption of a number of measures. Maximum effort will be applied to restore the visual character of the landscape following construction. Grading and benching of the ROW, and subsequent regrading and restoration of original contours will minimise landscape impact. A full reinstatement plan (see Appendix A) will be implemented and will be monitored as part of the pipeline surveillance. Continued erosion control will be implemented through the use of diverter berms, silt fences and trench breakers.

The linear character of the pipeline route will be disguised through the avoidance of side-slopes. Sight-lines will be avoided through the use of dog-legs in the ROW and through the incorporation of scalloped edges to tree-cut-lines.

1.5.1 General recommendations at AGIs

At AGIs, a number of landscape mitigation measures have been put forward by the landscape architect and include:

- No soil, grass, shrubs or trees will be cleared beyond a carefully defined boundary commensurate with construction requirements;
- Within the perimeter of the AGI, consideration will be given to interspersing administration and/or accommodation buildings with open grass cover and, where practicable and where not a safety hazard, shrubs and trees;
- Facility walls will be finished (texture, colour, etc.) and screened with trees and shrubs as appropriate to blend with the surrounding natural landscape.
- Non-natural, visually active and metallic colours and textures will be avoided. Colors sympathetic to the natural landscape will be used, including brown, grey and green colors and very limited black, yellow and red.

• The height and mass of buildings will be minimised, for example by using pitched roofs where possible; Site lighting (where applicable) will be designed and located to reduce off-site glare to a minimum, and minimise the impact on visual amenity at night, having regard to security and safety requirements. Lighting will be soft.

Site specific planting schemes for a number of AGIs are specified below.

1.5.1.1 Pump station 2, Tetritskaro (KP 87)

Table 0-3 P	roposed plan	ting scheme for	PSG2 (20 ha)
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Common Name of Proposed Plants	Latin Name of Proposed Plants	Maximum Height (m)	Planting density/distance between whips (m)
High- Mountainous Oak	Quercus macranthera	18	1.2 – 1.5
Hawthorn	Crataegus spp.	2 – 15	0.8 – 1.2
Dog-rose	Rosa canina	5	1.0 – 1.2

Figure 1 shows a simulated screening effect of the proposed planting scheme. Screening elements (local shrubs and trees) will be planted around the construction area, especially between the access road and the site and between the railway and the site.

1.5.1.2 Pigging station G1 BTC, south-east of Tsikhisjvari (KP 182)

Common Names of Proposed Plants	Latin Name of Proposed plants	Maximum Height (m)	Planting density/distanc e between whips (m)
Beech	Fagus orientalis	40	1.2 – 1.5
Goat Willow	Salix caprea	8	75,000 whips/ha
Hazelnut	Corylus avellana	6	0.6 – 1.0

Table 0-4 Proposed planting scheme for IPS G1 BTC (2 ha)

Refer to Figure 2 for graphical simulation.

1.5.1.3 Block valve stations G-B14 and G-B15, Sakire and Tiseli

The existing pattern of plots of land, fences, and windbreak (shrub/tree) lines will be maintained. Refer to Figure 3 for graphical simulation.

1.5.2 Route corridor sections

1.5.2.1 Recommendations on screening route corridor sections

• When crossing forested areas the ROW width will be reduced

- When crossing forested areas the linear character of the ROW will be "hidden" through irregular planting of trees and shrubs in the middle zone of the corridor and maintaining meadows within forests adjacent to the corridor
- In the Sakire section, the pipeline corridor will be built to maximize reinstatement potential. This could result in two terraces screened behind tree lines that will not contrast with the existing character of landscape pattern, or could result in one reduced ROW.
- The steep slope section at Tskhratskaro will be restored fully including soil, herbaceous cover and shrubs
- The floodplain forest within the 100m corridor of the Mtkvari River crossing will be replanted in accordance with the project replanting scheme.

1.5.2.2 River Mtkvari Crossing 2, KP 221 – KP 222

Common Names of Proposed Plants	Latin Name of Proposed Plants	Maximum Height m	Planting density/distance between whips (m)
Black Poplar	Populus nigra	30 - 40	1.0 – 1.2
Willow	Salix spp.	15	1.1 – 1.3
Tamarisk	Tamarix ramosissima	5	0.7 – 0.9
Sea Buckthorn	Hipopphaë rhamnoides	7	1,100 whips/ha

 Table 0-5 Proposed planting scheme for Mtkvari Crossing 2 (4.5 ha)

Refer to Figure 4 for graphical simulation.

1.5.2.3 Route section KP 182 – KP 183, south-east of Village Tsikhisjvari

The proposed planting scheme covers 7.2 ha.

Table 0-6 Proposed planting scheme for Eastern Part, KP 182 – KP 183

Common Names of Proposed Plants	Latin Name of Proposed Plant	Maximum Height m	Planting density/distance between whips (m)
Pine	Pinus sylvestris	35	10,000 whips/ha
Goat Willow	Salix caprea	8	75,000 whips/ha
Hazelnut	Corylus avellana	6	0.6 – 1.0

Table 0-7 Proposed planting scheme for Western Part, KP 182 – KP 183

Common Names of Proposed Plants	Latin Name of Proposed Plants	Maximum Height m	Planting density/distance between whips (m)
Beech	Fagus orientalis	40	1.2 - 1.5
Goat Willow	Salix caprea	8	75,000 whips/ha
Hazelnut	Corylus avellana	6	0.6 – 1.0

Refer to Figure 5 for graphical simulation of the proposed scheme.

Attachment 1: Figures



APPENDIX EI - LANDSCAPE ASSESSMENT & MANAGEMENT PLAN NOVEMBER 2002 EH12



BTC PROJECT ESIA GEORGIA FINAL ESIA APPENDIX EI - LANDSCAPE ASSESSMENT & MANAGEMENT PLAN NOVEMBER 2002 EH13


APPENDIX EI - LANDSCAPE ASSESSMENT & MANAGEMENT PLAN NOVEMBER 2002 EF14



APPENDIX EI - LANDSCAPE ASSESSMENT & MANAGEMENT PLAN NOVEMBER 2002 EH15



APPENDIX EI - LANDSCAPE ASSESSMENT & MANAGEMENT PLAN NOVEMBER 2002 EF16

Attachment 2: Characteristics of Recommended Plants

Plant Common Name	Latin Name	Standard size of whips (m)	Maximum height (m)	Planting density/distance between whips (m)	
Tetritskaro PS-02					
High-Mountainous	Quercus				
Oak	macranthera	0.1	18	1.2-1.5	
		Propagated by			
Hawthorn	Crataegus spp.	berries	2-7-15		
Dog-rose	Rosa canina	0.1-0.12	5	1.0-1.2	
	Tsikh	nisjvari Forest (east)			
				10,000 per	
Pine	Pinus sylvestris	0.15-0.3	35	hectare	
		shoots fully covered		75,000 per	
Goat Willow	Salix caprea	with soil	8	hectare	
Hazelnut	Corylus avellana	0.3	6	0.6-1.0	
	-	Pigging Station	-		
Beech	Fagus orientalis	0.1	40	1.2-1.5	
		shoots fully covered		75,000 per	
Goat Willow	Salix caprea	with soil	8	hectare	
Hazelnut	Corylus avellana	0.3	6	0.6-1.0	
	Tsikh	isjvari Forest (west)			
Beech	Fagus orientalis	0.1	40	1.2-1.5	
		shoots fully covered		75,000 per	
Goat Willow	Salix caprea	with soil	8	hectare	
Hazelnut	Corylus avellana	0.3	6	0.6-1.0	
		Sakire Forest			
Spruce	Picea orientalis	0.1-0.2	50	1.2-1.5	
	Abies				
Fir	nordmanniana	0.1	80	1.2-1.5	
Hazelnut	Corylus avellana	0.3	6	0.6-1.0	
Dog-rose	Rosa canina	0.1-0.12			
Mtkvari xing					
Black Poplar	Populus nigra	0.1-0.15	30-40	1.0-1.2	
		shoots fully covered			
Willow	Salix spp.	with soil	15		
	Tamarix	shoots fully covered			
Tamarisk	ramosissima	with soil	5	0.7-0.9	
	Hipopphaë				
Sea buckthorn	rhamnoides	0.1	7	1,100 per hectare	



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APPENDIX E ENVIRONMENTAL IMPACTS AND MITIGATION

ANNEX II AIR QUALITY MODELLING STUDY

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ATTACHMENTS

ATTACHMENT 1 – ISOPLETHS

Appendix E Annex II

Air Quality Modelling Study For BTC Crude Oil Pipeline Above Ground Installation

1 INTRODUCTION

The following report presents a dispersion modelling study of the atmospheric emissions resulting from the operation of proposed oil pumping stations in Georgia, associated with the BTC Oil Pipeline Project. The pipeline is expected to begin exporting crude oil from Sangachal (Azerbaijan) in 2004.

Despite all cost effective means of mitigation, significant atmospheric releases are anticipated to be associated with turbine drivers needed to mechanically drive oil pumping plant within Georgia. Two pump stations are proposed in the Georgian section of the pipeline (noted as PS G1 at KP 3.6 and PS G2 at KP 87).

During peak export, it is expected that four mainline oil export pumps will be required (with a fifth pump on standby). To provide suitable mechanical power to the pumps, each will be driven by a duel fuel turbine, which will provide 8MW power. At approximately 27% efficiency, each turbine driver will require the equivalent of 32MW of fuel to operate at maximum load. Each site, therefore, has an aggregated net rated thermal input of 128MW.

To maintain a conservative approach to this assessment, it has been assumed, based upon a reasonable worst case scenario, that turbine drivers will operate on a distillate fuel. However, it is anticipated that should the proposed SCP gas pipeline be constructed within Georgia (expected to begin export in 2006), all turbine drivers will operate on natural gas.

Preliminary dispersion modelling of the operational releases from the proposed thermal power plant has been conducted to determine appropriate stack design for turbine drivers at each site, and assess where additional mitigation may be required to achieve the project specific environmental standards.

2 ATMOSPHERIC RELEASES

The principal releases to the atmosphere resulting from the operation of turbine drivers plant are shown in Table 2-1.

Emission				
Oxides of Nitrogen (NO _x) ^(a)	\checkmark			
Carbon Dioxide (CO ₂)	\checkmark			
Carbon Monoxide (CO)	\checkmark			
Sulphur Dioxide (SO ₂)	\checkmark			
Particulate Matter ^(b)	✓ ^(C)			
Water Vapour	✓ (Invisible)			
Oxygen	\checkmark			
Hydrocarbon Compounds Negligible				
Notes: ^(a) Principally NO, although only NO ₂ requires assessment ^(b) Notably PM ₁₀ ^(c) Not significant where the fuel has a low ash content				

Table 2-1 Principal releases resulting from turbine driver operation

Other infrequent, or minor atmospheric releases, which would not normally require assessment, include:

- Releases from safety relief vents and purges for maintenance
- Nitrogen from maintenance purges

The proposed use of distillate fuel (generated from exported crude by a crude oil topping plant) means that the primary emissions of interest are oxides of nitrogen (NO_x), sulphur dioxide (SO_2) and 'fine' particles (PM_{10}). Carbon monoxide, which is formed by the incomplete combustion of hydrocarbon fuels, would normally be minimised by the careful control of the combustion process and therefore is not considered a principal release in this assessment.

3 ASSESSMENT CRITERIA

There are two sets of standards that must be achieved by the turbine drivers: those associated directly with the emission of polluting substances, and those associated with environmental air quality standards. Appropriate standards for the BTC Oil pipeline project have been defined within the HSE and Social Standards and Guidelines report (Issue A, 25.01.00).

3.1 EMISSIONS LIMITS FOR THERMAL COMBUSTION PLANTS

The proposed combustion plant will comply with guidelines set out in the World Bank Group's 'Pollution Prevention and Abatement Handbook' (2000)' and, with the exception of oxides of nitrogen, EU Emission Limits (Table 3-1).

Pollutant	(mg/Nm ³)		
Oxides of Nitrogen (NO _x) ^(a)	165		
Particulate Matter (PM) (D)	50		
Oxides of Sulphur (SO _x)	850		
Volatile Organic Compounds (VOC)	20		
Carbon Monoxide (CO)	N/A		
Notes:			
^(a) Principally NO, although only NO ₂ requires assessment			
^(b) Notably PM ₁₀			

Table 3-1	Accorement	critoria	for the	thermal	combustion	nlant
Table 3-1	Assessment	criteria	101 une	e thei mai	compusiton	plant

3.2 ENVIRONMENTAL AIR QUALITY STANDARDS

Table 3-2 presents the environmental air quality standards, adopted for this assessment. These standards represent both existing EU standards and EU objectives, set for the protection of human health.

Pollutant	Assessment Criteria (μg/m ³)	Averaging Period	Percentile	
NO ₂ ^(a)	200	1 hour	99.8 th	
	40	Annual mean		
CO ^(b)	11,600	Running 8 hour	100 th	
PM ₁₀ ^(c)	50	24 hour	90.4 th	
	40	Annual mean		
SO ₂ ^(c)	350	1 hour	99.7 th	
	125	24 hour	99.2 th	
Notes: ^(a) EU Directive to be achieved by 31 December 2005 ^(b) EU Directive to be achieved by 31 December 2003 ^(c) EU Directive to be achieved by 31 December 2004				

Table 3-2 EU ambient air quality assessment criteria

4 AMBIENT AIR QUALITY

In order to assess the proposed thermal combustion plants' potential for impact upon the local air quality, it is necessary to determine the existing ambient air quality.

Although no ambient air quality data is available at the time of writing, it is expected, owing to the absence of any major polluting sources, that existing concentrations within the atmospheric boundary layer would be very low, and therefore have not been considered in an additive context with modelled data.

5 INDICATIVE STACK HEIGHTS

Indicative stack heights have been calculated using recognised industrial methods; Technical Guidance Note D1 (1993). The input parameters for each thermal power plant are presented in Table 51 below. D1 provides (approximately) a suitable stack height for a point source. However, the simplistic nature of these calculations should be recognised, and values calculated only form the basis of more accurate dispersion modelling, which is presented in the subsequent sections.

D1 calculations for each plant type have been included with this document as a PDF file. These spreadsheets also present useful information regarding the release characteristics of each plant option.

Input Parameters ^{(a) (b)}			
Exhaust Gas Flow (kg/s)	34.7		
Temperature of exhaust gas (K)	784		
Moisture Content of Stack (%)	8.3		
Oxygen Content of Stack (%)	14.4		
SO _x emission (mg/Nm ³) ^(c)	91		
NO _x emission (mg/Nm ³)	165		
PM emission (mg/Nm ³)	18		
CO emission (mg/Nm ³)	64		
Discharge Velocity (m/s) 27.2			
Notes: ^(a) Parameters applicable to one Solar Mars 100 gas turbine (of which there are four active and one standby at each pump station) ^(b) Reference conditions (N): 15% oxygen, dry, 273K, 101.3 kPa ^(c) Based upon a 0.2% suppur content of the fuel.			

Table 5-1 Input parameters for D1 stack height determination

6

INTRODUCTION TO AIR DISPERSION MODELLING

In order to assess the predicted process contribution of the turbine drivers against relevant air quality standards and to optimise the height of each stack associated with the proposed facility, an atmospheric dispersion modelling study has been carried out using the Atmospheric Dispersion Modelling System Version 3 (ADMS) model. This computer-based model predicts the dispersion of operational emissions from a specific source (ie a stack) and the subsequent concentrations over a grid of receptor points.

Using the information contained within a meteorological dataset and appropriate stack discharge parameters, the ADMS model computes the ground level concentrations associated with each hourly value at each point within the specified study area. In combination with its frequency, it also computes the long-term average or percentile ground level concentration at each point.

The values computed at these points can be directly compared to the legislative standards and objectives, and can therefore determine an acceptable stack height for the emission source.

6.1 DISPERSION MODEL INPUT DATA

Input data required for ADMS consists of exhaust gas release characteristics, meteorological conditions and information on nearby structures and local topography.

6.1.1 Exhaust gas release characteristics

Plume dispersion and subsequent maximum ground level concentrations resulting from emissions from the thermal power plant will be governed principally by the following parameters:

•	Meteorological conditions:	eg wind speed, wind direction and depth of the atmospheric boundary layer
•	Temperature of exhaust gas:	a higher exhaust gas temperature will result in the plume possessing a greater thermal buoyancy and improved dispersion
•	Concentration of identified gaseous species in the exhaust gas:	the concentration of the identified emissions will affect the degree of subsequent ground level concentration

BTC PROJECT ESIA GEORGIA FINAL ESIA				
• Volume flow rate of exhaust gas:	 the effect of an increase in volume flow rate will generally be two fold: an increase in mass emission rates and subsequent ground level concentrations an increase in exit velocity which will result in improved plume dispersion 			

ADMS input data for the thermal power plant is summarised in Table 6-1.

Table 6-1 Dispersion model input parameters

Input Parameter	Solar Mars 100		
Internal Stack Diameter (m)	1.9		
Discharge Temperature at Stack Exit (K)	784		
Exit Velocity at Stack Discharge (m/s)	27.15		
Total Volume Flow Rate at Stack Discharge (m ³ /s)	78.8		
Moisture Content of Exhaust Gas (%)	8.28		
Oxygen Content of Exhaust Gas (%)	14.37		
Discharge density (kg/m ³)	0.45		
NO _X Mass Flow (g/s)	4.49		
SO ₂ Mass Flow (g/s) ^(b)	2.48		
PM Mass Flow (g/s)	0.49		
CO Mass Flow (g/s)	1.74		
(a) Parameters shown represent a single turbine (of which four will			
operate simultaneous during peak export, a fifth on standby)			
(b) Based upon 0.2% sulphur content by weight			

6.1.2 Meteorological conditions

For dispersion modelling, a meteorological data set comprising hourly sequential data for a period of 365 days has been obtained from Tbilisi Airport. The data allows the spatial variation of pollutant concentrations, as the plume migrates from the stack, to be explored under a wide range of locally representative conditions.

Meteorological data from Tbilisi was applied for dispersion modelling of both pump station sites. Measurements collected at this station are considered the most appropriate for this study as they have been collected in a climatically similar locality, and offer the best data capture of regionally available data sets.

Wind conditions near to the study site are presented in Figure E-1, as a wind rose. The wind rose shows that there is little deviation, in terms of both wind speed and direction, from the average or typical condition. The prevailing wind direction is north-westerly (300°), with speeds in excess of 8m/s. This suggests that the plume would predominantly disperse in a south-easterly direction (120°).



Figure 1



6.1.3 Structures within the vicinity

The proposed thermal power plant enclosure and other surrounding structures may have an effect on the pattern of plume dispersion and subsequent ground level concentrations. It has been assumed that the only significant structure at the pumping stations would be the 'pump house' (initial modelling runs have demonstrated that site structures of equal to or less than 10 m height do not significantly affect gas dispersion from stacks over 15m in height).

6.1.4 Local topography

Topography may also have a significant influence on the dispersion of emissions and subsequent ground level concentrations. It has been assumed that major topographic al features do not exist at either of the pump station sites. Minor undulation of landforms is accounted for in the definition of 'surface roughness' within the model.

6.1.5 Grid size

The user can define the area over which concentrations will be predicted, in terms of a regular Cartesian Grid. A larger grid size will enable examination of dispersion over a greater area, yet will result in a decrease in the precision of the predicted ground level concentrations. Following initial testing, an optimum grid size of approximately 1.5km² was chosen for this study.

6.1.6 Assumptions

Composition of NO_X generated by turbine plant

During operation of the proposed thermal combustion plant, NO_x will be released to the atmosphere as a result of distillate fuel combustion. In practice, typically 5-10% of the NO_x emitted from turbines is expected to be in the form of NO_2 (the species of interest) at the point of discharge (ie stack exit), the remainder being nitric oxide (NO). NO is a relatively innocuous substance, but it is of interest as a precursor to NO_2 .

Conversion of NO to NO₂ takes place in the atmosphere under the influence of several factors, primarily the availability of ozone (O₃) and atomic oxygen (O). NO reacts with ozone or atomic oxygen forming NO₂, the rate of conversion governed mainly by atmospheric conditions and the degree of availability of atmospheric oxidants.

Conversion of NO to NO₂ is significant with respect to locations within 5-10km of the proposed combustion plant. However, the chemistry of this conversion is complex and subject to many influences, and therefore it is not possible to accurately predict the rate of conversion of NO to NO_2 .

Warren Spring Laboratory Report LR693(AP)M (1993) supports the use of a $NO_x:NO_2$ ratio of 0.5 for power station emissions up to a distance of 50km (beyond which it reverts to 0.85). A study by Janssen (1988) reaches conclusions generally consistent with Warren Spring Laboratory, stating that at a distance of 5km from source (but depending on atmospheric stability, prevailing ozone concentration, wind speed and solar radiation), conversion of NO_2 from NO may vary from less than 20% (stable atmosphere) to up to 50% (unstable atmosphere).

It is therefore considered conservative to assume a $NO_x:NO_2$ conversion ratio of 0.5 within the study area for the assessment of the potential for impact on local air quality (ie 50% of the NO_x released is assumed to be present as NO_2). As this assumption is regarded as being conservative, it is likely to lead to a higher estimation of ground level NO_2 concentration than would occur in practice.

 SO_2

As noted earlier, turbine drivers will operate on a distillate fuel generated from the exported crude by a crude topping plant. Early assays of the mainline crude have indicated that a sulphur content of approximately 0.07% is to be expected, but may (with particular blends of exported crude) be as high as 0.15%. To maintain a reasonable worst case approach, it has been assumed that the distillate fuel for turbine drivers will have a sulphur content of 0.2%

7 TURBINE DRIVER STACK HEIGHT

Indicative stack heights have been calculated using Technical Guidance Note D1 (1993). D1 provides (approximately) a suitable stack height for a point source. However, the simplistic nature of these calculations should be recognised, and the values calculated only provide a starting point for more accurate dispersion modelling.

Consequent confirmation of stack heights indicated by D1 calculations has indicated that a stack height of 28m above ground level for each turbine driver provides appropriate dispersion of emissions (as discussed in the following Section).

8 DISPERSION MODELLING RESULTS

8.1 SHORT TERM CONCENTRATIONS

Table 8-1 presents the short-term modelled ground level concentrations of study species, resulting from two thermal combustion plants located in Georgia, PSG1 and PSG2. The proposed stack height of 28m for each turbine provides ground level concentrations of modelled species, which comply with EU short-term standards and objectives. The isopleths (ie, patterns of dispersion) are displayed in Attachment 1.

Pollutant	Maximum Modelled Concentration (μg/m ³)		Assessment Criteria (μg/m³)	Averaging Period	Percentile			
	PS G1	PS G2						
NO ₂ ^(a)	136	127	200	1 hour	99.8 th			
CO ^(b)	91	87	11,600	Running 8 hour	100 th			
PM ₁₀ ^(c)	5	5	50	24 hour	90.4 th			
SO ₂ ^(c)	138 57	138 53	350 125	1 hour 24 hour	99.7 th 99.2 th			
Notes: ^(a) EU Directive to be achieved by 31 December 2005 ^(b) EU Directive to be achieved by 31 December 2003 ^(c) EU Directive to be achieved by 31 December 2004								

Table 8-1 Short-term dispersion modelling results

8.2 LONG TERM CONCENTRATIONS

Table 8-2 presents the long-term dispersion modelling results for the two thermal combustion plants located in Georgia, PS G1 and PS G2. Similarly, a stack height of 28m for each turbine provides ground level concentrations of modelled species, which comply with current and proposed EU standards. The isopleths are displayed in Attachment 1.

Table 8-2	Long-term	dispersion	modelling results
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Pollutant	Maximum Modelled Concentration (μg/m³)		Assessment Criteria (µg/m³)	Averaging Period	Percentile			
	PS G1	PS G2						
NO ₂ ^(a)	15	8	40	Annual	Mean			
PM ₁₀ ^(b)	2	2	40	Annual	Mean			
Notes: ^(a) EU Directive to be achieved by 31 December 2005 ^(b) EU Directive to be achieved by 31 December 2004								

9 CONCLUSION

Atmospheric emissions for turbine drivers from two proposed pumping stations in Georgia, have been calculated and suitable stack heights proposed. D1 Stack height determination methodology was used to attain initial stack heights, followed by atmospheric dispersion modelling to ensure compliance with EU air quality standards and objectives. Stack heights are as follows:

- Pump Station 1 (PS G1): **28 metres** above ground level, for all Solar Mars 100 gas turbines
- Pump Station 2 (PS G2): **28 metres** above ground level, for all Solar Mars 100 gas turbines

ATTACHMENT 1 - ISOPLETHS Pump Station PS G1

Hourly 99.8th percentile nitrogen oxide concentrations for pump station PS G1 (KP 3.6)



Note: NO₂ assumed to represent 50% of the modelled concentration above.





Note: NO₂ assumed to represent 50% of the modelled concentration above.







Daily 99.2th percentile sulphur dioxide concentrations for pump station PS G1 (KP 3.6)











Running 8 hour mean carbon monoxide concentrations for pump station PS G1 (KP 3.6)

Pump Station PS G2



Hourly 99.8^{th} percentile nitrogen oxide concentrations for pump station PS G2 (KP 87)

Note: NO₂ assumed to represent 50% of the modelled concentration above.



Mean annual nitrogen oxide concentrations for pump station PS G2 (KP 87)

Note: NO_2 assumed to represent 50% of the modelled concentration above.









Mean hourly particulate matter concentrations for pump station PS G2 (KP 87)





Daily 90.4th percentile particulate matter concentrations for pump station PS G2 (KP 87)





APPENDIX B POLICY AND LEGAL FRAMEWORK

ANNEX I GEORGIA HGA APPENDIX 3 PART 3 ANNEX II GETTING HSE RIGHT

Appendix B Annex I

Georgia HGA Appendix 3 Part 3

ENVIRONMENTAL STANDARDS

- 3.1 With respect to minimising potential disturbances to the environment, including the surface, subsurface, sea, air, watercourses and reservoirs, lakes, flora, fauna, landscapes, ecosystems and other natural resources and property, the MEP Participants shall, in conducting all Pipeline Activities and with respect to the Facilities, conform to the environmental standards and practices set forth in this Appendix 3 as well as those generally observed by the international community with respect to Petroleum pipeline projects comparable to the Project, but in no event shall such environmental standards and practices be less stringent than the relevant standards and practices applied in the Netherlands (and, with respect to mountainous and earthquake-prone terrain as well as whenever the Netherlands has no relevant standard or practice, the relevant standards or practices, if any, of Austria) in respect of comparable projects (the "Environmental Standards"). For the avoidance of doubt, whenever the Environmental Standards refer to or are drawn from the standards and practices of any particular country or jurisdiction (such as the Netherlands or Austria), those environmental standards and practices:
 - do not include the laws of that country or jurisdiction defining or establishing the legal standard of liability (such as negligence, strict liability or the like) of Persons for harm arising from any environmental events, occurrences or noncompliance, it being agreed that the provisions of the Agreement (including, in particular, Articles 10 and 12) relating to what constitutes, and the consequences of, the MEP Participants' breach of obligations shall apply;
 - (ii) do not include the regulatory administrative structure or procedures (including those for licensing, permitting and regulatory approvals) of that country or jurisdiction, it being agreed that the regulatory administrative structure and procedures, including environmental permitting as set forth in Section 7.3 of the Agreement, of Georgia shall apply;
 - (iii) in those instances in which the particular environmental standard or practice assumes or is based upon technical standards or practices of a country or jurisdiction which are not identical or comparable to the Applicable Technical Standards, the MEP Participants shall either (a) follow those standards and practices which are compatible with the Applicable Technical Standards in order to achieve environmental protections substantially comparable to those of the country or jurisdiction or (b) comply with such country or jurisdiction's environmental standard or practice to the extent reasonably practicable under the circumstances, taking into account the use of the Applicable Technical Standards; and
- (iv) do not include environmental standards and practices beyond those applicable to Petroleum pipelines and pipeline operations.
- 3.2 The MEP Participants shall promptly notify the Government of all emergencies and other events (including explosions, leaks, and spills) occurring in relation to Pipeline Activities that result in or threaten serious personal injury, loss of life, or significant damage to the environment or property. Such notice shall include a summary description of the circumstances, and steps taken and planned by the MEP Participants to control and remedy the situation. The MEP Participants shall provide such additional reports to the Government as are necessary to keep it apprised of the effects of such events and the course of all actions taken to prevent further loss and to mitigate deleterious effects. At the Government's sole cost, risk and expense, and in a manner which does not interfere with the MEP Participants' activities undertaken in response to an emergency or other event as herein described, the designated representative(s) of the Government shall have the right to visit the scene and monitor the responsive or remedial activities of the MEP Participants to confirm compliance with this Code of Practice and the Agreement to which this Code of Practice is appended.
- 3.3 If any regional or intergovernmental authority having jurisdiction enacts or promulgates environmental standards or practices relating to the Facilities, Pipeline Activities or areas where Pipeline Activities occur, the MEP Participants and the Government will confer respecting the possible impact thereof on the Project, but in no event shall the Project be subject to any such environmental standards or practices to the extent they are different from, in addition to, or more stringent than the Environmental Standards.
- 3.4 Prior to the selection of the general location of the Facilities, a review of environmental conditions and the potential risks to the environment associated with Pipeline Activities shall be completed. This will consist of a scoping study and a risk assessment. The scoping study will be the basis for the environmental impact assessment ("EIA") further described in Section 3.6 hereof. The risk assessment will serve to highlight potential risks and costs impacts to the engineering design requirements of the Project.
- 3.5 After completion of the scoping study and risk assessment described in Section 3.4, the MEP Participants shall cause to be conducted a contaminated land baseline study (the "Baseline Study") to provide a qualitative assessment of the existing pollution and contamination in the areas within the Territory relevant to Pipeline Activities as of the Effective Date. The Baseline Study shall include:
 - (i) a desk study review of the relevant and available information;
 - (ii) an audit of relevant existing operations and practices and the collection of relevant environmental data from the areas surrounding the location of the Facilities, including information on:
 - (a) surface and subsurface geology;
 - (b) geomorphology;
 - (c) rock permeability and the presence of aquifers;
 - (d) assessment of existing quality of surface waters;

- (e) the effect of any existing contamination on flora, fauna, landscapes and ecosystems; and
- (f) a qualitative assessment of any pollution, environmental damage and contamination in respect of the Facilities.
- 3.6 Upon completion of the Baseline Study, the MEP Participants shall cause an EIA of Pipeline Activities and associated operations to be conducted with respect to potential environmental impacts to the Territory (whether from Pipeline Activities within or without the Territory). The EIA shall include:
 - (i) a project description;
 - (ii) an environmental and socio-economic description of the relevant areas of possible impact;
 - (iii) an evaluation of impact to the environment of the proposed construction and operation of the Facilities, including an estimate of those emissions and discharges into the environment (eg, associated air emissions, aqueous discharges and solid waste produced) that are reasonably foreseeable;
 - (iv) a plan for the identification and implementation of practicable mitigation measures for each identified impact;
 - (v) an assessment of the environmental risks associated with Pipeline Activities; and
 - (vi) the formulation of a monitoring programme to verify that mitigation measures are effective, and in the event that additional impacts are identified to ensure that additional appropriate mitigation measures are effected; provided, however, that said monitoring programme shall provide for Government participation at the Government's sole cost, risk and expense, which participation shall not interfere with Project Activities; and provided further, that in recognition that the Government will be conducting its own monitoring of the Project to assure environmental compliance, the MEP Participants will cooperate with the Government in respect of such Project monitoring, but the foregoing general duty of cooperation shall not vary any terms of the Agreement (including its Appendices).
- 3.7 Prior to the completion of the Facilities and in relation to Pipeline Activities, a plan for Petroleum spill response capability ("Spill Response Plan") as to spills within or that could affect the Territory will be created and implemented by the MEP Participants. The Spill Response Plan will include:
 - (i) environmental mapping of habitats vulnerable to potential Petroleum spills in the entire MEP System;
 - (ii) situational scenarios of potential spillages and responses, taking into consideration local circumstances;
 - (iii) plans for the provision of relevant Petroleum spill clean up equipment, materials and services;

- (iv) plans for the deployment of relevant equipment and emergency response notification details of the organisation required to handle Petroleum spill response; and
- (v) plans for the treatment and disposal of resulting contaminated materials.
- 3.8 Each of the scoping study, risk assessment, Baseline Study, EIA and Spill Response Plan (collectively, the "Environmental Strategy Product") shall be prepared by one or more recognised independent international environmental consulting firms selected by the MEP Participants and approved by the Government, such approval not to be unreasonably withheld or delayed. In this regard, the MEP Participants' choice for the recognised independent international environmental consulting firm shall be deemed approved by the Government if, by not later than twenty (20) days after such choice is notified to the Government, the MEP Participants have received no written objection (with the reason(s) for any such objection fully set forth) to their choice. The costs of the items constituting the Environmental Strategy Product, and implementation of the environmental strategy reflected in the EIA and the Spill Response Plan, shall be borne by the MEP Participants except that the Government shall be liable for all costs associated with its official and technical representatives.
- 3.9 The development and completion of the Baseline Study, the EIA and the Spill Response Plan shall be subject to the following procedures to ensure that they represent implementation of an appropriate environmental strategy with respect to the Project:
 - (i) The consulting firm(s) involved and representatives of the MEP Participants shall, at the request of the Government, consult with the official and technical representatives of the Government, at reasonable times and places, during the preparation of the Baseline Study, the EIA and the Spill Response Plan.
 - (ii) The Baseline Study, the EIA and the Spill Response Plan shall each be subject to approval of the Government in accordance with the following procedures:
 - (a) The Baseline Study, the EIA (with executive summary demonstrating adequate response to public concerns, as described below) and the Spill Response Plan shall each be submitted to the Government upon its completion, which completion of the Baseline Study and EIA shall be prior to commencement of construction activities and provided that the MEP Participants shall provide the Government no less than thirty (30) days prior notice before making any such submission(s). The Government shall approve each such item if it satisfies the requirements of this Appendix 3.
 - (b) If the Government requires clarification of any portion of the Baseline Study, the EIA or the Spill Response Plan, or determines that it has not satisfied the requirements of this Appendix 3, it shall submit its specific concerns or questions to the MEP Participants in writing within thirty (30) days of receipt of the item in question.

- (c) The Baseline Study, the EIA or the Spill Response Plan, as the case may be, shall be deemed approved by the Government if, within thirty (30) days after having been submitted to the Government, the MEP Participants have received no written submission of additional concerns or questions. If the Government submits specific concerns or questions, the item in question shall be deemed approved if, within thirty (30) days after the response to such concerns or questions is submitted to the Government, the MEP Participants have received no written submission of concerns or questions with respect to such response.
- (d) If the Government disapproves of any of the Baseline Study, the EIA or the Spill Response Plan and the MEP Participants believe that the Government has unreasonably withheld its acceptance, then the MEP Participants shall so notify the Government and the Parties shall attempt to amicably resolve any dispute. Failing resolution of any such dispute within fifteen (15) days of the receipt of such notice by the Government, the MEP Participants may cause the dispute to be resolved in accordance with the provisions of Article 17 of the Agreement.
- (iii) The EIA shall be subjected to public review and comment in accordance with the following procedures:
 - (a) Affected public and non-governmental organisations will be notified about the nature of the operation of the Facilities during the development of the EIA through dissemination of information to these organisations through meetings and exhibitions.
 - (b) Following the completion of the EIA, the public will be provided with information on the environmental aspects of the Project to enable it to comment with respect thereto. To facilitate this process the EIA and an executive summary (in the Georgian language) will be made available in a public place for review and comments; additionally an information copy of the executive summary shall be submitted simultaneously to the Government.
 - (c) A maximum of sixty (60) days will be allowed for public comments, which will be provided to the Government by the MEP Participants within thirty (30) days after the expiration of said sixty (60)-day period. Demonstration that the MEP Participants have reasonably addressed public concerns (through modification of the EIA, if necessary) will be included in a final executive summary that will be submitted to the Government.

- 3.10 Creation of the Environmental Strategy Product shall include and take account of and implementation of the environmental strategy reflected therein shall be in accordance with, the Environmental Standards and shall take into account the Applicable Technical Standards, as appropriate. Creation of the EIA shall also be in accordance with the principles of EC Directive 85/337/EEC (as amended by EC Directive 97/11/EC) and its conclusions will be based upon the following general environmental principles:
 - (i) there shall be no discharging of Petroleum;
 - (ii) waste Petroleum, sludge, pigging wastes, polluted ballast waters and other wastes will either be recycled, treated, burned, or buried employing the best practicable environmental option;
 - (iii) all waste streams will be disposed of in an acceptable manner and concentration; and
 - (iv) emission monitoring programs will be developed to ensure environmental compliance.
- 3.11 Once approved by the Government, the MEP Participants shall implement the mitigation and monitoring activities specified in the EIA. The results shall be published in reports available to the public and submitted to the appropriate State Authorities. The EIA monitoring programme shall be updated as required on an informal basis. Any disputes respecting the contents or implementation of the EIA monitoring programme shall be resolved in accordance with the provisions of Article 17 of the Agreement.
- 3.12 Any dispute as to implementation of the environmental strategy reflected in the Environmental Strategy Product shall be resolved in accordance with the provisions of Article 17 of the Agreement.
- 3.13 Without limiting the generality of Article 10 or Article 12 of the Agreement, the MEP Participants shall not be liable for any environmental pollution or contamination, damage, or other conditions if and to the extent the same were in existence on the Effective Date, which shall be deemed to include all conditions identified in the Baseline Study. The foregoing shall not preclude the MEP Participants from later establishing, through one or more subsequent studies prepared under the procedures applicable to the Baseline Study, the existence as of the Effective Date of other such conditions not identified by the Baseline Study, it being recognised that no study can be expected to identify all conditions that may exist.
- 3.14 By not later than thirty (30) days after any termination of this Agreement, the MEP Participants shall provide to the Government a written plan describing the proposed actions to be taken by them associated with the abandonment or other disposition of the Facilities (the "Abandonment Plan"). The Abandonment Plan shall address, among other things:
 - a) the removal of all surface installations;

- b) the clearance of all waterways and marine areas of material and equipment posing a navigational hazard;
- c) the drainage and proper disposition of any remaining Petroleum in the Facilities;
- d) the extent the MEP Participants do not plan to remove and salvage said
- e) to the extent the MEP Participants do not plan to remove and salvage said pipelines, the filling of all abandoned pipeline located offshore or underwater with water or inert material, the sealing of such pipelines at the ends and the taking of such other action as may be reasonably necessary in order to result in any abandoned facilities being left in an environmentally safe condition;
- f) the filling of all trenches, holes, and other surface depressions left by the removal of surface installations and such underground pipelines and installations as are removed by the MEP Participants for salvage;
- g) the revegetation of the Pipeline Corridor consistent with the terrain features and other prevailing conditions in the subject area; and
- h) the manner and techniques to be employed in accomplishing the foregoing activities consistent with the Environmental, Health and Safety Standards and/or Technical Standards, as applicable.

The Abandonment Plan shall be subject to approval by the Government, which approval shall not be unreasonably withheld or delayed. The Abandonment Plan shall be deemed approved by the Government if, within ninety (90) days after having been submitted to the Government, the MEP Participants have received no written submission of concerns or questions. If the Government submits specific concerns or questions, the MEP Participants shall respond to same in writing and the Abandonment Plan, as same may have been adjusted or modified by said response, shall be deemed approved if, within thirty (30) days after the response to such concerns or questions is submitted to the Government, the MEP Participants have received no written submission of concerns or questions with respect to such response. If the Government disapproves of the Abandonment Plan and the MEP Participants believe that the Government has unreasonably withheld its acceptance, then the MEP Participants shall so notify the Government and the Parties shall attempt to amicably resolve any dispute. Failing resolution of any such dispute within thirty (30) days of receipt of such notice by the Government, the MEP Participants may cause the dispute to be resolved in accordance with the provisions of Article 17 of the Agreement. Once the Abandonment Plan has been approved or all disputes respecting same resolved, by not later than thirty-six (36) months after the later of the date of termination of this Agreement or approval by the Government of the Abandonment Plan, the MEP Participants shall be obligated to accomplish the abandonment of the Facilities in accordance with the Abandonment Plan. Said abandonment obligations are hereinafter referred to as the "Abandonment Obligations."

3.15 Within thirty (30) days after the Government's approval of the Abandonment Plan, as provided in Section 3.14 of Appendix 3, in order to financially secure their Abandonment Obligations hereunder and without impairing their obligation to perform same, the MEP Participants shall provide the Government one or more irrevocable direct pay letters of credit (collectively, the "Letter of Credit"). The Letter of Credit shall (i) be in an aggregate amount to be reasonably agreed by the MEP Participants and the Government as a component of the Abandonment Plan, (ii) be issued to the Government by a financial institution(s) having a long-term unsecured senior debt rating of at least "A" or its equivalent by Standard & Poor's Corporation, a division of the McGraw-Hill Companies, or "A2" or its equivalent by Moody's Investors' Service, Inc. at the time of issuance, or be otherwise acceptable to the Government (the "Issuer"), (iii) be in form and substance reasonably acceptable to the Government, (iv) have a minimum term of one (1) year, (v) be for the benefit of the Government, (vi) automatically extend for a term of at least one (1) year or until the full performance in all material respects by the MEP Participants of the Abandonment Obligations and (vii) provide that the Issuer shall provide at least thirty (30) days prior written notice to the Government of any termination or non-renewal of the Letter of Credit. In the event the Abandonment Obligations remain unperformed and any existing Letter of Credit is not replaced by the MEP Participants in accordance with the foregoing procedures (but in an aggregate amount that reflects any reduction of the Letter of Credit for any previous drawings or for any reduction in the amount of estimated remaining Abandonment Obligations) by not later than fifteen (15) days prior to the termination of the existing Letter of Credit, then, in order to assure completion of any Abandonment Obligations which remain outstanding, the Government shall be entitled to draw upon the Letter of Credit as of said fifteenth day prior to the notified termination date thereof up to an amount that is the Government's good faith estimate of the remaining Abandonment Obligations for which the MEP Participants are liable under the Abandonment Plan, subject, however, to reimbursement by the Government to the MEP Participants of the amount, if any, by which the funds so withdrawn by the Government exceed the actual costs incurred by the Government to complete any unfulfilled Abandonment Obligations.

- 3.16 The following provisions shall apply with respect to the obligations of the MEP Participants for environmental matters after termination of this Agreement and performance of the Abandonment Obligations:
 - i. After completion of the Abandonment Obligations the MEP Participants shall cause an environmental assessment similar in scope to, and prepared in accordance with the same standards as are applicable to, the Baseline Study (the "Preliminary Exit Study") to be prepared by a recognised independent international environmental consulting firm selected by the MEP Participants and approved by the Government, such approval not to be unreasonably withheld or delayed. In this regard, the MEP Participants' choice for the recognised independent international consulting firm shall be deemed approved by the Government if, by not later than twenty (20) days after such choice is notified to the Government, the MEP Participants have received no written objection (with the reason(s) for any such objection fully set forth) to their choice. If the Preliminary Exit Study is prepared at the request of the Government as contemplated above, it shall be delivered to the

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Government within one hundred eighty (180) days after performance of the Abandonment Obligations.

- ii. Once such study is prepared and delivered to the Government, it shall be subject to approval by the Government, which approval shall not be unreasonably withheld or delayed. The Preliminary Exit Study shall be deemed approved by the Government if, within thirty (30) days after having been submitted to the Government, the MEP Participants have received no written submission of concerns or questions. If the Government submits specific concerns or questions, the Preliminary Exit Study shall be deemed approved if, within thirty (30) days after the response to such concerns or questions is submitted to the Government, the MEP Participants have received no written submission of concerns or questions with respect to such response. If the Government disapproves of the Preliminary Exit Study and the MEP Participants believe that the Government has unreasonably withheld its acceptance, then the MEP Participants shall so notify the Government and the Parties shall attempt to amicably resolve any dispute. Failing resolution of any such dispute within thirty (30) days of the receipt of such notice by the Government, the MEP Participants may cause the dispute to be resolved in accordance with the provisions of Article 17 of the Agreement.
- Once the Preliminary Exit Study is approved or all disputes respecting iii. same are resolved, the MEP Participants shall be obligated to continue to monitor those areas where Pipeline Activities occurred in order to identify and remediate those adverse environmental impacts related to Pipeline Activities which may subsequently become evident. Such monitoring and remediation obligation shall continue for a period of two (2) years, at which time the above-stated provisions of this Section 3.16 respecting the Preliminary Exit Study shall apply for purposes of preparing a Final Exit Study. Once the Final Exit Study is prepared, submitted for Governmental approval and it has been approved by the Government, then from and after the end of said two-year period and completion of the activities, if any, called for in the Final Exit Study, the MEP Participants shall be released from any liability for environmental impacts with respect to or resulting from the Project and the Government shall indemnify, defend and hold harmless the Project Participants with respect to any claims of any third parties with respect thereto.
- iv. If a Final Exit Study is performed and if said Final Exit Study, as approved by the Government, indicates that there have been no environmental impacts of Pipeline Activities that have not been remediated or otherwise appropriately addressed in accordance with this Appendix 3, or if impacts that are identified are remediated or otherwise appropriately addressed in accordance with such standards and this is reflected in an update to the Final Exit Study, then from and after delivery of the Final Exit Study (as so updated) to the Government, the MEP Participants shall be released from any liability for environmental impacts with respect to or resulting from the Project and the Government shall indemnify, defend and hold harmless the Project Participants with respect to any claims of any third parties with respect thereto.

3.17. In addition to their applicability to the MEP Participants, the provisions of this Appendix 3 shall apply with respect to each Project Participant other than an MEP Participant, and all of its actions, to the extent such actions constitute conduct or performance of Pipeline Activities.



getting HSE right

a guide for BP managers

March 2001

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Amendment Number	Date	Section / Topic	Authorised by
Issue 1.1	8 Jan 99	-	P Elliot
Issue 1.2	8 May 99	Minor changes to align with printed (hard copy) version	P Elliot
Issue 1.3	March 2001	Minor changes; company name amended to 'BP'	L Callard

Getting HSE right

A guide for BP managers

Introduction

Our goals...

BP will be distinctive worldwide in our pursuit and attainment of health, safety and environmental performance. BP's Commitment to HSE Performance is one of the five Group Business Policies (Ethical Conduct, Employees, Relationships, HSE Performance, Control and Finance). It is our pledge to demonstrate respect for the natural environment and to work to achieve our goals of no accidents, no harm to people and no damage to the environment.

How we achieve them...

This Guide describes the BP HSE Management System Framework and the Key Processes which support the HSE Expectations to be adopted by all BP managers. These encompass the complete spectrum of health, safety and environmental risk management including personal security, technical/operational integrity of facilities and equipment, and product stewardship. They are the boundaries within which all BP managers must operate.

All Business Unit leaders (in BP Chemicals multi-business sites, the Works General Manager) must communicate the HSE Expectations to their teams and are accountable for delivery of HSE performance. Each business unit shall have documented systems in place to meet the Expectations, including justification, where necessary why certain Expectations are not applicable to that Business Unit.

What is the prize...?

Effective management processes that fulfil the intent of the HSE expectations will result in enhanced business unit performance, protection of our group reputation, improvement of our liability profile, and a distinctive leadership position in our industry and the world.

What the Framework provides...

The HSE management system framework provides a broad-based set of Expectations integrated into thirteen elements of accountability. This framework will help line managers focus on critical HSE needs, forecast and allocate resources, set direction for HSE activities, and consistently deliver improved HSE performance.

It is the Group's intent that these Expectations receive full Business Unit support in order to build a management system designed around the 'Plan-Perform-Measure-Improve' cycle (*Figure 1*). Management systems are the *people* and *integrated* processes that meet these Expectations and deliver desired, consistent business performance. All components of the management system, including setting the level of business performance, are controlled by the Business Unit. They have the authority to satisfy the thirteen elements with existing processes, programmes and systems (e.g. ISRS, ISO, etc.) as long as conformance with the Expectations can be demonstrated.



Figure 1 Continuous Improvement - BP's HSE Management System Framework

How this fits into the whole picture...

The HSE Management System Framework links to the BP Commitment to Health, Safety and Environmental Performance (*Figure 2*). The framework in turn drives the development and implementation of complete management systems by the Business Units. These are locally owned and administered with ownership by all business unit employees.

Local management systems are arranged so they accommodate group HSE performance targets pertaining to, for example, reductions in CO2 emissions, ISO 14001 certification requirements, biodiversity, and sustainable development.

Everyone in BP is responsible for HSE.



Figure 2: The BP HSE Management System

Figure 2 The BP HSE management system

How we learn from each other...

The HSE Toolbox will be maintained on the Intranet containing good operating processes/practices, knowledge and audit protocols. These show good demonstrated practice from around the BP Group, and should be referenced when developing Business Unit management systems. More importantly, business unit personnel are encouraged to contribute their good practices to the HSE Toolbox in order to promote sharing and adoption of lessons learned.

How we know it is being done effectively...

Business Unit leaders assure themselves and the Group Chief Executive that all relevant processes are in place and working effectively to manage HSE risks associated with their business activities. This is achieved through regular:

- risk assessments and risk management programmes
- peer reviews, self-assessments and objective external assessments
- reviews of performance indicators against agreed targets

Paper copies are uncontrolled. The controlled version is on the BP Intranet <u>http://gbc.bpweb.bp.com/hse/policy/Hseright99</u>

HSE assurance is regularly discussed between Business Unit Leaders and their senior team. An assurance audit is periodically conducted to provide a review of key internal controls. In addition, an annual HSE assurance report is prepared summarizing progress and planned activities.

(p. M.L.

John Mogford Group Vice President, HSE

BP's Commitment to Health, Safety and Environmental Performance

Everybody who works for BP, anywhere, is responsible for getting HSE right. Good HSE performance and the health, safety and security of everyone who works for us are critical to the success of our business.

Our goals are simply stated - no accidents, no harm to people, and no damage to the environment.

We will continue to drive down the environmental and health impact of our operations by reducing waste, emissions and discharges, and using energy efficiently. We will produce quality products that can be used safely by our customers.

We will:

- consult, listen and respond openly to our customers, employees, neighbours, public interest groups and those who work with us
- work with others our partners, suppliers, competitors and regulators to raise the standards of our industry
- openly report our performance, good and bad
- recognize those who contribute to improved HSE performance

Our business plans include measurable HSE targets. We are all committed to meeting them.

John Browne Group Chief Executive HSE Policy January 1999

BP 's Health, Safety and Environmental Expectations

BP's HSE Expectations are detailed within the thirteen elements of the HSE Management System Framework. These Expectations outline BP's requirements for the management of:

- safety and accident prevention
- plant and equipment integrity
- pollution prevention
- energy conservation
- personal, occupational and environmental health
- personal/physical security
- product stewardship
- sustainable development

In all our activities and operations, we will:

- comply fully with all legal requirements and meet or exceed these Expectations wherever we operate in the world.
- provide a secure working environment by protecting ourselves, our assets, and our operations against risk of injury, loss or damage from criminal or hostile acts.
- ensure that all our employees, contractors and others are well informed, well trained, engaged and committed to the HSE improvement process. We recognize that safe operations depend not only on technically sound plant and equipment but on competent people and an active HSE culture, **and that no activity is so important that it cannot be done safely.**
- regularly provide assurance that the processes in place are working effectively. While all BP employees and contractors are responsible for HSE performance, line management is accountable for understanding and managing HSE risks.
- fully participate in hazard identification and risk assessments, Assurance Audits, and reporting of HSE results.
- maintain public confidence in the integrity of our operations. We will openly report our performance and consult with people outside the company to improve our understanding of external and internal HSE issues associated with our operations.
- expect that all parties working on BP's behalf recognize that they can impact our operations and reputation, and must operate to our standards. We will assure ourselves that our contractors' and others' management systems fully support our Commitment to HSE Performance.

Addressing the full set of HSE Expectations is mandatory for every activity across the entire BP organization. The relevance, application and degree of implementation within a particular operation or Business Unit will be a function of:

- the operational risk profile
- local and national regulatory requirements
- any voluntary HSE management programmes

Managers are accountable for putting in place appropriate documented systems and processes for each Expectation, for ensuring continuing progress towards BP's HSE goals and targets, and for confirming that these processes are effective via the HSE Assurance process.

The content, format and terminology of HSE management and audit systems at the Business Unit or Functional Unit level are a matter of local choice, provided these:

- are compatible with the Assurance Audits
- are appropriate to operational risks
- are relevant to regulatory and voluntary codes subscribed to by BP
- can be referenced back to all relevant Expectations set out in this HSE Management System Framework

At the same time, we encourage standardization of programmes, work processes, and procedures across similar operations and Business Units, and the transfer, sharing and adoption of efficient and cost-effective good practices.

Element 1: Leadership and Accountability

People at all levels in the BP organization are responsible for leading and engaging the workforce in meeting our health, safety, technical integrity and environmental goals and objectives. Leaders will be held accountable for accomplishing this by demonstrating correct HSE behaviours, by clearly defining HSE roles and responsibilities, by providing needed resources, and by measuring, reviewing and continuously improving our HSE performance.

Expectations

1.1 Leaders model positive HSE behaviours by personal example both on and off the job, and reinforce and reward positive behaviours.

1.2 Leaders engage in clear, two-way communication with employees, contractors and others on HSE issues.

1.3 Leaders integrate the HSE Expectations into business planning and decision making processes, ensuring that documented systems are in place to deliver these Expectations.

1.4 Leaders establish clear HSE goals and objectives, roles and responsibilities, performance measures and allocate competent resources and, where necessary, specialist expertise.

1.5 HSE Management systems are developed, documented, implemented and supported throughout the organization. These address health, safety, technical integrity, environmental, security, product and operational risks in accordance with the appropriate Expectations.

1.6 Leaders' HSE performance is assessed against their annual objectives, based on feedback from line management, peers and others in the Business Unit.

1.7 Leaders integrate Group HSE targets into their business activities. (*These include, for example, external verifications, climate change, sustainable development, biodiversity, and emissions reductions.*)

1.8 Leaders promote the sharing of HSE lessons learned inside and outside their Business Unit.

Element 2: Risk Assessment and Management

Management of risk is a continuous process and the cornerstone of all the HSE elements. We will regularly identify the hazards and assess the risks associated with our activities. We will take appropriate action to manage the risks and hence prevent or reduce the impact of potential accidents or incidents.

Expectations

2.1 Leaders put into place and promote the use of processes to identify hazards associated with BP's activities, assess risks, control the hazards and manage the risks to acceptable levels.

2.2 Potential hazards and risks to personnel, facilities, the public, customers and the environment are assessed for existing operations, products, business developments, acquisitions, modifications, new projects, closures, divestments and decommissionings.

2.3 Assessed risks are addressed by levels of management appropriate to the nature and magnitude of the risk. Decisions are clearly documented and resulting actions implemented through local procedures.

2.4 Risk assessments and risk management/control measures are referenced in project approval documentation.

2.5 Risk assessments are updated at specified intervals and as changes are planned.

Element 3: People, Training and Behaviours

People's behaviour is critical to BP's success; therefore, our workforce will be carefully selected and trained, and their skills and competencies regularly assessed.

Expectations

3.1 Employees and contractors practice, encourage, and reinforce safe, healthy and environmentally sound behaviours.

3.2 HSE roles, responsibilities and accountabilities are developed and used to define individual performance targets. These are documented, and feedback on personal performance is provided.

3.3 Recruitment, selection and placement processes ensure that personnel are qualified, competent, and physically and mentally fit for their assigned tasks.

3.4 BP's workforce has the required skills and training to competently perform their tasks in a healthy, safe and environmentally sound manner. Training is evaluated to determine its effectiveness.

3.5 With employees' involvement, physical, chemical, biological, ergonomic and psychological health hazards are identified and the risks managed in the workplace.

3.6 Each worksite has access to an appropriate level of medical support and to resources/facilities that promote health and wellness.

3.7 A programme is in place to ensure that the performance of our workforce and others on our premises is not impaired by drugs or alcohol.

3.8 New or transferred employees, contractors and other visiting personnel undergo appropriate site orientation/induction training which covers HSE rules and emergency procedures.

Element 4: Working with Contractors and Others

Contractors, suppliers and others are key to our Group business performance and we will assess their capabilities and competencies to perform work on our behalf. We will work together with them to ensure our HSE Expectations are aligned. We will monitor contractors' and partners' performance and ensure our procurement processes contain the rigour to deliver our Expectations.

Expectations

4.1 Pre-qualification, selection and retention criteria are established for work performed by contractors, suppliers and others, including a system for assuring their compliance.

4.2 Hazards and risks associated with contractor and procurement activities in our businesses are identified, managed and communicated.

4.3 Interfaces between BP and suppliers of services and products are identified and effectively managed.

4.4 Clear deliverables and performance standards are agreed to and systems are put in place to assure HSE and technical compliance.

4.5 Purchased products and services are, where possible, verified as meeting national/international health, safety and environmental standards.

4.6 Joint venture and alliance partners have HSE management systems that are aligned with those of BP, meet legal compliance requirements and satisfy the Group's Expectations and targets.

Element 5: Facilities Design and Construction

New facilities and modifications to existing facilities will be designed, procured, constructed and commissioned to enable safe, secure, healthy and environmentally sound performance throughout their operational life, by using recognised standards, procedures and management systems.

Expectations

5.1 Baseline technical, environmental and health data are collected before the development of any new operation, facility or major modification.

5.2 Facilities are designed and constructed using technology which balances commercial risks and financial benefits to manage technical risk and minimise or eliminate emissions, discharges, impacts on biodiversity and other environmental impacts.

5.3 Project management systems and procedures addressing technical integrity and HSE accountabilities are documented and well understood. Design, procurement and construction standards are formally approved by the designated technical/engineering authority. Formal design review, verification and validation studies are carried out based on risk assessment.

5.4 Operational, maintenance and HSE expertise are integrated early in the project/design stage. Experience from previous projects and current operations is applied.

5.5 Potential hazards are identified and HSE risks assessed using appropriate risk assessment tools (*e.g. quantified risk assessments, HAZOPS, and HSE reviews*) at specific stages of a project from concept through to start-up, and risks are mitigated through risk management techniques.

5.6 Deviations from design standards are identified and managed at an appropriate level, with the reasons documented and retained.

5.7 Local regulatory requirements are met or exceeded. Where these are absent or inadequate, standards are set that protect people and the environment.

5.8 Quality assurance and inspection systems are in place to ensure that facilities meet design and procurement specifications and that construction is in accordance with approved standards.

5.9 Documented pre-startup reviews are carried out for all newly installed or modified equipment to confirm that construction is in accordance with design, all required verification testing is complete and acceptable, and all recommendations/deviations are closed and approved by the designated technical authority.

Element 6: Operations and Maintenance

Facilities will be operated and maintained within the current design envelope to ensure safe, secure, healthy and environmentally sound performance.

Expectations

6.1 Post-startup reviews are carried out for all newly installed or modified equipment to confirm that construction is in accordance with design, all required verification testing is complete and acceptable, and all recommendations/deviations are closed and approved by the designated technical authority.

6.2 Applicable regulatory requirements are met or exceeded and operational/technical/mechanical integrity is maintained by use of clearly defined and documented operational, maintenance, inspection and corrosion control systems.

6.3 Key operating parameters are established and regularly monitored. The workforce understands their roles and responsibilities to maintain operations within these parameters.

6.4 Clearly defined start-up, operating, maintenance and shutdown procedures are in place with designated authorities identified (*e.g. permit to work, hand-over, equipment and process isolation, etc..*)

6.5 Equipment that has been out of service for maintenance or modification is subject to documented inspection and testing prior to use.

6.6 Reliability and availability of protective systems are maintained by appropriate testing and maintenance programmes, including management of temporary disarming or deactivation.

6.7 Risks introduced by simultaneous operations are assessed and managed.

6.8 HSE impacts associated with waste, emissions, noise, biodiversity and energy use are monitored and minimised.

6.9 Comprehensive waste management programmes are in place to ensure that wastes are minimised, re-used, recycled, or properly disposed of.

6.10 Decommissioning, remediation and restoration plans are established using riskbased studies for end of life equipment/ facilities.

6.11 A quality assurance programme exists to ensure that equipment replacement or modification maintains operations integrity.

Element 7: Management of Change

All temporary and permanent changes to organization, personnel, systems, procedures, equipment, products, materials or substances will be evaluated and managed to ensure that health, safety and environmental risks arising from these changes remain at an acceptable level. We will comply with changes to laws and regulations and take account of new scientific evidence relating to HSE effects.

Expectations

7.1 The health, safety, security, environmental, technical and other impacts of temporary and permanent changes are formally assessed, managed, documented and approved.

7.2 Changes in legal and regulatory requirements, technical codes, and knowledge of health and environmental effects, are tracked and appropriate changes implemented.

7.3 Effects of change on the workforce/organization, including training requirements, are assessed and managed.

7.4 The impact on product quality of changes in manufacturing processes is assessed, associated hazards are evaluated and risks are controlled.

7.5 The original scope and duration of temporary changes are not exceeded without review and approval.

Element 8: Information and Documentation

We will maintain accurate information on our operations and products. It will be held securely yet readily available.

Expectations

8.1 A system is in place to securely manage drawings, design data and other documentation, including definition of responsibilities for maintaining this information.

8.2 Applicable regulations, permits, codes, standards and practices are identified. The resultant operating requirements are documented and communicated to the workforce.

8.3 Pertinent records are maintained, available and retained as necessary. Obsolete documentation is identified and removed from circulation.

8.4 Scope and format of technical documentation will be agreed for each facility and will form part of the design input for new facilities and modifications.

8.5 Employee health, medical and occupational exposure records are maintained with appropriate confidentiality and retained as necessary.

Element 9: Customers and Products

We will assess, manage and communicate the hazards associated with BP's products. We will communicate up-to- date information to help users and others handle our products in a safe and environmentally responsible manner.

Expectations

9.1 Assessments are conducted for new products prior to marketing or distribution, to identify health, safety and environmental hazards and risks associated with normal use and foreseeable misuse.

9.2 Periodic reassessments are conducted for all manufactured and re-branded products and intermediate streams. This includes a review of adverse effects reported or experienced by those handling these products.

9.3 New uses or markets for existing products are evaluated to ensure that health, safety and environmental hazards and risks are identified and addressed.

9.4 Records of assessment, background information and conclusions are kept up-todate throughout the product's life and retained as appropriate.

9.5 Up-to-date information on health, safety and environmental hazards and risks relating to the use, storage, handling, transport and disposal of our products is available to the workforce, customers and others. Material Safety Data Sheets (MSDS), labels and other information are developed and issued to handlers and users in accordance with legislative and customer requirements, and as information changes.

9.6 A system exists to collect and review adverse effects reported or experienced by those handling our products. Causes for concern are identified and actions are taken.

9.7 An effective recall system exists for products where a defect could give rise to health, safety or environmental hazards.

9.8 A system is in place to respond on a 24-hour basis to emergency requests for product health, safety and environmental information.

Element 10: Community and Stakeholder Awareness

We value the importance of community awareness and will actively engage in dialogue with various stakeholders to maintain public confidence in the integrity of our operations and products and our Commitment to HSE Performance.

Expectations

10.1 Open and proactive communications are established and maintained with employees, contractors, regulatory agencies, public organizations and communities regarding the HSE aspects of our business.

10.2 BP recognizes and responds to government and community HSE related Expectations and concerns about our operations and our products.

10.3 HSE impacts of new business development on local communities are openly assessed, communicated, and integrated into the business case.

10.4 HSE impacts of any divestment or decommissioning on existing operations, neighbours or local community (*originally identified during the new business development stage*) are reviewed, communicated and managed.

10.5 Major business operations periodically issue an externally verified statement relating to HSE performance and programmes.

Element 11: Crisis and Emergency Management

Emergency management plans will be maintained to cover all of our facilities, locations and products. These plans will identify equipment, training and personnel necessary to protect the workforce, customers, public, environment and BP's reputation in the event of an incident.

Expectations

11.1 Emergency management plans are based on the risks that potentially impact the business. These plans are documented, accessible, clearly communicated and align to the BP Group's emergency management system.

11.2 Equipment, facilities and personnel needed for emergency response are identified, tested and available.

11.3 Personnel are trained and understand emergency plans, their roles and responsibilities, and the use of crisis management tools and resources.

11.4 Drills and exercises are conducted to assess and improve emergency response/crisis management capabilities, including liaison with and involvement of external organizations.

11.5 Periodic updates of plans and training are used to incorporate lessons learned from previous incidents and exercises.

Element 12: Incidents Analysis and Prevention

Incidents will be reported, investigated and analysed to prevent recurrence and improve our performance. Our investigations will focus on root causes and/or system failures. Corrective actions and preventive measures will be utilized to reduce future injuries and losses.

Expectations

12.1 All health, safety, technical integrity, security and environmental incidents, including near misses, are openly reported, investigated, analysed and documented.

12.2 Major incidents are investigated by a multi-function/level team with participation and leadership from outside the business unit.

12.3 Incident investigations, including identification of root causes and preventive actions, are documented and closed-out.

12.4 Information gathered from incident investigations is analysed to identify and monitor trends and develop prevention programmes.

12.5 Lessons learned from investigations are shared across BP and personnel take appropriate action upon receipt of such information.

12.6 Mutual sharing of lessons learned and good practice is encouraged within the wider energy and chemical industry.

Element 13: Assessment, Assurance and Improvement

We will periodically assess the implementation of and compliance with these Expectations to assure ourselves and stakeholders that management processes are in place and working effectively. This will involve both internal self-assessments, and appropriate external assessments. We will use this information to improve our performance and processes.

Expectations

13.1 HSE performance indicators (*both inputs and outcomes*) are established, communicated and understood throughout the organization.

13.2 The workforce is actively involved in periodic self-assessments of the effectiveness of processes and procedures to meet the HSE Expectations.

13.3 HSE performance indicators are regularly used to determine when and what management system changes are necessary. When changes occur in one HSE Element the impact on the entire management system is evaluated.

13.4 A system exists to continually improve HSE behaviours through observation, recording, and coaching.

13.5 A documented, risk-based audit programme exists to periodically evaluate progress towards HSE targets, regulatory compliance, and the effectiveness of the Business Unit management system(s).

13.6 The Business Unit, in co-operation with the audit team, plans audits which are objective and systematic. These are documented and conducted using expertise from inside and outside the unit.

13.7 Findings from learning processes (*eg audits, incident investigations, near misses, HAZOPS, etc.*) are prioritised, tracked and used to systematically improve the HSE management system.

13.8 The Business Unit leadership team reviews the management system to ensure it is continually delivering consistent, desired performance. Based on the review, new risk-based targets are considered and established wherever necessary.

13.9 Business Units report HSE performance data, as part of the Group's HSE Reporting Requirements.

13.10 A process is in place whereby assurance is regularly provided to the Group Chief Executive demonstrating effective implementation of the BP HSE Policy and Expectations. Annual self-assessments against these Expectations are carried out by each Business Unit, along with external audits at least every three years.

Key HSE Process 1

Delivering HSE Assurance

Assurance is the process whereby Business Unit and Support Unit Managers confirm that processes are in place and working effectively in order to manage the key internal controls for, and major risks to, sustainable business performance. This process is supplemented periodically by an unbiased Assurance Audit.

HSE Assurance addresses delivery of:

- BP's HSE Commitment
- HSE Expectations
- Legal compliance

HSE assurance is a continuous review process involving regular dialogues about:

- Supporting Assurance Audit, Peer and Business Unit Assessments
- Identifying and managing risks
- Evaluating HSE performance trends

These are documented in a formal Annual HSE Report.

DIAGRAM?

Key features of HSE Assurance are:

- management accountability for establishing effective documented processes to deliver the HSE Expectations.
- effective review processes involving Assurance Audits, Business Unit Peer Reviews, and annual internal self-assessments as well as external assessments every 3 years.
- plans to improve performance and address areas requiring attention.

Supported by:

- regular evidence that major risks and key internal controls are being actively managed at the appropriate level.
- regular evidence of effective implementation of processes and procedures.
- regular evidence of continuously improving performance.

How the process works in practice

• Business and Support Units hold regular dialogues with their Business GVP about HSE performance trends, progress against specific targets and the management of major risks.

- Regular dialogue also takes place with Regional Directors to discuss the management of HSE, particularly those issues having national or regional significance or which may affect BP's global reputation.
- Business and Support Units commit to an auditing and review programme relevant to the risk profile of the activity. The major part of this programme involves ongoing self-assessment. Comprehensive independent audits are conducted at regular intervals to provide overview and credibility.
- Periodic Assurance Audits are conducted.
- Business Unit and other senior managers prepare a formal Annual HSE Report to the Group Chief Executive. This takes the form of a statement certifying the extent of compliance with legal requirements and BP's HSE Commitment, supported by evidence of:
 - effective management of major risks
 - effective implementation of HSE Expectations
 - performance against agreed targets and objectives
 - documented Action Plans for closure of all outstanding items from HSE self/external assessments

Guidance on HSE Assurance Report format and the reporting timetable are issued by the Global Business Centre HSE Team. The GBC will annually prepare an overall summary of submissions for the BP Group Chief Executive outlining achievements and significant areas for action. The report not only documents recent performance but also outlines future assurance and corrective action plans.

Key HSE Process 2

<u>Behaviours</u>

Ultimately, people are safe or injured by what they do *(behaviour)*. Unfortunately, they are often tempted to ignore the need for precautionary action because their experience has taught them they can take risks and not get hurt. The ABC Model of human behaviour provides a framework for understanding why people do or do not take certain risks, so that we can design an effective intervention process.

Behaviourists call the events that precede behaviour, Antecedents (A) and the events that follow the Behaviour (B), Consequences (C). Thus the ABC Model.

- *Antecedent:* A signal, cue or prompt that comes before a behaviour and sets the stage for the behaviour to occur; eg telephone rings, traffic light turns yellow, boss issues a memo calling for some action.
- *Behaviour:* An act or actions of an individual that can be observed by others, what a person says or does; eg you answer phone, you accelerate through the intersection to beat the red light, you immediately do what the boss's memo tells you to do.
- *Consequence:* What happens to the performer as a result of the behaviour; eg talk to a friend, get pulled over by a policeman for going through the red light, receive a thank you call from the boss for following instructions.

The first step in understanding why someone is engaging in a specific behaviour is to identify the precise antecedents that set the stage for that behaviour. For example, the antecedent of a phone call requesting a report and specifying a deadline sets the stage for writing a safety report. A vague request for information may not.

Since many antecedents have little impact on our behaviour, the next step in understanding behaviour is to analyse the consequences that cause the behaviour to continue. These might include getting approval for a plan, wasting time, or feeling proud of preventing an accident.

Favourable or positive consequences cause a behaviour to continue. Unfavourable or negative consequences have the opposite effect on behaviour.

There are many other facets to consider when using the ABC Model to manage performance. Timing and frequency of consequences must be considered, and of course, the delivery of positive consequences requires some thought and skill. Consequences must be clearly associated with the desired behaviour or no change will occur. Whether a consequence is positive or not is determined by the performer, not the person delivering the consequence. Nevertheless, recognizing **that behaviour is a function of its consequences** is Paper copies are uncontrolled. The controlled version is on the BP Intranet <u>http://gbc.bpweb.bp.com/hse/policy/Hseright99</u> a good place to start trying to understand behaviour and how you can influence it for the benefit of the organization and the people in it.

Four Consequences

As previously mentioned, consequences determine whether a behaviour will continue, increase, decrease or stop altogether. There are four consequences associated with behaviour change. Two of them are termed reinforcement. When you see **reinforcement** in this context you can be sure that behaviour will increase. However there are two categories of reinforcement - *positive reinforcement* and *negative reinforcement*.

Positive Reinforcement provides a desirable consequence. People perform because when they do, something occurs which they like. We choose a favourite shirt because when we wear it we get complimented.

Negative Reinforcement requires the performer to do something in order to avoid something unpleasant. We wear rain gear when it is raining to avoid getting soaked. We rarely wear it when the sun is shining.

Both consequences have a place in life and in business. However, only positive reinforcement causes people to do more than they are required to do.

- Positive reinforcement is characterized as want to do, and
- Negative reinforcement is characterized as have to do.

Two other types of consequences decrease or eliminate a behaviour by providing an undesirable consequence to the performer or by removing something they like.

Punishment is the term used by behaviourists to indicate the delivery of an undesired consequence. When we ran that red light and were pulled over and ticketed, we received something we didn't want – punishment. If this occurs frequently, we might actually stop driving through yellow lights.

Extinction is the term used to describe the lack of a positive consequence following a behaviour. If the boss's memo called for you to do something you didn't want to do, and following your performance he said nothing, you might not do that act again. Or you might do it one more time just to see. If there is still no confirmation that the boss noticed or cared and you would rather not engage in the new behaviour, you will stop. This kind of 'no consequence' consequence has probably killed more initiatives than any other cause.

Although negative reinforcement, punishment and extinction have their uses, positive reinforcement is the most effective way to improve performance. When people are positively reinforced for working safely, they not only seek more opportunities to work safely, they see safety as a source of job satisfaction rather than another requirement to be met. This produces exemplary safety performance. When we strengthen our use of safe behaviour, we automatically weaken the use of unsafe behaviours and avoid the negative

side effects that always accompany any disciplinary process. Of course, it will always be necessary to use negative consequences when someone intentionally engages in significant unsafe behaviours. Since discipline can only stop undesired behaviour, it is essential to follow up disciplinary action with positive reinforcement for improvement.

To manage safety effectively, we must use consequences appropriately. This means that reinforcement and punishment must be earned. Dinners given to a team for overall safety results may reward individuals who did nothing to improve safety performance. Assigning safety documentation to those who do it well and not to those who do it poorly may increase mediocre performance. Unearned rewards often teach people that nobody knows who really does what. Unearned punishment teaches people that it doesn't matter what they do, they can't win.

It does not matter what we intend when we give consequences, but it does matter what the performer perceives happened to them because of their behaviour. Managing safety means ensuring that people who actively drive safety by their behaviour get what they deserve: **recognition and reinforcement.**
<u>HSE Risk Management</u>

Every BP Business Unit and team agrees to performance targets which include HSE performance. There are many potential scenarios which could result in failure to reach these targets. Systematic risk assessment and management seek to ensure that these scenarios are properly understood and given appropriate attention.

The risk management process involves the following activities

- identifying hazards or threats
- **assessing** the risk to people, property, the environment, and profits associated with those hazards or threats
- evaluating risk elimination/reduction measures
- **implementing** the risk elimination/reduction measures

HSE Element 2 sets expectations for risk management. A wide variety of techniques and processes are available appropriate to the circumstances and level of risk involved, and these should be considered in relation to **three categories of risk**:

Business Risk is a term to describe all risks facing a business. Typical risks will be political, financial, competitive, technological and HSE-related. Management of business risk is owned directly by the Business Unit management team and typically involves:

- identification of high level risks including HSE risks which may further be categorized into workplace risks and process/technical risks as outlined below
- use of a risk matrix or formal risk assessment to capture severity and manageability of perceived risk
- management action plans to provide demonstrable assurance that key risks are being managed

Workplace Risk is the risk to workers due to health and safety hazards in their normal working activities. Typical consequences may be injury, death or damage to health. Some workplace accidents may include property damage and business interruption. Reputation damage is likely in some instances. These risks are often managed directly by individuals or front-line teams and involve:

- structured hazard potential assessment
- formal task risk assessment for routine and non-routine jobs
- control by standing procedures or permits to work
- informal assessment by individuals in the course of a task
- self regulation checks and audits to ensure that systems and procedures are working effectively

Process and Technical Risk is the risk due to failure of the performance of process equipment. There are two types of failure that should be considered:

- failure of the equipment to deliver business performance (*e.g. quality/quantity of output, reliability, energy efficiency etc.*) Typical adverse consequences include failure to meet emissions requirements, noise standards or the impact of off-specification product
- loss of containment e.g. risk due to accidental release of process fluids. Typical consequences include toxic clouds, fire, explosion and pollution.

Such risks are typically assessed by technical specialists/teams and involve:

- formal identification, assessment and management of risks involved in a particular project, operation or activity
- hazard identification processes such as HAZOP
- quantified assessment processes such as QRA

Key Concepts of Risk Management

Risk assessment is the process of estimating the likelihood of an accident occurring, estimating the magnitude of the consequential loss and making a judgement about the significance and tolerability of the risk. **Risk is a function of both frequency and consequence; both are equally important**.

Risks may be expressed either

- *qualitatively* e.g. high/medium/low or
- *quantitatively* e.g. dollars or expected mortality/year

Risk management decisions must consider both frequency and consequence.

The *expected annualized loss* (loss x likelihood) should theoretically determine the level of attention which any risk should justify and also the resources devoted to reduce it. There may, however, be good ethical or business reasons for being more risk averse in some circumstances. In general, however, a risk-neutral stance should be adopted, i.e. a \$10,000 loss every year may be considered equivalent to a \$100,000 loss once every 10 years.

Strategies for Risk Management

Strategies must be cost effective; if they are not, the organization **may** be safe but will certainly *not* be competitive.

- Start with simple risk assessment processes. Detailed methods are expensive and should only be used where simpler studies indicate cause for concern
- Work across all three categories of risk. Identify and rank major business risks but remember that basic task assessment in the workplace will not only prevent injury but may well contribute to the management of major risks.
- **Concentrate on the effective use of resources** in areas where these give the greatest return

Group-wide guidance is in place for judging the tolerability of risk to the workforce and the public, and for using methods for the selection of cost-effective management measures.

Risk communication is a difficult area. Social perceptions of tolerable risk are strongly influenced by subjective factors such as whether people feel they are well informed and fairly treated. Effective risk communication rests, nonetheless, largely on effective risk management; people don't want to hear about theory but rather what is actually being done to manage the risks which concern them.

BP self insures unless required to insure by law. Advice on insurance policy relating to HSE risks should be sought from BP Insurance.

Crisis and Emergency Management

Clearly defined and well thought out plans are essential to deal with emergencies at every level of BP operations. The BP Crisis and Emergency Management System provides a framework within which individual plans are integrated by providing clarity of responsibility and enabling support and back up to be provided where needed.

Principles

The approach, involving over-reaction, assessment and subsequent de-escalation, applies throughout. In a crisis event, there will be a maximum of three levels of management, with a clearly identified team leader at each level.

- Each facility will have an Incident Management Plan
- Each Business Unit *(includes major BP Chemicals sites)* or group of Units, will have a Business Support Plan
- The Global Business Centre will have a Crisis Management Plan
- Each National Associate will have a National Plan, linking to all businesses and operations in that country, with clear links to relevant Government agencies
- Each Region will have a Regional Support Plan to enable the Regional Director and the Business Units in the area to link and assist each other
- The above plans will have clear linkages with each other to ensure that, in each case, roles and responsibilities are delineated inside the three levels and in the support functions
- All plans will be regularly tested through exercises to measure their effectiveness and to provide training for the response organization.
- A Regional Support Group will be available to support each business in an emergency.



Local HSE Management Systems

* or in BP Chemicals, major European Chemicals Sites supported by Business Management

Incident Management Plan

Each BP facility, vessel or operation will maintain an Incident Management Plan, conforming to government regulations, to manage the physical response to the incident and the associated external issues. The Incident Management Plan will:

- identify the major risks potentially impacting business operations and local communities.
- describe the response strategies and the management organization
- set out the roles and responsibilities of the key personnel involved
- contain internal and external notification procedures, community resources, response organization charts, resources and personnel
- describe how BP will establish communications and work with community, local government and regulatory organizations to manage the impacts of the incident
- describe how the local media/reputation issues will be addressed
- link with the Business Support and National Associate Plans to access additional support resources and developing policy guidance

Business Support Plan

Business Units (*or major BP Chemicals sites*) will maintain, individually or severally, a Business Support Plan to support the Incident Management Plans of the facilities, vessels and operators for which they are responsible. Where a Business Unit is based on a single site, the Incident Management and Business Support plans may be addressed in a single document.

The Business Support Plan will identify:

- how additional resources and personnel will be made available to support the Incident Management organization
- how communications will be maintained with Incident Management Teams, external agencies and across the BP Group, particularly with the Global Business Centre in London
- how the impact on reputation will be managed during and after the incident.
- how the technical and commercial implications of the incident will be managed and where in the Group this support will be obtained

National Associate Response Plan

In every country in which BP has a presence, the responsible senior manager will maintain a National Associate Plan, supporting the Incident Management and Business Support Plans of all BP facilities, vessels and operations in the country. The National Associate Plan will identify:

- the way in which the overall BP response in the country will be co-ordinated
- the links to Government agencies and emergency response organisations and with the national media, to protect BP's reputation
- sources of internal and external (national and regional) support, assistance and resources to aid the response

Regional Support Plan

In each region, the Regional Director will have a Regional Support Plan, which will enable the Regional Director to support the National Associate and Business response. Where appropriate, it will also provide the structure to enable the Business Units across the Region to aid each other in an emergency and to link their plans together

The Regional Support Plan will detail:

- how the Regional Director is to be contacted and what actions are to be taken by him/her or on his/her behalf
- how and where communications will be accessed and set up
- how response back-up and technical and other resources will be accessed

Group Crisis Management Plan

The Global Business Centre will maintain a Group Crisis Management Plan that focuses on strategic issues that could impact the Group and supports all Business Unit Plans. There will be a single contact mechanism for all Business Units and the GBC response will depend on the severity of the incident (*eg notification only, information flow, small communications/support team or full Group Crisis Team in action.*)

The Group Crisis Management Plan will:

- identify how a Group response strategy will be developed to proactively manage such issues as BP 's overall reputation, license to operate, and such liabilities or loss potential which might threaten the BP Group as a whole
- identify how BP Group resources and personnel will be made available to support Business Unit and Incident Management organizations

Regional Support Group

A Regional Support Group from each Business Unit will be maintained together with a database of external specialist support co-ordinated, trained and activated through a Regional Support Group representative. The Regional Support Group may include facilities and administrative management available to the Business Support Team if required. Linkages will be established to this group and to the Incident Management Team/Business Management Team, Associate President and Regional Plans.

Major Incident and High Potential Incident Reporting

Principle:

The aim is to provide Senior Management with an immediate notification that a serious event that could threaten the reputation of the BP Group. Notification is on the basis that 'forewarned is forearmed' and does not imply responsibility or blame. The report is not expected to be a complete account of events or to contain authoritative information on cause. It is not necessarily 'recordable' as a BP incident. Group Major Incidents may or may not require activation or mobilization of the Emergency Management System.

An incident requiring emergency support and therefore reported via the Crisis and Emergency Management System (see Key HSE Process 4) should also be reported as a Group Major Incident, if it meets the criteria for a Major Incident or a High Potential Incident.

Timing of Report:

A Major Incident or High Potential Incident (*as defined below*) should be reported as soon as possible, but at most within 24 hours, to the appropriate distribution identified below. Notification of a Major Incident to the appropriate Group Vice President must be through personal conversation.

Major Incident

A major incident is an incident, including a security incident, involving any one of the following:

- a fatality associated with BP operations
- multiple serious injuries
- significant adverse reaction from authorities, media, NGO's or the general public
- cost of accidental damage exceeding US\$500,000
- oil spill of more than 100 barrels, or less if at a sensitive location (1 barrel = 159 litres = 42 US gallons)
- release of more than ten tonnes of a classified chemical.

Core Distribution:

- Group Chief Executive
- Executive Vice Presidents
- Group Vice President Government and Public Affairs
- Vice President and Head of Group Press Relations
- Group Vice President HSE
- Vice President Group Security

Business Unit and Business Stream distribution (including Business Stream Executive Committee members) together with any national or regional requirements will be added to the core list locally. Central e-mail distribution lists are maintained for each business stream

High Potential Incident

A High Potential incident is an incident or near miss, including a security incident, where the **most serious probable outcome** is a Major Incident.

The purpose of High Potential incident reporting is to encourage learning from serious incidents. If, after investigation, an incident is found to fit these definitions, it should be reported, even if it is outside the nominated reporting timeframe, or does not explicitly meet these definitions.

Core Distribution

- Business Stream Group Vice President
- Group Vice President HSE
- Vice President Group Security

Business Unit and Business Stream distribution (*including Business Stream Executive Committee members*) together with any national or regional requirements will be added to the core list locally. Central e-mail distribution lists are maintained for each business stream.

Common Processes

Method:

Verbal notification to a Group Vice President for Major Incidents, as well as e-mail or fax to the agreed core distribution list plus other addressees appropriate to the incident location and business. The notification should be issued by or on behalf of the appropriate site manager or Business Unit Leader, i.e. close to the scene of action.

Format:

Use of free text or proforma is acceptable. Two things are mandatory:

- title must be Major Incident Announcement or High Potential Incident Announcement, as appropriate, so it shows up consistently on e-mail lists
- all the required information fields must be completed (*see proforma*)

Special Note on Security Incidents:

Security incidents, such as overt attack against a location or aircraft, siege with BP hostages, bomb attack, etc. that are public knowledge should be reported as above.

In the event of kidnapping, extortion, product contamination threat or covert attack against a BP employee or facility, or any similar incident that may not be in the public domain, the Business Unit Leader or Emergency Co-ordinator should communicate immediately with the relevant Group Vice President or the Rota Executive Vice President privately, and if possible, securely. The Group Vice President will inform those who need to know or can advise or help.

	<u>U</u>	<u>RGENT</u>	
Business U	nit:	Contact:	
Country: Data of inc	dont.	Location of in	ncident:
Date of Inc.	ident:	I ime of inclu	ent:
Brief Account of Incident:			
People	Number of Injuries	Number of fatalities	Description
BP Employ	/ee		
Contractor			
I MITO Part	y		
Business In	npact / Damage /	Loss:	
External ag	gencies involved:		
News Medi	a coverage:		
BP person i	in charge of Resp	oonse / Investiga	tion:
What again	anaa haa haan na	auostod?	

Example Proformas showing Required Information Fields

BP HIGH POTENTIAL INCIDENT ANNOUNCEMENT		
<u>URGENT</u>		
Business Unit:	Contact:	
Country:	Location of incident:	
Date of incident:	Time of incident:	
Brief account of incident:		
Potential Outcome:		
Likely Cause:		
Actions Taken:		
BP person in charge:		

Incident Investigation Guidelines

It is essential to discover the root causes of incidents, so that :

- effective preventive actions can be decided and implemented locally
- 'Lessons Learned' can be identified, implemented and shared with other operations which have similar risks
- trends can be uncovered through valid statistical analysis

Detailed investigations should be carried out for all major incidents (*injury or damage*) and any minor incident or near-miss with a high potential of being a major one. Less serious incidents should be investigated with a degree of rigour appropriate to the potential for loss or injury. The principles employed are nonetheless the same

It is very unusual for an incident to have one single cause. Normally incidents result from a chain or combination of actions or errors, some going quite far back in time. This is why it is essential to have a systematic and thorough investigation, following a consistent methodology, so that the chain of causes can be tracked right back to its origins.

Investigation Procedure

All BP operations should have a detailed procedure to assist in this process which takes the investigation back through the chain of events that eventually resulted in the incident.

At each stage it is important to determine why these occurred and in which areas management control was deficient.

The linkages are tracked at each stage by asking the question 'why' to establish the factors that allowed the condition to occur.

At each stage there is seldom a single cause, and the investigator must search thoroughly to ensure that none are missed.

Procedure for Major Incident Investigations*

Following a major incident, an investigation should be initiated immediately by the Business Unit Manager along the following lines:

Step 1 - Appoint and fully brief team members, including appropriate technical experts, and a chairman with sufficient seniority and independence from the involved operation to reflect the seriousness of the incident.

Step 2 - Issue terms of reference. These define the scope of the investigation and should include tracking the causation chain as well as other related factors, e.g. performance of emergency response and external services. Consider at what point legal advice may be required.

Step 3 - Specify timing of the report. It may be appropriate to issue an interim report within a few days of the incident to provide a factual account of events and some immediate recommendations for corrective action. It may also be necessary to alter the composition of the investigating team at this point if some particular expertise is found to be needed.

Step 4 - Issue the final report, which will be fully detailed with in-depth technical analysis and a fully considered set of short and long-term recommendations. Ideally the report should be issued within 30 days.

Once the report is available, Business Unit management should review the findings and recommendations and agree on their course of action. The final report should contain management responses to all recommendations with clear delegation of responsibilities for action. A timescale for review or completion is essential.

The Business Unit Leader will decide on the distribution of the full report, in particular which findings and 'lessons learned' are to be shared with others both inside and possibly outside BP.

* For incidents involving occupational fatalities, the Group Fatal Accident Investigation process will be activated.

Key Process 7

HSE Performance Targets

BP's Commitment to HSE Performance sets clear aspirations: 'Our goals are simply stated - no accidents, no harm to people and no damage to the environment'

HSE targets are included in performance contracts at all levels within BP, for both individuals and groups, e.g. Business Units or Support Teams, as steps in the progression towards our goals and against which performance is assessed in the short to medium term.

In addition to serving as progress measures, there are two other important objectives in setting targets:

- to encourage sound behaviours by changing or reinforcing
- *to demonstrate commitment* both internally and externally

Targets should be SMART i.e. Specific, Measurable, Achievable, Realistic and Timely. There is also scope for *'stretch' targets* where the optimistic nature of the target represents a real challenge for the individual or the organization.

Targets can be expressed in terms of

- *outcomes* tangible results indicating improved performance, e.g. fewer injuries, spills, or near misses
- *Inputs* activities expected to cause or affect the desired outcomes, eg audits, training, or risk assessments completed

Both are important. Input targets tend to help drive behaviour and are therefore better used in individual performance contracts and at the facility level. Outcome targets help demonstrate commitment and work best with groups and at higher levels within the organization.

A combination of outcome and input targets is essential to focus effort and drive behaviour changes, especially when 'stretch' outcome targets are set.

- Event based outcome targets for injuries or spills should be based on measures which are statistically significant over the timescale for achievement. Serious injuries are rare in many facilities; recordable injury and illness rate is therefore a more useful target measure when coupled with input measures such as task training completed or procedures reviewed
- Group targets for emissions reductions similarly require input targets at the operational level such as reduced flaring or fugitive emission monitoring and control

Some Group level targets are publicised externally in the annual HSE Performance Report which can be found on the BP internet (www.bp.com). Others at Group and Business level remain part of the internal performance management system.

HSE Reporting Requirements

HSE data collected by the Global Business Centre HSE Team are used to:

- evaluate monthly, quarterly and annual performance trends for Executive and Group Vice Presidents and Business Stream Executive Committees
- monitor performance against Group targets
- provide data for BP's Annual Report and Accounts and for the annual public HSE report
- provide ad hoc reports for senior managers aggregated by Business stream or clusters of Business Units

HSE data are submitted and retained in parallel with other Group systems for collecting financial and other performance data. Reporting units largely comprise Business and Support Units but other sub-groups are sometimes necessary.

- Performance data are currently reported to the Group for all operations where BP has equity and is deemed to have operational responsibility and hence HSE responsibility
- BP has expanded these reporting boundaries to encompass some operations where the Group has equity share, but not operational responsibility. Opportunities should therefore be taken to promote this concept with partners on a voluntary basis
- Reporting units are designated by each Business Stream

Timely provision of HSE data is the responsibility of Business Unit Leaders, who nominate one or more contacts to liaise with the GBC HSE Team:

- monthly and quarterly data are submitted the following month in line with the Group Financial Outlook (GFO) timetable
- raw data are collected, not frequencies, to enable data aggregation

Some Business Units submit HSE data in their routine monthly reports to the Global Business Centre. These data should be consistent with the data submitted to the GBC HSE Team.

Data reporting requirements are generally similar for all Business Streams (see tabulation on page 44). Guidance on reporting major incidents, including fatalities, is found in Key Process 5. Safety and spills information is currently collected monthly, although use of Traction (BP's online incident and action tracking system) allows reporting of such incidents. Environmental data is collected quarterly, 6-monthly or annually depending on the Business Stream requirements. Data collected throughout the reporting cycle is used externally to represent performance in our paper and webbased reports, and internally for performance comparison against targets. Data definitions are common across BP and are outlined in Key Process 10. The BP Environmental Reporting Guidelines are available on the internet at *http://gbc.bpweb.bp.com/hse/performance/perform/protocol/Environ/index.htm.*

	BP Upstream	BP Downstream	BP Chems	BP G&P	Other
Fatalities, injuries and illnesses (employees & contractors)					
Fatalities (number)	•				•
Days Away From Work Cases (number)	•	•			•
Recordable Injuries & Illnesses (number)	•	•	•	•	•
Hours worked (number)					•
Transportation Incidents (employes & co	ntractors)			
Road accidents (number)	•	•			●
Distance driven, vehicle kms	•	•	•		•
Distribution incidents during transportation (number)			•		
Distribution incidents at customer premises (number)			•		
Spills 1 barrel (bbl) = 159 lit	res = 42 US gal	lons			
Number of oil spills	•	•			
Volu me of oil spilled (litres)	•	•	•		
Volume of oil spilled but unrecovered (litres)	•	•	•	•	
Spill to land or surface water	•	•	•	•	
Spills which reach the environment (number)	•	•	•		
Loss of containment (number)	•				
Chemical releases (as defined, number)		•			•

	BP Upstream	BP Downstream	BP Chems	BP G&P	Other
Environmental data					
Carbon dioxide emissions (tonnes)	•	•	•	•	•
Other emissions to air (tonnes)	•	•	•	•	•
Discharges to water (tonnes)	•	•	•		•
Waste (tonnes)		•			•

Notes:

- reporting definitions for monthly reporting are set out in Key Process 1

all parameters reported as numbers unless otherwise indicated
injury frequencies will be calculated per 200,000 hours worked (as per OSHA) definition)

- road accident rates will be calculated per million vehicle kilometres driven

Joint Ventures and other Operational Relationships

BP has varying forms of contractual relationships with third parties to work with them in areas such as joint ventures, operating agreements, tolling arrangements, licensing arrangements and franchises.

Where a Business Unit has any such relationship, the Business Unit Leader is responsible for ensuring that the third party:

- has a Health, Safety and Environmental policy in place and can demonstrate compliance with that policy
- can demonstrate compliance with legal obligations, and
- reports fatalities and serious incidents associated with the activity to BP

The Business Unit Leader will also require such additional HSE performance data as is necessary to provide assurance of compliance to the appropriate Group Vice President, in line with normal BP processes.

If it is determined that the third party is not in compliance with legal requirements, the Business Unit Leader will expect compliance within a specified time period. The Business Unit Leader will inform the Group Vice President when significant noncompliance is identified and keep the Group Vice President informed of actions being taken to achieve compliance.

Where BP's relationship with a third party creates ownership in a separate operating entity such as a joint venture, the relevant performance data and assurance should be sought from the entity itself.

When BP ownership of an entity is greater than 40%, either through joint venture or direct ownership, or where there is significant risk to BP's reputation, additional reporting requirements apply. Although this performance is not included in BP Group performance as described in Key Process 8, such entities should be held to the performance standards and reporting requirements applicable to wholly BP-owned or BP-operated entities. Specifically this entails provision of:

- safety and incident data to meet BP Group definitions
- environmental data to meet the BP Group protocol

All such entities should be required to operate in a manner consistent with the BP Commitment to HSE Performance.

HSE Reporting Definitions

Data requirements differ slightly by Business Stream, but data definitions are common across BP. The definitions are complex especially for environmental parameters. Reporting of injuries and illness requires good understanding of how to differentiate between

- whether or not it is work-related, and
- whether it is an illness, an injury or a first aid treatment

Definitions for parameters reported monthly and other key indicators are included in this key process.

BP's injury and illness definitions are the US Occupational Safety and Health Administration (OSHA) definitions as found in the document 'Record Keeping for Occupational Injuries and Illnesses' ('Blue Book') and in subsequent interpretation from OSHA. The definitions in this Key Process are based on the OSHA definitions. Additional guidance can be found in the BP document entitled 'Occupational Injury/Illness Group Reporting Guidelines'.

Detailed definitions supporting the calculation of environmental data are set out in the BP document entitled 'Environmental Performance - Group Reporting Guidelines'.

The definitions associated with these Key Processes are used to ensure international comparability of data for internal BP reporting. Using the definitions may lead to differences between BP reports and locally reported HSE performance data using other guidelines, often required by legislation.

Definitions

Reporting Unit	The name of Business Unit or Regional Services Unit or Site which is reporting data
Business or Business Stream	Chemicals, Upstream, Downstream, or Other, (eg Solar)

Employee	A person directly employed by a BP company.
Contractor	A contractor is any non-BP person who is on BP premises under contract, for business purposes or anyone providing materials, personnel, or services that directly benefit BP and relate to a contract or subcontract. The contract may be with BP or another contractor who is working on behalf of BP.

	For group injury and illness reporting purposes, the following 'contractors' are <u>excluded</u> except in the event of a fatal accident when any contractor fatality <u>must</u> be reported:
	\cdot persons delivering goods, products or materials at a BP site
	• someone engaged in the delivery of products by road in execution of a contract with a BP company that runs for less than one year (<i>ie short term or spot contractors</i>)
	• a crew member of a vessel on short term or spot charter to a BP company (<i>ie not on time charter</i>).
	\cdot retail service station dealers and their staff at Company Owned Dealer Operated (<i>CODO</i>) sites.
	\cdot crew of a non-BP tanker loading or discharging crude oil or product for its own account at a marine terminal.
	• injuries to workers in third party fabrication yards or toll- manufacturing sites will not be recorded at BP Group level. However, they should be monitored by Business Unit and/or Project management, and significant events reported through the Major Incident Announcement system.
Third Party	Any person who is not an employee or contractor of BP as defined above
BP Premises	A site operated by a BP company or a marine vessel owned or operated by a BP company.
BP Company	A company wholly owned by the BP Group, or
	a company or joint venture where BP has equity and is responsible for HSE. Normally this is where BP is considered to be the operator, (eg where BP has a management or technical service agreement).

Establishing a 'work relationship'	The work relationship is established when the injury or illness results from an event or exposure in the work environment. The work environment primarily consists of: • the employer's premises, and
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	\cdot other locations where employees are engaged in work-related activities or are present as a condition of their employment.
	When an employee is on the employer's premises (<i>generally excluding parking lots</i>) the work relationship is presumed; when off the premises the relationship must be established.
	· travel on Company business should be considered work- related.
	\cdot a hotel or motel while being used on company business should be considered a 'home away from home' and evaluated as such.
	\cdot travel between home and work is not work-related.
	• Injuries or illnesses that occur to employees or contractors while participating in voluntary activities (<i>ie those that are</i> <i>provided or made possible by BP but in which participation is</i> <i>voluntary and for personal benefit, such as use of a fitness</i> <i>centre</i>) shall not be included in the BP Group internal reporting. However, local recording, follow-up etc. is essential, as is compliance with all legal requirements.
Recordable Fatality (number)	An employee or contractor fatality is deemed recordable if the incident is found to be work-related or related to the wider activities of BP. Fatalities arising, for example, from suicide, inexplicable personal behaviour or natural causes would normally be excluded. All fatalities associated with BP, whether recordable or not, are reported within 24 hours through the Major Incident Announcement procedure.
Days Away From Work Case (DAFWC) (number)	A work-related injury or illness that causes the injured person to be away from work for at least one normal shift after the shift on which the injury occurred, because he/she is unfit to perform any duties. All DAFW Cases should be reported by the reporting unit at which they occurred.
Recordable Injury/Illness (RI) Case (number)	RI cases are all work-related deaths and illnesses, together with injuries that result in loss of consciousness, restriction of work or motion, transfer to another job, or require treatment beyond first aid.
Recordable Injury/Illness Frequency (RIF)	RIF is expressed as the number of recordable injuries and illnesses per 200,000 hours worked.

First Aid Cases	A work related injury that requires one time treatment and subsequent observation (<i>for example minor scratches, burns,</i> <i>cuts, splinters which do not ordinarily require medical care</i>) and does not result in a DAFW or RI Case. Such treatment and observation are considered first aid even if provided by a physician or registered medical professional.
Hours Worked (number)	Total hours worked within a reporting unit, including office staff, part-time employees, apprentices and trainees and personnel from other BP sites or centres working within the unit for more than one month.
	where a person is using Company property as a temporary home (eg on the Alaskan North Slope and offshore platforms) 12 hours should be taken as the working day. For ship operations at sea, a 24 hour working day should be taken.
Occupational Illness and Industrial Diseases (number)	An abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion or direct contact. Chronic conditions should be reported once, in the period during which the condition was first diagnosed. See note at the end of this Key Process to differentiate
	between illness and injury.
Road Accidents (number)	Accidents involving vehicles which occur on the road and result in damage or a work-related injury. Includes work-related operation of vehicles by BP employees and product delivery vehicles or vehicles over 3.5 tonnes unladen operated by BP contractors.
	\cdot A zero-cost threshold is applied and reporting is irrespective of whether the accident was judged preventable or non-preventable.
	• A BP operated vehicle is a delivery, or other vehicle driven by a BP employee for work related purposes, although the vehicle may be owned, hired or leased.
	• A contractor operated delivery vehicle is either a company branded vehicle or a vehicle under a BP term contract <i>(ie for</i> <i>more than one year)</i> where the same driver is employed on a regular basis.
Nictoneo Nrivon	Total work related kilometres travelled by RD operated or

(kilometres)	contractor vehicles, whether empty or laden, should be reported. These may be estimated where appropriate.
Road Accident Rate	The number of road accidents per million vehicle kilometres travelled.

Distribution	Include transport incidents (all modes) resulting in
	· a DAFW Case
	·loss of material (exceeding 500 kg of non-classified material, or exceeding 50 kg of classified material or any loss from air freight)
	· any environmental damage from material loss
	\cdot any property damage or other costs exceeding US \$50,000.
	Data to be split by those incidents occurring during transportation and those occurring at customer premises.
	Reported to London by BP Chemicals transportation units only.
Oil Spills	A spill is defined as an accidental or unplanned loss of primary containment from a BP or contractor operation, irrespective of any secondary containment or recovery. When discovered, leakage from vessels is included in spill reporting, but may be reported separately.
	Details of spills less than 1 barrel need not be reported, but should be held locally.
Total Volume of Oil Spilled (litres)	The volume in litres of oil escaping primary containment, for spills equal to or greater than 1 barrel.
	1 barrel = 159 litres = 42 US gallons.
Total Oil Spilled and Unrecovered (litres)	The volume in litres of spilled oil, for spills equal to or greater than 1 barrel, that remains in the 'environment' ie the ground, water, atmosphere or food chain.

Oil Spills to Land or Water	If an oil spill reaches surface water (<i>fresh, salt or brackish</i>) it is defined as a spill to water, otherwise it is a spill to land. Spills to snow or ice should be categorized according to their proximity to a shoreline - offshore is classified as 'to water' and onshore as 'to land'.
Spills which reach the environment	An oil spill greater than 1 barrel, where there is no secondary containment, or where any liquid breaches or leaks from secondary containment, to come into contact with the ground, snow, ice or water.
Chemical Releases (number)	The number of chemical releases that are reportable to local agencies under local regulations for BP Chemicals operations.
Loss of Containment (number)	Any unplanned event where hydrocarbons are released from primary containment and results in the need for action such as shutdown, evacuation or maintenance, to mitigate the effects of the loss of containment. Fugitive emissions should not be included.
Waste, Discharges and Emissions	Measurement and estimation protocols for wastes, discharges to water and emissions to air are published in <i>'Environmental Performance - Group Reporting Guidelines'</i> .
	Waste, discharges and emissions will be reported in metric tonnes. One tonne = 1000 kilograms, or 2200 pounds.

Difference Between Occupational Injury And Illness

The potential outcome of any 'insult' to the body, for example the consequences of a fall or exposure to a hazardous agent, is an adverse health effect. These are differentiated as either an injury or illness/disease for analysis of causal factors. In a working environment, this is *determined by the nature of the original event or exposure which caused the effect* rather than the resulting condition of the affected employee.

- *Injuries* are caused by instantaneous identifiable events in the working environment
- *Illnesses* are caused by anything other than identifiable instantaneous events eg if repeated or prolonged exposure is involved the outcome is considered an illness. Additionally, a judgement needs to be made as to whether this exposure was work-related.

Differentiation is not always straightforward and clear definitions are necessary. Some conditions could be classified as either an injury or an illness but not both. For example:

- Hearing loss resulting from an explosion (*an instantaneous event*) is classified as an injury, whereas if it results from exposure to noise over a period of time it is classified as an illness
- Contact with a hot surface or caustic chemical causing an instantaneous burn is an injury. Sunburn, frostbite and welding flash burns are normally classified as illnesses because they usually result from prolonged or repeated exposure
- Tendonitis resulting from a one-time blow to the tendons of the hand is considered an injury, whereas repeated trauma or repetitive movement resulting in the same condition is considered an illness
- Back cases should be classified as injuries because they are usually triggered by an instantaneous event. Classifying back cases as injuries is appropriate not only for cases resulting from identifiable events, but also for cases where the specific event cannot be pinpointed, since back cases are usually triggered by some specific movement (*such as a slip, trip, fall, sharp twist, etc.*). Such generalizations are necessary to keep record keeping determinations as simple and equitable as possible

Unlike injuries, illnesses may not be easily recognised and *evaluation by trained medical personnel is desirable for confirmation both of diagnosis and attribution to occupational or non-occupational causation* in accordance with the OSHA Guidelines. Once a work-related illness is diagnosed, managers are responsible for ensuring that they are reported.

Illnesses frequently involve factors such as multiple causation, historic exposures totally unrelated to the current working environment and may also not result in time away from work or require modified job duties. They may also recur or result in a chronic condition. *Occupational illnesses are therefore reported only once - at the time of diagnosis or recognition*. As a consequence, the calculation of meaningful severity or frequencies is more complicated than for injuries.

<u>Health Management</u>

Safe and efficient operations depend on people. We must operate our facilities in a way that minimises health risks to employees, contractors and the community, and encourages our people to adopt a healthy lifestyle. This will enhance operations integrity, our reputation and productivity, and will establish a firm foundation for growth.

Health encompasses a **'spectrum'** of states ranging from the extremes of premature death to optimum health. Good health benefits the individual and plays an integral part in delivering successful business performance by minimizing loss and maximising gain (*Figure 1*).



Health Risk Management - the 'Basics'**

(See Figure 2)

Effective health risk management encompasses four key activities:

Business Planning

Workplace, environmental and travel health hazards are identified, and risks are assessed:

- for all new operations or modifications to plant or process
- before the acquisition of sites, leases, plant or materials
- before posting staff to remote, tropical or developing countries
- following changes in public and environmental health conditions.

Health Processes/Programmes

Paper copies are uncontrolled. The controlled version is on the BP Intranet http://gbc.bpweb.bp.com/hse/policy/Hseright99 These should be in place to cover:

- **medical management** the provision of medical support in the event of injury or illness, and to enable work in specified jobs or working environments
- **prevention** the control of workplace health risks to employees and contractors, the control of local *public health* risks to our employees and contractors, and control of environmental health risks to our neighbours, customers and the public from our operations and products
- promotion activities optimizing the health and well-being of our people

Health programmes are **risk-based** and their nature, scope and extent take into account the type and scale of the operation, the availability of suitable local health services, local hazards, legislation, standards and culture.

Health Measurement and Assessment

Procedures should be in place to:

- report, investigate and document adverse health effects (*illnesses*) attributed to operations, processes, product or materials, and the working environment
- audit, verify and provide assurance of performance against expectations and external benchmarks

Health **records** are maintained and data is periodically reviewed, to assess the effectiveness of hazard control measures and health management programmes.

Health Performance Improvement

A Process should be in place to periodically:

- assess performance
- review health risks
- seek continuous improvement.





HSE Toolbox

Implementation of each HSE Expectation requires one or more discrete management processes. Typical processes are set out in the BP 'HSE Toolbox' which is available on the Global Business Centre HSE Team Web Site.

- The 'HSE Toolbox' lists the various management processes and references them back to the relevant HSE Expectation; it also outlines good practice features. It can be used as a tool for gap analysis, auditing and self regulation
- The 'HSE Toolbox' output can also be reconfigured to match voluntary codes such as ISRS, REALM and ISO 14001 together with requirements such as US OSHA Process Safety Management regulations. This means that a single set of model management processes can meet the requirements for a wide range of code compliance and auditing purposes
- The inventory of HSE management processes within the Toolbox is designed to evolve as good practice evolves and lessons are learned. Each process is assigned to a network or team for maintenance or updating
- The 'HSE Toolbox' also contains several communications/sharing systems to enable a Network member to contribute good practice, ask questions on the Network and send Alerts on important HSE issues

Glossary

ACCIDENT PREVENTION

Accident prevention includes Major Accidents which when relevant (eg in accordance with the SEVESO II directive) a Major Accident Prevention Policy (MAPP) will be drawn up to guarantee a high level of protection to man and the environment by appropriate means, structures and management systems.

ASSURANCE AUDITS

A process to objectively evaluate the business unit's systemic management of the 13 elements of Getting HSE Right. The assessment consists of a review of policies, processes, programmes, documents and records coupled with selected field verification.

BENCHMARKING

A technique to compare and contrast the performance and practices of one business/facility with another in an attempt to share best practice.

BIODIVERSITY

The total variety of life on earth. It includes species, ecosystems and the whole of the natural world from the commonplace to the highly endangered. Loss of biodiversity has been linked with unsustainable development.

GVP

Group Vice President.

HAZOP

Hazard and Operability study, a hazard assessment technique used during the design stage of plant and equipment.

JOINT VENTURE

Any company that is not owned by BP but is in partnership with the Group via a contractual relationship to create a separate operating entity.

LEADER

Any person within the Group who has responsibility for others.

LIFE

The period of time from inception, through design, construction, operation and decommissioning of plant and hardware, and the same period of time from the inception, through production, marketing, sale and eventual disposal of products, including their re-use or recycling.

NGO

Non-governmental organization.

OUTCOMES AND INPUTS

Information on HSE outcomes (lagging) and inputs (leading) is included in Key Process 2.

<u>QRA</u>

Quantified Risk Assessment.

SIMULTANEOUS OPERATIONS

Any instance where a work activity outside the normal scope of work for the particular location is occurring at the same time as normal operations. Examples include construction or demolition activities within or adjacent to operating plant, the use of a drilling rig on an existing installation etc.

STAKEHOLDERS

Anyone with an interest in the Group's activities. Stakeholders include, for example, shareholders, employees, contractors, suppliers, customers, communities neighbouring our facilities and non-governmental organizations.

SUSTAINABLE DEVELOPMENT

As defined in Our Common Future, the 1992 Report of the Brundtland Commission, "Humanity has the ability to make development sustainable - to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs".

Sustainable resources are those which are derived from supplies which can be or are replenished such that the resource level is maintained for future use by future generations.

TARGETS

Specific goals and objectives to be achieved. Targets may be set by leaders and managers throughout the Group, apply as defined to the appropriate Business Units, and are included in performance contracts at all levels within BP.

VOLUNTARY MANAGEMENT PROGRAMME

Any management programme or system the Group or Business Unit subscribes to that is not a regulatory requirement. Examples include Responsible Care, ISO 9000/14001, EMAS, ISRS.

WORKFORCE

Our workforce is 'anyone who works for BP'. It includes employees, and contractors and any other third party personnel when they work for the Group. Definitions of employees, contractors and third parties to be used for accident/incident reporting are included in the section on HSE Reporting Definitions.












APPENDIX D SOCIAL BASELINE

ANNEX I COMMUNITYSURVEY SUMMARY

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Appendix D Annex 1 Community survey summary

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APPENDIX D ANNEX 1 COMMUNITY SURVEY SUMMARY

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline		Expectations	Specific Characteristics	Requests/ Social Needs
				GARDA	ABAN			
					-	Local employment	Water: Few times a week	More information
					F	Compensation for	Electricity: Sometimes	
-	Jandari (G)	3,034	Georgian/ Azeri	Positive		land	Gas: Canisters	improved water supplies
					I	None	Telephones: Mobile	Improved electricity
							Roads: Poor	saliddhs
					-	Local employment	Water: Almost always	More information
				Positive with	F	Compensation for	Electricity: Often	
7	Nazarlo	5,648	Azeri	pockets of hostility		land	Gas: Canisters	improved roads
				(WREP experience)	1	Gas	Telephones: Local and	
						Pollution & health	Roads: Poor	
					-	Local employment	Water: Few times a week	More information
				Generally positive. but	ł	Compensation for	Electricity: Often	
e	Kesalo	4,720	Azeri	with pockets of hostility		land	Gas: Canisters	improved water supplies
				(WREP experience)	I	Safety	Telephones: Mobile	Improved roads
							Roads: Poor	

Improved electricity supplies Improved school infrastructure and payment of teachers' salaries Requests/ Social Needs Possible input to local enterprises More information More information about pipeline Improved water supplies Improved roads about pipeline Water: Scheduled - often Roads: Fair along the main road and main streets but otherwise poor Electricity: Very seldom Characteristics Telephones: local and mobile Telephones: local and mobile Specific Water: Seldom – scheduled Electricity: Often Gas: Piped gas Gas: Piped gas Roads: Poor Compensation for land Expectations Local employment Local employment Compensation for land Damage to infrastructure Improved infrastructure Safety Safety Noise Traffic Traffic Dust + I I + Mainly positive with **pockets** of hostility (WREP reservations and **pockets** (WREP Attitude to Pipeline Positive, with experience) experience) Georgian /Azeri /mixed Azeri/Georgian Nationality (Included in population statistics for Gardabani Town) Population 11,844 Settlement Gardabani Town Kapanachi –Lelashka Map Ref. S 4

BTC PROJECT ESIA GEORGIA FINAL ESIA

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					Local employment	Water: Almost always but not everywhere	More information about pipeline
					Compensation for land	Electricity: Often	Improved roads
ი	Birliki	2,699	Azeri	neutral		Gas: Canisters	
						Telephones: Mobile	
						Roads: Poor	
					Local employment	Water: Few times a week	More information
					+ Compensation for	Electricity: Very seldom	
					land	Gas: Canisters	improved water supplies
7	Akhali	2,040	Georgian/mixed	Positive with	Improved infrastructure	Telephones: Mobile	Improved electricity
	Samgon)	reservations		Roads: Poor	saliddhs
					Safety		Improved roads
					- Dust		
					Traffic		

Improved sanitation and sewerage Improved electricity supplies Requests/ Social Needs Improved communications More information about pipeline More information about pipeline Improved water supplies Improved roads Improved roads Electricity: Very seldom Characteristics Water: Almost always Telephones: local and mobile Telephones: Mobile Specific Water: Seldom – scheduled Electricity: Often Gas: Piped gas Gas: Canisters Roads: Poor Roads: Poor Local employment Expectations Local employment Compensation for land Compensation for land Jobs not given to locals Damage to land Improved infrastructure Noise Traffic Safety Safety Noise + I + L Attitude to Pipeline Positive with reservations Positive with reservations Georgian/mixed Nationality Azeri Population 111,966 5,490 Settlement Akhtagla Rustavi Town Map Ref. ω ი

BTC PROJECT ESIA GEORGIA FINAL ESIA

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					Local employment	Water: Almost always	More information about nineline
					Compensation for	Electricity: Very seldom	leaved phome
					ומוות	Gas: Canisters	supplies
9	Karatagla	2,379	Azeri	reservations	Jobs not given to	Telephones: Mobile	Improved roads
					IOCAIS	Roads: Poor	
					 Safety 		
					Damage to Land		
					Local employment	Water: Very seldom	More information
					Compensation for	Electricity: Very seldom	
÷	Krteanici	2 620	Georgian	Positive with		Gas: Canisters	
=		242		reservations	Availability of piped gas	Telephones: Mobile	Improved waters supplies
					:	Roads: Poor	
					- None		

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
7	Kumisi	2,025	Georgian/mixed	Positive/ neutral	Local employment Compensation for land Improved water supply + Improved infrastructure Availability of piped gas - Traffic	Water: Very seldom Electricity: Sometimes Gas: Canisters Telephones: Mobile Roads: Poor	More information about pipeline Improved water Improved roads Improved electricity supplies
				MARNE	EULI		
					Local employment + Compensation for land	Water: Almost always Electricity: Almost always	Help to local enterprises Improved roads
13	Marneuli Town	25,350	Azeri/Georgian/mixed	Positive/ neutral	Safety	Gas: Piped gas Telephones: local and mobile	Improved access to energy and water supplies
					 Traffic Increased pressure on water subplies 	Roads: Fair along the main road and central streets	

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					Local employment	Water: None	More information
					Compensation for	Electricity: Almost always	
14	Jandari (M)	1,751	Azeri	Positive	ומוות	Gas: Piped gas	Improved roads
					Damage to Land	Telephones: local and	to water supplies
					Garbage and waste management	Roads' Poor	
				TETRITS	KARO		
					Local employment	Water: Almost always but	More information
					Compensation for		
					land	Electricity: Very seldom	Improved roads
	:				T Improved infrastructure	Gas: Piped gas	Improved electricity
15	Marshda	393	Georgian/mixed	Positive		Telephones: Mobile	
	Ivialabua)		Development of tourism	Roads: Poor	Improved communications
					Traffic		Development of tourism
					- Safety		

Improved electricity supplies Improved electricity supplies Improved electricity supplies Requests/ Social Needs Improved access to electricity and water supplies More information about pipeline More information about pipeline More information about pipeline Improved water supplies Development of tourism Improved roads Improved roads Improved roads Electricity: Very seldom Electricity: Very seldom Electricity: Very seldom Characteristics Water: Almost always Water: Almost always Telephones: Mobile Telephones: Mobile Specific Telephones: None Gas: Piped gas Gas: Canisters Water: None Roads: Poor Roads: Poor Roads: Poor Gas: None Increased pressure on electricity Expectations Local employment Local employment Local employment Compensation for land Compensation for land Compensation for land Development of tourism Environmental concerns Improved roads Improved infrastructure Improved infrastructure supplies Safety Safety + I + + L Attitude to Pipeline Positive/ neutral Positive Positive Georgian/Armenian/Gr Georgian/mixed Nationality Georgian eek Population 147 588 2 Settlement Akhali-Marabda Khaishi Kotishi Map Ref. 16 4 18

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline		Expectations	Specific Characteristics	Requests/ Social Needs
						Local employment	Water: None	More information about pipeline
					+	Compensation for	Electricity: Very seldom	Improved water
19	Patara-	59	Armenian	Positive			Gas: Canisters	supplies
					I	None	Telephones: None	Improved electricity
							Roads: Poor	supplies Improved roads
					-	Local employment	Water: Few times a week	More information
					F	Compensation for	Electricity: Very seldom	
20	Didi-Durnuki	57	Armenian	Positive/		laria	Gas: Canisters	improved water supplies
				IIEdulai	I	None	Telephones: Mobile	Improved electricity
							Roads: Poor	supplies Improved roads
					-	Local employment	Water: Few times a week	More information
					F	Compensation for	Electricity: Very seldom	
21	Tsintskaro	627	Armenian/ Mixed	Positive			Gas: Canisters	
					I	None	Telephones: Mobile & Landlines	
							Roads: Poor	

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					Local employment Compensation for	Water: None Electricity: Verv seldom	More information about pipeline
22	Kosalari	750	Azeri	Positive/	+ land	Gas: Canisters	Improved water supplies
				liental	das gas	Telephones: local and mobile	Improved electricity supplies
					- None	Roads: Poor	
					Local employment	Water: None	More information
					Compensation for	Electricity: Very seldom	limbrovind water
23	Daget-	148	Armenian	Positive/	+ Iallu Dood ronoir	Gas: Canisters	supplies
				וובמוומו		Telephones: Mobile	Improved electricity
					 Damage to Land 	Roads: Poor	supplies Improved roads
					Local employment	Water: Always	Moro information
					Compensation for	Electricity: Very seldom	about pipeline
24	Samshvilde	517	Armenian	Positive	ומוות	Gas: Piped gas if paid	Improved roads
					Safety	Telephones: Mobile	Improved electricity
					Dust	Roads: Poor	aupplica

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expe	ctations	Specific Characteristics	Requests/ Social Needs
					Local em	ployment	Water: Almost always but not everywhere	More information about pipeline
					Compens land	sation for	Electricity: Very seldom	Improved roads
	() ()				+ Availabili gas	ty of piped	Gas: Canisters - Pipeline exists	
25	Town	4,008	Georgian/mixed	Positive/ neutral	Improved		Telephones: Mobile	
					standard	ture and of living	Roads: Central road fair but poor inside the town	
					Traffic			
					- Safety			
					Local em	ployment	Water: Almost always	More information
					Compens	sation for	Electricity: Very seldom	anout pipellite
26	Chivschavi	401	Georaian	Positive/			Gas: Canisters	
			2	neutral	infrastruc	ture	Telephones: Mobile	Improved electricity
					- None		Roads: Poor	
					Local em	ployment	Water: None	More information
					Compens	sation for	Electricity: Very seldom	
27	Ipnara	16	Georgian/Armenian	Positive/ neutral	Idiid		Gas: Canisters	irriproved water supplies
					- None		Telephones: Mobile	Improved roads
							Roads: Poor	

ific Requests/ ristics Social Needs	always but More information about pipeline	y seldom Improved roads		obile			always but More information about pipeline	y seldom Improved roads		obile		always More information about pipeline	y seldom Improved roads		cal and supplies	Development of tourism	
Speci Characte	Water: Almost not everywhere	Electricity: Ver	Gas: Canisters	Telephones: Mo	Roads: Poor		Water: Almost not everywhere	Electricity: Ver	Gas: Canisters	Telephones: Mo	Roads: Poor	Water: Almost	Electricity: Ver	Gas: Canisters	Telephones: loc mobile	Roads: Poor	
Expectations	Local employment Commensation for	land	Availability of piped	- מיס נוס	Kepair roads	Safety	Local employment	Compensation for land	Improved	Inirasuructure	None	Local employment	Compensation for land		improved infrastructure	Safety	Traffic
e to		-	+			1		+					+				1
Attitude Pipelin			Positive	ווכמוומו					neutral						Positive		
ality			eorgian						eorgian						/Greek		
Nation			Greek/Ge						Greek/Ge						Georgian		
oulation			36						104						620		
Pol																	
Settlement Pop			Jigrasheni						lvanovka						Akhalsopeli		

Requests/ Social Needs More information about pipeline More information about pipeline Improved water supplies Improved roads Improved roads Improved water supplies Electricity: Very seldom Electricity: Very seldom Specific Characteristics Telephones: local and mobile Telephones: Mobile Telephones: Mobile Electricity: Seldom Gas: Canisters Gas: Canisters Roads: Poor Water: None Roads: Poor Water: None Water: None Roads: Poor Gas: None Expectations Local employment Local employment Local employment Compensation for land Compensation for land Compensation for land None None None + I + I + I Attitude to Pipeline Very Positive Positive/ neutral Positive Greek/Georgian Nationality Greek/Azeri Greek Population 167 225 22 Settlement Bashkoi Akhaliki lmera Map Ref. 32 33 31

APPENDIX DI – SOCIAL BASELINE NOVEMBER 2002 DH-13

BTC PROJECT ESIA GEORGIA

FINAL ESIA

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					Local employment	Water: Almost always but not everywhere	More information about pipeline
					+ Improved infrastructure	Electricity: Very seldom	Improved roads
34	snapar- Haraba	76	Greek	Positive		Gas: Canisters	
						Telephones: Mobile	
						Roads: Poor	
					Local employment	Water: None	More information
					Compensation for	Electricity: Very seldom	
35	Shipiaki	78	Greek/Georgian	Positive	land	Gas: Canisters	improvea water supplies
					- None	Telephones: Mobile	Improved roads
						Roads: Poor	
					Local employment	Water: None	More information
					Compensation for	Electricity: Very seldom	
36	Beshtasheni	448	Greek	Positive	- - -	Gas: None	supplies
					improved infrastructure	Telephones: Mobile	Improved roads
					- None	Roads: Poor	

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					Local employment	Water: Seldom	More information about pipeline
					Compensation for + land	Electricity: Very seldom	Improved access
27	Teallya		Greek/Georgian	Positive/	Avialability of nined	Gas: Canisters	to water supplies
5	24144	0 0 1 1		neutral	gas	Telephones: local and mobile	Improved roads
					 Safety & security 	Roads: Poor	Improved electricity and communications
					Local employment	Water: None	More information
					Compensation for	Electricity: Sometimes	
38	Kariaki	193	Greek/Georgian	Positive with	+ land	Gas: Canisters	Improved water supplies
)	reservations	Availability of piped	Telephones: Mobile	Improved roads
					- Safety	Roads: Poor	
					Local employment	Water: None	More information
					Compensation for	Electricity: Very seldom	
39	Santa	36	Greek/Georgian	Positive		Gas: Canisters	irriproved water supplies
					infrastructure	Telephones: Mobile	Improved electricity
					None	Roads: Poor	Improved roads

APPENDIX DI – SOCIAL BASELINE NOVEMBER 2002 D+15

TC PROJECT ESIA GEORGIA FINAL ESIA
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Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					Local employment + Revive the village	Water: Seldom Electricity: Very seldom	More information about pipeline
40	Tsintskaro	301	Greek	Positive/ neutral	Improved infrastructure	Gas: Canisters	improved water supplies
					5	Telephones: local and mobile	Improved roads
					- None	Roads: Poor	
					Local employment	Water: None	More information about pipeline
					Compensation for	Electricity: Very seldom	Immoved water
1	Achkala	1 010	Armenian	Positive/	Doad rapair	Gas: Canisters	supplies
F				neutral		Telephones: local and mobile	Improved roads
					- Safety - Increased crime	Roads: Poor	
					Local employment	Water: None	More information
					+ Compensation for	Electricity: Very seldom	
42	Jinisi	517	Greek	Positive/	lalid	Gas: Canisters	iniproved water supplies
				liedua	infrastructure	Telephones: local and mobile	Improved roads
					- None	Roads: Poor	

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectation	us Cl	Specific haracteristics	Requests/ Social Needs
					Local employn	ient Water: For Electri	: Few times a week	More information about pipeline
9	(:	+ land	Gas. (lariy. Very seruarii Canisters	Improved roads
43	Gumbati	n/a	Georgian/mixed	Positive	Improved infrastructure	Teleph	ones: Mobile	Improved electricity supplies
					- None	Roads	:: Poor	Improved water supplies
					Local employn	ent Water: not eve	:: Almost always but erywhere	More information
				,	Compensation + land	for Electri	icity: Very seldom	about pipeline
44	Avranlo	97	Greek/Georgian	Positive/ neutral	Improved	Gas: (Canisters	Improved roads
					IIIIIasuucuue	Teleph	nones: Mobile	
					 Safety 	Roads	: Poor	
					Local employn	ent Water: not eve	:: Almost always but erywhere	More information about pipeline
					Compensatio + land	n for Electri	icity: Very seldom	Improved electricity
AR AR		800 F		Positive with pockets of	Availability of p	iped Gas: (Canisters	supplies Improved reads
}	Kizil-Kilisa	006,1		hostility	0 0 0	Teleph	nones: Local and	
					Foreign work	ers Roade	Door	
					Lack of emplo for locals	ment	-	

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline		Expectations	Specific Characteristics	Requests/ Social Needs
						Local employment	Water: Few times a week	
				Docitiva/	+	Compensation for	Electricity: Very seldom	
46	Ozni	697	Armenian	neutral with			Gas: Canisters	
				reservations		infrastructure	Telephones: local and mobile	
					I	Safety	Roads: Poor	
						Local employment	Water: Almost always but	More information about pipeline
					+	Compensation for land	Electricity: Very seldom	Improved roads
47	Rekha	540	Georgian	Positive		Improved	Gas: Canisters	Improved water
						IIIIIasuucuue	Telephones: Mobile	saliddins
					I	Safety	Roads: Poor	Improved electricity supplies
						Local employment	Water: Seldom	More information
					+	Compensation for	Electricity: Very seldom	limbround under
48	Khando	201	Georgian/Greek	Positive/ neutral		alla	Gas: None	supplies
					I	None	Telephones: None	Improved roads
							Roads: Poor	
				BORJ	IMO			

<u> </u>	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					Local employment	Water: Almost always but not everywhere	More information about pipeline
					Improved + infrastructure	Gas: Canisters	Improved roads –
					Development of	Electricity: Often	Akhaliki
				Positive with	(DUI ISI II	Telephones: Mobile	Development of
Ê	abatskuri	731	Armenian	pockets of hostility	Foreign workers	Roads: Poor	rourism
					Safety		
					- Noise		
					Traffic		
					Damage to Land		
					Local employment	Water: Almost always	More information about pipeline
					Improved + infrastructure	Gas: Canisters	Improved roads
					A. Sainder Hillidelies, A	Electricity: Often	To: colorent of
0					Availability of piped gas	Telephones: Mobile	Levelopment of tourism
4	Andeziti	500	Georgian/mixed	Positive	Environmental concerns	Roads: Poor	Improved access to water and energy
					 Increased traffic 		Traffic control
					Safety		(requested by respondents)
					Impact on tourism		

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					Local employment	Water: Almost always	More information
					Compensation for	Gas: Canisters	
					land	Electricity: Often	improved roads
					Availability of piped gas	Telephones: Mobile	Improved school infrastructure and
					+ Development of fourism	Roads: Poor	teachers' salaries
							Development of
4	Tsikhisjvari	U U U U	Greek /Armenian/	Positive with pockets of	Improved infrastructure		tourism
0		20 20 20	Georgian	hostility	Environment & Health		
					Noise		
					Traffic		
					 Damage to Land 		
					Safety		
					Garbage and waste management		

Requests/ Social Needs	More information about pipeline Improved electricity supplies Improved roads Development of tourism	More information about pipeline Improved roads
Specific Characteristics	Water: Scheduled – every day Electricity: Up to 6 hours a day Gas: Piped gas Telephones: local and mobile Roads: Poor	Water: Access to spring water Electricity: None Gas: Canisters Telephones: None (no mobile access) Roads: Extremely poor
Expectations	Local employment Compensation for tand Improved infrastructure Environmental damage Traffic Vibration and damage to houses Safety	Local employment Improved roads + Improved infrastructure Compensation for land and forest and forest - concerns Safety
Attitude to Pipeline	Positive/ neutral with reservations	
Nationality	Georgian/Armenian	Georgian
Population	18,500	(Temporary shepherds village)
Settlement	Borjomi	Kodiani
Map Ref	22	ß

Requests/	Social Needs	More information	lmbroved roads		tourism		More information	about pipeline		Development of tourism					
Specific	Characteristics	Water: Almost always	Gas: Canisters	Electricity: Almost always	Telephones: Mobile	Roads: Poor	Water: Almost always	Gas: Canisters	Electricity: Almost always	Telephones: Mobile	Roads: Poor				
Exnectations		Local employment	Compensation for			- Environmental	concerns Local employment	Compensation for	- Iailu	Availability of piped gas	Improved infrastructure	Environmental	concerns	- Safety	Take jobs away from locals
							-		т		C 10			1	
¥	le				1)						vit) DIS				
Attitude to	Pipeline			0 	LOSIIVE						Positive with reservations				
Nationality Attitude to	Pipeline										Georgian/mixed reservations				
Population Nationality Attitude to											937 Georgian/mixed Positive with reservations				
Settlement Population Nationality Attitude to											Sakire 937 Georgian/mixed reservations				

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
22	Tadzrisi	582	Georgian	Positive	Local employment Compensation for land + Improved infrastructure Development of tourism Environmental concerns - Safety	Water: Almost always Gas: Canisters Electricity: Almost always Telephones: Mobile Roads: Poor	More information about pipeline Improved roads Development of tourism
				AKHALT	SIKHE		
					Local employment + infrastructure	Water: Almost always but not everywhere Electricity: Very seldom	More information about pipeline Improved electricity
57	Tiseli	226	Georgian	Positive	- Damage to land	Gas: Canisters Telephones: Mobile Roads: Poor	supplies Improved roads
58	Tkemlana	360	Georgian	Positive	Local employment + land	Water: Almost always Electricity: Very seldom Gas: None	More information about pipeline Improved electricity supplies
					 Damage to land 	Telephones: Mobile Roads: Poor	Improved roads

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					Local employment	Water: Almost always but not everywhere	More information about pipeline
					+ Compensation for land	Electricity: Very seldom	Improved electricity
					Improved infrastructure	Gas: Canisters	supplies Improved roads
50	Ateluni	777	Coordina (mixed	Positive with		Telephones: Mobile	
r C	HINNEN	, + -		reservations	Noise & Dust	Roads: Fair along the	infrastructure and
					 Crime & Safety 	elsewhere	payment of teachers' salaries
					Traffic		
					Only temporary improvements		
					Local employment	Water: Almost always but	More information
					+ Compensation for		
					land	Electricity: Very seldom	Improved electricity
60	Agara	395	Georgian	Positive/ neutral	Decreased migration	Gas: Canisters	supplies Improved roode
					••••	Telephones: Mobile	
					– Increased traffic	Roads: Poor	
					Local employment	Water: Almost always	More information
					Compensation for	Electricity: Very seldom	
61	Sakuneti	591	Georgian	Positive		Gas: Canisters	Improved roads
					Damage to land	Telephones: Mobile	Improved electricity supplies
					1		

APPENDIX DI-SOCIAL BASELINE NOVEMBER 2002 D+P24

Roads: Poor

Safety

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					Local employment	Water: Almost always	More information
					Compensation for	Electricity: Very seldom	
62	Zikilia	390	Georgian	Positive	alla	Gas: Canisters	
)		 Damage to land 	Telephones: Mobile	irriproved water supplies
						Roads: Poor	Improved electricity supplies
					Local employment	Water: Almost always	Repair of the bridge in the village
					+ Compensation for	Electricity: Very seldom	
63	Tsnisi	695	Georgian	Positive	Ianu Averite Filite e Erie e J	Gas: Canisters	
)		Availability of piped gas	Telephones: Mobile	irriproved electricity supplies
					- Damage to land	Roads: Poor	
					Local employment	Water: Few times a week	More information
					+ Compensation for	Electricity: Very seldom	Improved water
64	Klde	873	Georgian	Positive		Gas: Canisters	supplies
			l		infrastructure -	Telephones: local and mobile	Improved roads
					None	Roads: Poor	Improved electricity supplies

APPENDIX DI – SOCIAL BASELINE NOVEMBER 2002 D+25

BTC PROJECT ESIA GEORGIA FINAL ESIA

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
65	Suburb of Akhaltsikhe		Armenian/Georgian	Positive/ neutral	Local employment + Compensation for land Availability of piped gas	Water: Few times a week Electricity: Very seldom Gas: None Telephones: Mobile	More information about pipeline Improved roads Improved electricity supplies
					 Increased traffic & vibration 	Roads: Poor	Improved access to water supplies
					Local employment Compensation for + land	Water: Scheduled Electricity: Very seldom Gas: Seldom Canisters	More information about pipeline Improved electricity supplies
99	Akhaltsikhe Town	19,118	Georgian/mixed	Positive/ neutral	Availability of piped gas Improved infrastructure	Telephones: Mobile Roads: Fair	Improved roads
					 Increased traffic & vibration Increased pressure on water subblies 		

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectations	Specific Characteristics	Requests/ Social Needs
					+ Local employment	Water: Few times a week	More information about pipeline
67	Tsira	435	Armenian/Georgian	Positive/	infrastructure	Gas: Seldom Canisters	Improved water supplies
1)	neutral	- None	Telephones: Mobile	Improved electricity
						Roads: Poor	supplies Improved roads
					Local employment	Water: Few times a week	More information about pipeline
				:	+ Compensation for	Electricity: Very seldom	lmproved water
68	Tskruti	1,224	Armenian	Positive/ neutral with	Avialability of nined	Gas: Seldom Canisters	supplies
				reservations	gas	Telephones: local and mobile	Improved electricity supplies
					 Damage to land 	Roads: Poor	Improved roads
					Local employment	Water: Almost always	More information about pipeline
					Improved infrastructure	Electricity: Up to 4 hours a day	Improved roads
69	Skhvilisi	1,748	Armenian/Georgian	neutral with		Gas: Seldom Canisters	Improved electricity
				16361 / 441/0113		Telephones: Mobile	saupures
					Satety Issues	Roads: Poor	
					Damage to land		

BTC PROJECT ESIA GEORGIA	FINAL ESIA
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Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline		Expectations	Specific Characteristics	Requests/ Social Needs
						_ocal employment	Water: Few times a week	More information about pipeline
					+	Compensation for and	Electricity: Less than 2 hours a day	Improved electricity
					_ 0	Improved water supplies	Gas: Seldom Canisters	uppiles Improved roads
02	Vale Train		Armenian	Positive/			Telephones: Mobile	
2	Station			reservations	1	Vibration associated with traffic and construction	Roads: poor	
					0)	Safety issues		
					_ >	Increased pressure on vater supplies		
						_ocal employment	Water: Almost always	More information about pipeline
					+	Compensation for and	Electricity: 2-3 hours a day	Improved electricity
					1	Availability of piped	Gas: Canisters	supplies
71	Vale	5.687	Georaian/Armenian	Positive/	0,	gas	Telephones: Local and	Improved school infrastructure and
)	neutral		increased traffic -	mobile Roads: Poor	payment or teachers' salaries
					1	vibilation along the road and damage to rouses		Help development of local enterprises
						Take away jobs from ocals		

Map Ref.	Settlement	Population	Nationality	Attitude to Pipeline	Expectati	ons Specific Characteristics	Requests/ Social Needs
					Local employi	nent Water: Shortage for drinking and irrigation	More information about pipeline
					Compensation f	Electricity: Up to 8 hours a day	Repair of river bridge
	Naokhrebi		Armenian	Positive/	lallu	Gas: Seldom Canisters	Improved roads
72		721		pockets of	Increased traffic	Telephones: None	
				llosulluy	 Safety 	Roads: Poor	
					Damage to Lan		
					Take away jobs locals	from	
Not mig	e: Expectations ht result in hosti	in bold relate to le attitudes in th	the reasons cited for pote e settlements with pocket	ential hostility in th is of hostility. If the	e respective settleme negative expectatior	nts. le if the positive expectations a s occur, this might have the same	e not met, this effect.

APPENDIX D SOCIAL BASELINE ANNEX II TABLE OF SETTLEMENTS

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BTC PROJECT ESIA GEORGIA FINAL ESIA

Table 9.2 Table of settlements- with map references for Figure 9-2

Akhaltsikhe	Tiseli	Tkemlana	Atskuri	Agara	Sakuneti	Zikilia	Tsnisi	Klde	Suburb of Akhaltsikhe	Akhaltsikhe Town	Tsira	Tskruti	Skhvilisi	Vale Train Station	Vale	Naokhrebi		
	57	8 29	20	60	61	62	ន	64	65	99	67	89	8	0/	71	72		
Borjomi	Tabatskuri	Bakurianis Andeziti ⁽¹⁾	Tsikhisjvari	Borjomi	Kodiani	Dviri	Sakire	Tadzrisi										
	49	50	51	52	53	54	55	56										
Tsalka	Imera	Bashkoi	Akhaliki	Shapar-Haraba	Shipiaki	Beshtasheni	Tsalka	Kariaki	Santa	Tsintskaro	Ashkala	Jinisi	Gumbati	Avranio	Kizil-Kilisa	Ozni	Rekha	Khando
	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Tetritskaro	Akhali-Marabda	Dzveli-Marabda	Kotishi	Khaishi	Patara-Durnuki	Didi-Durnuki	Tsintskaro	Kosalari	Daget-Hachin	Samshvilde	Tetritskaro Town	Chivschavi	Ipnara	Jigrasheni	Ivanovka	Akhalsopeli		
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Marneuli	Marneuli Town	Jandari (M)																
	13	14																
Gardabani	Jandari (G)	Nazarlo	Kesalo	Kapanachi- Lelashka	Gardabani Town	Birliki	Akhali Samgori	Rustavi Town	Akhtagla	Karatagla	Krtsanisi	Kumisi						
	-	2	ю	4	ۍ	9	7	ω	თ	10	11	12						

APPENDIX DII – SOCIAL BASELINE NOVEMBER 2002

(1) Also referred to as Andezit.

SOCIAL BASELINE APRIL 2002

Calculated By:Neil TitleyChecked By:Ian JamesApproved By:Ian JamesJob Number:47092-005Client:BP

<u>General Introduction</u> <u>Stack Height Determination for a Solar Mars 100 Gas Turbine - CO emissions</u>

1

The following base conditions for each turbine have been used within the stack height calculations.

Exhaust gas flow=	34.65 kg/sec		
Temperature of Discharge=	784 K		
Moisture content of stack gas=	8.28 %		
Oxygen content of stack gas=	14.37 %		
Exhaust gas emission=	64 mg/Nm3	Reference Conditions=	15 %, Dry
No/ of Units	1		

Calculate the Pollution Index (Pi)

Pi = ED / (Gd-Bc) (D1 eqn 1)

where: Pi = Pollution Index (m3/s)

ED = Sum of Discharge rates for CHP units included within CHP scheme (Actual) (g/s)

 $Gd = Guidance \ concentration \ of \ discharged \ pollutant \ (Actual \ Discharge \ conditions) \ (mg/m3)$

Bc = Background Concentration of discharged emission (mg/m3)

Need to Determine Pollutant Concentration at Stack Discharge Conditions (Cd)

$Cd = Cs \times (273/Tc)$	b x ((100-H2Od)/100) x $((20.9 - O2d) / (20.9 - O2d))$	(D1 App B)
	, n ((100 1120 d)/ 100	/ n ((20)/ 02d)/ (20)/	

Where :	Cs = Pollutant Concentration at Standard Conditions	=	64	mg/m3
	Td = Temperature of Discharge Gas	=	784	К
	H20d= Moisture content of discharge	=	8.28	%
	O2d= Oxygen content of discharge	=	14.37	%
	O2s= Oxygen content at reference conditions	=	15	%
Thus:	Pollutant Concentration at Stack Discharge (Cd) =	22.62	mg/m3	

Calculate Discharge Volume Flow Rate at Stack Discharge (V)

	V =	Exhaust Gas Flow / Density of Gas at Discharge Temperat	ure		
	Where :	Exhaust Gas Flow	=	34.65 Kg	/sec
		Density of Gas at Discharge Temperature	=	0.450 Kg	/m3
	Thus :	Volume Flow Rate at Stack Discharge (V) =		76.97 m3	i/s
Calculate Disch	narge Rate (D)				
	$D = (V \times Cd)/1000$) (D1 App B)			
	Where:	D = Discharge Rate at Discharge Conditions (g/s)			
		V = Discharge Volume Flow Rate at Discharge Conditions	5	=	76.97 m3/s
		Cd = Pollutant Concentration at Stack Discharge		=	22.62 mg/m3

Calculated By:	Neil Titley					
Checked By:	Ian James					
Approved By:	Ian James					
Job Number:	47092-005					
Client: BP						
	Thus:	Discharge Rate =	1.74 g/s			
Calculate Poll	ution Index (Pi)					
Pi = (((D/(Gd-I	3c))x1000) (D	1 Eqn 1)				
Where :	D = COMBINED	Discharge Rate of Pollutant I	FROM ALL STACKS IN STUI	DY	1.74 g/s	
	= 1 x Discharge F Gd = Guidance Co	Rate (1 units option of Pollutant AT)	perating, D1 4.2) STACK CONDITIONS		11.6 mg/m3	
	Bc = Background	Concentration			0.002 mg/m3	(D1 Tab.2)
	Pi =	150.14 m3/s				
A th G	value for Bc was of ae type of district. Th d was obtained from	btained from Table 2 (D1 gu he area around the site was do n UK Air Quality Standards,	idance notes), which details 'Ty eemed to fall within the 'Partia which sets 8 hour running mear	pical Background Lev Ild developed area' ca a air quality standards b	vels of Common Pollutan ategory. for CO .	ts' by
Determine	Discharge Sta	ick Height				
Calculate Hea	t Release					
Q = ((V(1-(283	/Td))/2.9)x No. of S	tacks) (D1 Eqn 3, D1 para	a. 6.4.2))			
Where :	V = Total Volume	Flow at Discharge Condition	ns	76.97 m3/s		
	Td = Temperature	of Discharge		784 K		
	Q =	17.0 MW				
RULE :	Q minimum = 0.0 Qactual > Qmini)3 MW mum, therefore proceed wit	(D1 5.2) th Ub calculation	2.1)		
a						
<u>Ult</u>	OTTECTED STACK Heij	gnt for Buoyancy (UD)				
n =()^a Pi^b	(D) = Ean(6)					

00 = 10 a FF 0	(D1 Eqti 0)		
Where for value	es of Q<1 MW:	a = -1.11 - 0.19log10^Q	(D1 Eqn 6)
		$b = 0.49 + 0.005 log 10^Q$	
Where for value	es of $Q > 1$ MW	a= -0.84-0.1*exp(Q^0.31)	(D1 Eqn 6)
		b= 0.46+0.011.exp(Q^0.32)	
Q>1 Therefore :	a =	-1.95	
	b =	0.59	
Therefore	Ub =	0.22 m	
RULE :	Ub	1 m min 200 m max	(D1 5.3.3)
	Q	0.03 kW min 100 MW max	
	Pi	50 min 10000000 max	
	Either Ub, Q or Pi	do not comply with this rule, see D1	

Calculated By:	Neil Titley
Checked By:	Ian James
Approved By:	Ian James
Job Number:	47092-005
Client: BP	

Calculate Uncorrected Stack Height for Momentum (Um)



Calculated By: Neil Titley Checked By: Ian James Approved By: Ian James Job Number: 47092-005 Client: BP

Determine Final Stack Height For Multiple Buildings and Tall Buildings

$C = Hm + (1 - Hm/Tm)[U + (Tm - U)(1 - A^-U/Hm)] $ (D1 Eqn 19)									
	C = Corrected Stack Height (m)								
	U = Uncorrected D	Discharge Stack Hei	ght		=	0.22 m			
	A = Um/Ub (If the	ere is no value of U	b or if Ub	> Um, A = 1)	=	31.42 m			
	H = Building Heig	ht			=	See Table Below			
	W = Building Wid	th			=	See Table Below			
	K = Lesser of build	ling height or build	ing width		=	See Table Below			
	T = Height of distu	urbed flow over buil	lding = H	+ 1.5K	=	See Table Below			
	Tmax = Maximum	T considering all r	elevant b	uildings	=	27.5 m			
	Hmax = Maximum	H considering all	relevant b	uildings	=	11.0 m			
Consider all rele	evant Buildings (ple	ase refer to enclose	d plan of	site)					
Building ID	Building Height	Building Width	К	Т					
Pump House	11	90	11	27.5					
Hmax =	11.0		Tmax =	27.5					
	Therefore :	C = Final corrected	discharg	e stack height =		12.21 m			

Calculated By: Neil Titley Checked By: Ian James Approved By: Ian James Job Number: 47092-005 Client: BP

<u>General Introduction</u> <u>Stack Height Determination for a Solar Mars 100 Gas Turbine - NOx emissions</u>

The following base conditions for each turbine unit have been used within the stack height calculations.

Exhaust gas flow=	34.65 kg/sec		
Temperature of Discharge=	784 K		
Moisture content of stack gas=	8.28 %		
Oxygen content of stack gas=	14.37 %		
Exhaust gas emission=	165 mg/Nm3	Reference Conditions=	15 %, Dry
No/ of Units	1		

Calculate the Pollution Index (Pi)

Pi = ED / (Gd-Bc) (D1 eqn 1)

where: Pi = Pollution Index (m3/s)

Calcula

ED = Sum of Discharge rates for CHP units included within CHP scheme (Actual) (g/s)

Gd = Guidance concentration of discharged pollutant (Actual Discharge conditions) (mg/m3)

Bc = Background Concentration of discharged emission (mg/m3)

Need to Determine Pollutant Concentration at Stack Discharge Conditions (Cd)

$Cd = Cs \times (273/Td) \times ((100-H2Od)/100) \times ((20.9 - O2d) / (20.9 - O2s))$ (D1 App B)

Where :	Cs = Pollutant Concentration at Standard Conditions	=	165	mg/m3
	Td = Temperature of Discharge Gas	=	784	K
	H20d= Moisture content of discharge	=	8.28	%
	O2d= Oxygen content of discharge	=	14.37	%
	O2s= Oxygen content at reference conditions	=	15	%
Thus:	Pollutant Concentration at Stack Discharge (Cd) =	58.33 1	mg/m3	

Calculate Discharge Volume Flow Rate at Stack Discharge (V)

	V =	Exhaust Gas Flow / Density of Gas at Discharge Tempera	ature				
	Where :	Exhaust Gas Flow	=	34.65	Kg/sec		
		Density of Gas at Discharge Temperature	=	0.450	Kg/m3		
	Thus :	Volume Flow Rate at Stack Discharge (V) =		76.97	m3/s		
te Discl	narge Rate (D)						
	$D = (V \times Cd)/1000$	0 (D1 App B)					
	Where:	D = Discharge Rate at Discharge Conditions (g/s)					
		V = Discharge Volume Flow Rate at Discharge Condition	ns	=		76.97	m3/s
		Cd = Pollutant Concentration at Stack Discharge		=		58.33 1	ng/m3

Calculated Type Vertication of the Vertication of							
Checkel BY: In June : Approved PY: In June : 200 Lenge N is a rest in the set of the set	Calculated By	: Neil Titley					
Approved By: Lus James 20 Number: 27 20 2005 Like Like View The model of the part of th	Checked By:	Ian James					
Interview 2012 Particle Parteverse Partinde Particle Particle Parteverse Particle	Approved By:	Ian James					
Construction 0.0000 gene 1 Construction 0.0000 gene 1 With the construction 0.0000 gene 1 A value for the watching from Table (D) lapped meen onclock which the the Variable developed area constructions or the construction of the construc	Job Number:	47092-005					
Ine: Decknage Rue = 4.893 gÅ Calcular Pollution Index (P) Science Volume Pole (D): (0.1 Eq. 1). Where: D = 0.0000 BBDD Dischage Rate of Pollumant PROM ALL STACK NONDITON: 4.94 gÅ D = 0.0000 BBDD Dischage Rate of Pollumant PROM ALL STACK CONDITONS 0.02 m/m³. (0.5 205 EGC) D = 0.0000 concentration 0.020 m/m³. (0.1 Tab.2) D = 0.0000 for other base accound the size was decimated from Tables 2.01 guidance anos), which details Tayload Background Levels of Common Pollatonary by the tree of dataset. The area anound the size was decimated from the mean values per hour, or per period less than an hour, records throughout the year (S2:005 EEC). Decentration How SMB procenile elected and from the mean values per hour, or per period less than an hour, records throughout the year (S2:005 EEC). D = 0.000 Volume Flow a Discharge Conditions 76.9 m.3°. Culture Hours 6.1 m.3°. Culture Hours 6.1 m.3°.	Client: BP						
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Calculate Justice (P) (0) Eqn () Here: (0) COMBIND Discharge Rate of Pollumint ROM ALL STACKS IN STUDY 4.49 µS (0) Condence Concentration of Pollumint AT STACK CONDITIONS (0) 20 mg/m3 (0) 20 mg/m3 Be = Background Concentration of Pollumint ROM ALL STACKS INSTUDY 4.49 µS (0) 20 mg/m3 <							
P = (0)(0)(0) + (0)(0)(0) + (0)(0)(0)(0) + (0)(0)(0)(0)(0)(0)(0)(0)(0)(0)(0)(0)(0)(Calculate Po	llution Index (Pi)					
Where: D = COMBINED Discharge Rate (1 mins operating, D1 4.2) 0.2 mg/m3 (6 \$2055EEC) Be = Background Concentration 0.002 mg/m3 (D1 Tab.2) 0.002 mg/m3 (D1 Tab.2) Pi = 22673.34 m3/s 0.002 mg/m3 (D1 Tab.2) 0.002 mg/m3 (D1 Tab.2) A value for Re was obtained from Table 2: (D1 guidance notes), which details <i>Tspical Background Levels of Common Pollutants</i> * by the type of district. The mean avalues was deneed to full which the " <i>Parialial developed area</i> " entegory. Gd was obtained from Table 2: (D1 Fap.3) Clearnine Useshare Rotes U = values of district. The mean avalues was obtained from the 98th percentile calculated from the mean values perhoar, or per period less than an hour, recorded throughout the year (85:2055EEC) Clearnine Useshare Rotes Q = values 76:97 m3/s Q = values 76:47 m3/s Value Value Value Prove Was MW (D1 5.2).1 Q = values Q = values (D1 5.2).1 Value Valu	Pi = (((D/(Gd	-Bc))x1000) (D	1 Eqn 1)				
I N Dicketarge Rate (1 units operating, D1 4.2) 0.2 mg/m3 (052 005 FLC) B - Background Concentration 0.002 mg/m3 (D1 Tab.2) F = 22673.34 m3/s 0.002 mg/m3 (D1 Tab.2) A value for Be was obtained from Table 2 (D1 guidance notes), which details <i>Typical Background Level of Common Pollutams'</i> by the type of district. The area around the site was deemed to fall within the <i>Partialit develoyed area'</i> category. G da was obtained from the 98th percentile calculated from the mean values per hour, or per period less than an hour, recorded throughout the year (85205 FEC) Celermine Discharge Stack Height Calculate House Stack Height Celermine Discharge Conditions 76.97 m3/s T = 1700 MW Q = 1700 MW Release Provide the Stack Height for Buomancy (Db) Q = 1700 MW Release Provide Stack Height for Buomancy (Db) Q = 1700 MW Q = 170 MW Release Provide Stack Height for Buomancy (Db) Q = 0.000 Sing IO'Q Q = 0.000 MW Q = 0.000 MW Q = 0.000 MW Q = 0.000 MW Q = 0.000 MW <th>Where :</th> <th>D = COMBINED</th> <th>Discharge Rate of Pollutant FROM ALL STACKS</th> <th>IN STUDY</th> <th>4.49 g/s</th> <th></th>	Where :	D = COMBINED	Discharge Rate of Pollutant FROM ALL STACKS	IN STUDY	4.49 g/s		
$P = 2073.34 \text{ m/s}$ $P = 2073.34 \text{ m/s}$ A value for B was obtained from Table 2 (D1 gainding e notes), which details Typical Background Levels of Common Pollutaner by the type of district. The area around the site was detained to fall within the <i>Partialid developed area</i> ² category. Glowagboat the year (SF 2005 EEC) Determine Discharge Stack Height $P = (V(1/(2837d))/2.9) \text{ No. of Stacks} (D1 Egn 3, D1 para. 64.2)$ $P = (V(1/(2837d))/2.9) \text{ No. of Stacks} (D1 Egn 3, D1 para. 64.2)$ $P = 17.0 \text{ M/s}$ $P = 17.0 \text$		= 1 x Discharge l Gd = Guidance C	Rate (1 units operating, D1 4.2) oncentration of Pollutant AT STACK CONDITION	S	0.2 mg/m3	(85/205/EEC)	
$P_{i} = 22673.34 \text{ m}_{3}^{i}$ A value for the vase obtained from Table 2 (D1 guidance notes), which details <i>Typical Background Levels of Common Pollutants</i> , by the type of district. The area around the site was decended to fall within the <i>Partiallid developed area</i> ' category. Guidance from the 98th percentile calculated from the mean values per hour, or per period less than an hour, recorded throughout the year (85/205/EEC) Determine Discharge Stack Height $Q = (V(1/(2837d))/2.9) \times No. of Stacks) (D1 Eqn 3, D1 para. 64.2); Were: V = Total Volume Flow at Discharge Conditions 76.97 m/s. Td = Temperature of Discharge 170.0 MW Q = 170.0 MW RUE: Q minimum = 0.03 MW Q = 170.0 MW D1 Eqn 4.1 = 0.03 MM Q = 1.1 + 0.19 \log 10^{O} (D1 Eqn 6) = 0.1 + 0.1 + 0.19 \log 10^{O} (D1 Eqn 6) = 0.04 + 0.005 (D1 Eqn 6) = 0.04 + 0.0$		Bc = Background	Concentration		0.002 mg/m3	(D1 Tab.2)	
A value for B & was obtained from Table 2 (D1 guidance notes), which details <i>Typical Background Levels of Common Pollutants</i> by the type of district. The area around the site was deemed to fall within the <i>Partialili developed area</i> ' category. Gl was obtained from the 98th percentile calculated from the mean values per hour, or per period less than an hour, recorded from glood the year (85/205/EEC) Determine Discharge Stack Heiph Q = ((v(1-(283/Td))/2.9)× No. of Stacks) (D1 Eqn 3, D1 para. 64.2): Where $V = Total Volume Flow at Discharge Conditions 76.97 m3/s$ Td = Temperature of Discharge 170. MW RUE Q = 107.0 MW Calculat > Q minimum = 0.03 MW Quetual > Q minimum, therefore proceed with Ub calculation Determine Stack Heiph (D1 52.1) Quetual > Q minimum = 0.03 MW Quetual > Q minimum = 0.03 MW Quetual > Q minimum = 0.04 MU Quetual > Q minimum = 0.04 (U) Quetual > Q minimum = 0.04 (U) (D1 Eqn 6) $E = 0.49 + 0.005 \log 10^Q$ Where for values of Q > 1 MW $a = -1.11 - 0.19 \log 10^Q$ (D1 Eqn 6) $E = 0.46 + 0.001 \exp(Q^0.31)$ $b = 0.30 + 0.001 \exp(Q^0.31)$		Pi =	22673.34 m3/s				
A value for the was obtained from Table 2 (D1 guidance notes), which details <i>Typical Background Levels of Common Pollutanis</i> by the type of district. The area around the site was deemed to fall within the <i>Partialial developed area</i> ' category. Guidance from the 98th percentile calculated from the mean values per hour, or per period less than an hour, recorded from the result of the Values Per box. The Percentile Calculated from the mean values per hour, or per period less than an hour, recorded in the Values of Calculated Tom the mean values per hour, or per period less than an hour, recorded in the Values Percentile calculated from the mean values per hour, or per period less than an hour, recorded in the Values Percentile Calculated from the mean values per hour, or per period less than an hour, recorded in the Values Percentile calculated from the mean values per hour, or per period less than an hour, recorded in the Values Percentile Calculated from the mean values per hour, or per period less than an hour, recorded in the Values Percentile Calculated from the mean values per hour, or per period less than an hour, recorded in the Values Percentile Calculated from the mean values per hour, or per period less than an hour, recorded in the Values Percentile Calculated from the mean values per hour, or percentile Calculated Percented Percentile Calculated Percentile Calculated Perce							
$ \begin{array}{cccc} \begin{tabular}{lllllllllllllllllllllllllllllllllll$		A value for Bc was obtained from Table 2 (D1 guidance notes), which details ' <i>Typical Background Levels of Common Pollutants</i> ' by the type of district. The area around the site was deemed to fall within the ' <i>Partialld developed area</i> ' category.					
Brienging (8)/200/EEC) Determine Discharge Stack Height Calculate Iterateses Q = (V(1+283/Td))/2.9)x No. of Stacks) (D1 Eqn 3, D1 para. 64.2)) Where : V = Total Volume Flow at Discharge Conditions 76.97 m3/s Td = Temperature of Discharge 784 K Q = 17.0 MW RULE : Q minimum = 0.03 MW Qactual > Qminimum = 0.03 MW (D1 52.1) Qactual > Qminimum = 0.03 MW Qactual > Quin MW Distact Height for Buovancy (Ub) Distact Height for Buovancy (Ub) Distact Height for Buovancy (Ub) <td co<="" th=""><td></td><td>Gd was obtained from</td><td>n the 98th percentile calculated from the mean value</td><td>es per hour, or per period les</td><td>s than an hour, recorded</td><td></td></td>	<td></td> <td>Gd was obtained from</td> <td>n the 98th percentile calculated from the mean value</td> <td>es per hour, or per period les</td> <td>s than an hour, recorded</td> <td></td>		Gd was obtained from	n the 98th percentile calculated from the mean value	es per hour, or per period les	s than an hour, recorded	
Determine Discharge Stack Height Schulate Heat Q = (V(1/283/Td))/2.9)× No. of Stack) (D1 Eqn 3, D1 para. 64.2)) Where: V = Total Volume Flow at Discharge Conditions 76.97 m3/s Td = Temperature of Discharge 784 K Q = 17.0 MW RUE : Q minimum = 0.03 MW Queut > Ominimum = 0.03 MW Queut > Ominimum = 0.043 MW (D1 52.1) Schulate Uncerveted Stack Height for Buovancy (Ub) (D1 Eqn 6) Ub = 10°a Pt ^{ab} (D1 Eqn 6) Where for values of Q < 1 MW a = -1.11 - 0.19log10°Q (D1 Eqn 6) b = 0.49 + 0.005log10°Q (D1 Eqn 6) b = 0.49 + 0.005log10°Q (D1 Eqn 6) Celeftone flow alword of the seque (0.03) (D1 Eqn 6) b = 0.49 + 0.005log10°Q (D1 Eqn 6) b = 0.49 + 0.005log10°Q (D1 Eqn 6) b = 0.49 + 0.005log10°Q (D1 Eqn 6) b = 0.59 (D1 Eqn 6) b = 0.59 (D1 Eqn 6) Clear of the main of		throughout the year (a	85/205/EEC)				
Jetermine Discharge Stack freient Calculate Heat Kelease Q = (V(1-(2837d))/2.9)x No. of Stacks) (D1 Eqn 3, D1 para. 6.4.2)) Where : V = Total Volume Flow at Discharge Conditions 76.97 m3/s Td = Temperature of Discharge 784 K Q = 17.0 MW Q = 17.0 MW RULE :: Q minimum = 0.03 MW Qacual > Qminimum, therefore proceed with Ub calculation Calculate Uncorrected Stack Height for Buovancy (Ub) Ub = 10 ⁿ a Pi ^s /b (D1 Eqn 6) b = 0.49 + 0.005log10 ^o Q Where for values of Q > 1 MW a = -0.84-0.1*exp(Q*0.31) (D1 Eqn 6) b = 0.59 Therefore: a = -1.95 b = 0.59 Therefore: Q max (D3 MW (D1 Eqn 6) b = 0.59 Therefore: Q (D1 Eqn 6) b = 0.59 Therefore: Q (D1 S.3.3) Q (D3 MW min (D3 S.3) Q (D3 MW min (D0 MW max (D1 S.3.3)) B (D1 MW min (D1 MW min (D1 S.3.3)) Q (D3 M	Determin	• Diashanas Sta	ah Haish4				
Calculate Heat Kelease $Q = ((V(1-(283Td))/2.9) \times No. of Stacks) (D1 Eqn 3, D1 para. 6.4.2)) Where : V = Total Volume Flow at Discharge Conditions 76.97 m3/s Td = Temperature of Discharge 784 K Q = 17.0 \text{ MW} (D1 5.2.1) RULE : Q actual > Qminimum = 0.03 MW (D1 5.2.1) Qactual > Qminimum, therefore proceed with Ub calculation Calculate Uncorrected Stack Height for Buovance (Ub) Ub = 10^n a Pt^h (D1 Eqn 6) Where for values of Q < 1 MW a = -1.11 - 0.19log 10^Q (D1 Eqn 6) b = 0.49 + 0.005log 10^Q Where for values of Q > 1 MW a = -0.84 - 0.1*exp(Q^0.31) (D1 Eqn 6) Discharge colspan="2">Colspan="2">Colspan="2">Colspan= 2" Colspan= 2 Q a 0.38 W min (D1 Eqn (Q^0.32) Q a 0.39 W Colspan= 2 Colspan= 2 $	Determin	e Discharge Sta					
$ \begin{array}{ccccc} Q = (V(1-(283)Td))/2.9) \times No. of Stacks) & (D1 Eqn 3, D1 para. 6.4.2)) \\ \\ \end{tabular} \end{tabular}$	Calculate He	at Release					
Where : V = Total Volume Flow at Discharge Conditions 76.97 m3/s Td = Temperature of Discharge 784 K $Q =$ 17.0 MW RULE : Q minimum = 0.03 MW (D1 5.2.1) Qactual > Qminimum, therefore proceed with Ub calculation Calculate Uncorrected Stack Height for Buovancy (Ub) Ub = 10°a Pi^ob Ub = 10°a Pi^ob Q<1 MW: a = -1.11 - 0.19log10°Q (D1 Eqn 6) Where for values of Q <1 MW: a = -1.11 - 0.19log10°Q Where for values of Q > 1 MW a = -0.84-0.1*exp(Q°0.31) (D1 Eqn 6) b = 0.46 + 0.005log10°Q Where for values of Q > 1 MW a = -0.84-0.1*exp(Q°0.32) Q Q = 0.59 Therefore: a = -1.95 b = 0.59 Therefore: Ub = 4.21 m QUD ME max QUD ME max QUD ME max QUD ME max QUD ME max DID ME max QUD ME max DID ME max DID ME max QUD ME max	Q = ((V(1-(28))))	33/Td))/2.9)x No. of S	tacks) (D1 Eqn 3, D1 para. 6.4.2))				
Till = Temperature of Discharge 784 K Q = 17.0 MW RULE : Q minimum = 6.03 MW Qactual > Qminimum, therefore proceed with Ub calculation (D1 5.2.1) Calculate Uncorrected Stack Height for Buovancy (Ub) (D1 5.2.1) Ub = 10 ⁰ a Pi ^A b (D1 Eqn 6) Where for values of Q <1 MW a = -1.11 - 0.19log10 ^o Q (D1 Eqn 6) Where for values of Q <1 MW a = -0.84-0.1*exp(Q ^o 0.31) (D1 Eqn 6) b = 0.49 + 0.005log10 ^o Q (D1 Eqn 6) Where for values of Q > 1 MW a = -0.84-0.1*exp(Q ^o 0.31) (D1 Eqn 6) b = 0.46+0.011.exp(Q ^o 0.32) (D1 Eqn 6) Clearefore u = -1.95 - b = 0.59 - - Therefore Ub = - 4.21 m RULE : Ub = - 4.21 m Que 0.03 kW min 100 MW max 200 m max (D1 5.3.3) Q 0.03 kW min 100 MW max 200 m max - Q 0.03 kW min 100 MW max - - No min - -	Where :	V = Total Volume	e Flow at Discharge Conditions	76.97 m3/s			
$ \begin{array}{c c c c c } Q = & 17.0 \text{ MW} \\ \hline RULE : Q ininimum = 0.03 \text{ MW} & (D1 5.2.1) \\ \hline Qactual > Qminimum, therefore proceed with Ub calculation \\ \hline Calculate Uncorrected Stack Height for Buoyanev (Ub) \\ \hline Ub = 10^n \text{ Pi}^n b & (D1 Eqn 6) \\ \hline Ub = 10^n \text{ Pi}^n b & (D1 Eqn 6) \\ \hline b = 0.49 + 0.005 \log 10^n Q & (D1 Eqn 6) \\ \hline b = 0.49 + 0.005 \log 10^n Q \\ \hline Where for values of Q > 1 \text{ MW} & a = -0.84 - 0.1* exp(Q^n 0.31) & (D1 Eqn 6) \\ \hline b = 0.46 + 0.011 exp(Q^n 0.32) \\ \hline \end{array} $		Td = Temperature	e of Discharge	784 K			
RULE : Q minimum = 0.03 MW Qactual > Quninimum, therefore proceed with Ub calculation (D1 5.2.1) Calculate Uncorrected Stack Height for Buovancy (Ub)		Q =	17.0 MW				
Calculate Uncorrected Stack Height for Buoyancy (Ub)Ub = 10^a Pi^b (D1 Eqn 6)Where for values $Q < 1$ MW: $a = -1.11 - 0.19 \log 10^Q$ (D1 Eqn 6) $b = 0.49 + 0.005 \log 10^Q$ $b = 0.49 + 0.005 \log 10^Q$ (D1 Eqn 6)Where for values $Q > 1$ MW $a = -0.84 - 0.1^* exp(Q^* 0.31)$ (D1 Eqn 6) $b = 0.46 + 0.011 \cdot exp(Q^* 0.32)$ $b = 0.46 + 0.011 \cdot exp(Q^* 0.32)$ Q>1 $b = 0.59$ Therefore $a = -1.95$ $b = 0.59$ $b = 0.59$ ThereforeUb = 4.21 mRULE :Ub = 100 mmaxQ 0.03 kW min 000 mmax 200 mmaxQ 0.03 kW min 000 MW max 00 min	RULE :	Q minimum = 0. Qactual > Qmini	03 MW inum, therefore proceed with Ub calculation	(D1 5.2.1)			
$\begin{array}{c c c c c c } \hline Calculate Uncorrected Stack Height for Buovancy (Ub) \\ \hline Ub = 10^{a} Pi^{b} & (D1 Eqn 6) \\ \hline Where for values J Q < 1 MW: a = -1.11 - 0.19log10^{Q} (D1 Eqn 6) \\ b = 0.49 + 0.005log10^{Q} \\ \hline b = 0.49 + 0.005log10^{Q} \\ \hline b = 0.46 + 0.011.exp(Q^{0}0.32) \\ \hline b = 0.46 + 0.011.exp(Q^{0}0.32) \\ \hline \\ D \\ P \\ P$							
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Calculate Un	corrected Stack Hei	ght for Buoyancy (Ub)				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Ub = 10^a Pi	'b (D1 Eqn 6)					
	Where for val	ues of Q<1 MW:	a = -1.11 - 0.19log10^Q	(D1 Eqn 6)			
Where for values of $Q > 1 MW$ $a = -0.84 - 0.1^* exp(Q^* 0.31)$ (D1 Eqn 6) $b = 0.46 + 0.011.exp(Q^* 0.32)$ Q>1 Therefore: $a =$ -1.95 $b =$ 0.59 Therefore Ub = $4.21 m$ RULE : Ub $1 m min_{200 m max}$ (D1 5.3.3) Q $0.03 kW min_{100 MW max}$ Pi Pi $50 min$ $50 min$			$b = 0.49 + 0.005 log 10^Q$				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Where for val	ues of $Q > 1 MW$	a= -0.84-0.1*exp(Q^0.31)	(D1 Eqn 6)			
			b= 0.46+0.011.exp(Q^0.32)				
b = 0.59 Therefore Ub = 4.21 m RULE : Ub 1 m min (D1 5.3.3) 200 m max Q 0.03 kW min 100 MW max Pi 50 min	Q>1 Therefore :	a =	-1.95				
Therefore Ub = 4.21 m RULE : Ub 1 m min (D1 5.3.3) Q0 m max 200 m max Q 0.03 kW min 100 MW max Pi 50 min		b =	0.59				
RULE: Ub 1 m min (D1 5.3.3) 200 m max 200 m max Q 0.03 kW min 100 MW max Pi 50 min	Therefore	Ub =	4.21 m				
200 m max Q 0.03 kW min 100 MW max Pi 50 min	RULE :	Ub	1 m min	(D1 5.3.3)			
100 MW maxPi50 min		Q	200 m max 0.03 kW min				
1000000 max		Pi	100 MW max 50 min 10000000 max				

Calculated By: Neil Titley

Checked By: Ian James

Approved By: Ian James

Job Number: 47092-005

Client: BP

Ub, Q and Pi all comply with this rule

Calculate Uncorrected Stack Height for Momentum (Um)

Firstly Determine Discharge Momentum (M):



Calculated By: Neil Titley Checked By: Ian James Approved By: Ian James Job Number: 47092-005 Client: BP

Determine Final Stack Height For Multiple Buildings and Tall Buildings

$\mathbf{C} = \mathbf{H}\mathbf{m} + (1 - \mathbf{H}$	[m/Tm)[U + (Tm - U)(1 - A^-U/Hm)]		(D1 Eqn 19)			
	C = Corrected Stac	k Height (m)					
U = Uncorrected Discharge Stack Height			=	4.2	1 m		
	A = Um/Ub (If the	re is no value of Ut	or if Ub	> Um, A = 1)	=	2.7	2 m
	H = Building Heigl	nt			=	See Ta	ble Below
W = Building Width			=	See Ta	ble Below		
	K = Lesser of build	ing height or buildi	ng width		=	See Ta	ble Below
	T = Height of distu	rbed flow over build	ding = H	+ 1.5K	=	See Ta	ble Below
	Tmax = Maximum	T considering all re	elevant b	uildings	=	27.5	m
Hmax = Maximum H considering all relevant buildings			=	11.0	m		
Consider all rele	evant Buildings (plea	se refer to enclosed	plan of s	site)			
Building ID	Building Height	Building Width	К	Т			
Pump House	11	90	11	27.5			

Hmax =

11.0

Tmax = 27.5

Therefore : C = Final corrected discharge stack height =

17.97 m

Calculated By: Neil Titley Checked By: Ian James Approved By: Ian James Job Number: 47092-005 Client: BP

General Introduction Stack Height Determination for a Solar Mars 100 Gas Turbine - SOx emissions

The following base conditions for each turbine unit have been used within the stack height calculations.

Exhaust gas flow=	34.65 kg/sec		
Temperature of Discharge=	784 K		
Moisture content of stack gas=	8.28 %		
Oxygen content of stack gas=	14.37 %		
Exhaust gas emission=	91 mg/Nm3	Reference Conditions=	15 %, Dry
No/ of Units	1		

Calculate the Pollution Index (Pi)

Pi = ED / (Gd-Bc) (D1 eqn 1)

where: Pi = Pollution Index (m3/s)

ED = Sum of Discharge rates for CHP units included within CHP scheme (Actual) (g/s)

Gd = Guidance concentration of discharged pollutant (Actual Discharge conditions) (mg/m3)

Bc = Background Concentration of discharged emission (mg/m3)

Need to Determine Pollutant Concentration at Stack Discharge Conditions (Cd)

Cd = Cs x (273/Td) x ((100-H2Od)/100) x ((20.9 - O2d) / (20.9 - O2s)) (D1 App B) Where : Cs = Pollutant Concentration at Standard Conditions = 91 mg/m3 Td = Temperature of Discharge Gas _ 784 Κ H20d= Moisture content of discharge 8.28 % = O2d= Oxygen content of discharge 14.37 % = O2s= Oxygen content at reference conditions = 15 % Pollutant Concentration at Stack Discharge (Cd) = 32.17 mg/m3 Thus:

Calculate Discharge Volume Flow Rate at Stack Discharge (V)

V =	Exhaust Gas Flow / Density of Gas at Discharge	Exhaust Gas Flow / Density of Gas at Discharge Temperature			
Where :	Exhaust Gas Flow	=	34.65 Kg/sec		
	Density of Gas at Discharge Temperature	=	0.450 Kg/m3		
Thus :	Volume Flow Rate at Stack Discharge (V) =		76.97 m3/s		
charge Rate (D $D = (V \times Cd)$) /1000 (D1 App B)				

Calculate Dis

Where: D = Discharge Rate at Discharge Conditions (g/s)

V = Discharge Volume Flow Rate at Discharge Conditions

76.97 m3/s

=

Calculated By:	Neil Titley					
Checked By:	Ian James					
Approved By:	Ian James					
Job Number:	47092-005					
Client: BP						
		Cd = Pollutant Concentration	n at Stack Discharge	=	32.17 mg/m3	
	Thus:	Discharge Rate =	2.48 g/s			
Calculate Poll	ution Index (Pi)					
Pi = (((D/(Gd-	3c))x1000) (E	01 Eqn 1)				
Where :	D = COMBINED	Discharge Rate of Pollutant F	ROM ALL STACKS IN STUDY		2.48 g/s	
	Gd = Guidance Concentration of Pollutant AT STACK CONDITIONS			0.35 mg/m3	(80/779/EEC)	
Bc = Background Concentration 0.002 mg/m3 (D1 Tab.2)					(D1 Tab.2)	
	Pi =	7114.74 m3/s				

A value for Bc was obtained from Table 2 (D1 guidance notes), which details '*Typical Background Levels of Common Pollutants*' by the type of district. The area around the site was deemed to fall within the '*Partialld developed area*' category.

Gd based upon EU standards where the 98th percentile of daily mean smoke value is 150-350 ug/m3 (80/779/EEC) amended by (89/427/EEC).

Determine Discharge Stack Height

Calculate Heat Release

Q = ((V(1-(283/Td))/2.9)x No. of Stacks) (D1 Eqn 3, D1 para. 6.4.2))

Where :	V = Total Volume Flow at Discharge Conditions		76.97 m3/s	
	Td = Temperature of D	Discharge	784 K	
	Q =	17.0 MW		
RULE :	Q minimum = 0.03 M	IW	(D1 5.2.1)	

CULE :	Q minimum = 0.03 MW	(DI 5.
	Qactual > Qminimum, therefore proceed with Ub calculation	

Calculate Uncorrected Stack Height for Buoyancy (Ub)

Ub = 10^a Pi^	b (D1 Eqn 6)		
Where for valu	ues of Q<1 MW:	a = -1.11 - 0.19log10^Q	(D1 Eqn 6)
		$b = 0.49 + 0.005 log 10^{Q}$	
Where for valu	ues of $Q > 1 MW$	a= -0.84-0.1*exp(Q^0.31)	(D1 Eqn 6)
		b= 0.46+0.011.exp(Q^0.32)	
Q>1 Therefore :	a =	-1.95	
	b =	0.59	
Therefore	Ub =	2.12 m	
RULE :	Ub	1 m min 200 m max	(D1 5.3.3)
	Q	0.03 kW min	

Calculated By: Neil Titley

Checked By: Ian James

Approved By: Ian James

Job Number: 47092-005

Client: BP

Pi 50 min 1000000 max Ub, Q and Pi all comply with this rule

Calculate Uncorrected Stack Height for Momentum (Um)



Calculated By:	Neil Titley			
Checked By: I	an James			
Approved By: I	an James			
Job Number: 4	7092-005			
Client: BP				
Ub < Um, There	fore base Stack Height Calculation on Ub	(D1 5.4.1)	Therefore U =	2.12 m

Determine Final Stack Height For Multiple Buildings and Tall Buildings

$C = Hm + (1 - Hm/Tm)[U + (Tm - U)(1 - A^-U/Hm)]$	(D1 Eqn 19)	
C = Corrected Stack Height (m)		
U = Uncorrected Discharge Stack Height	=	2.12 m
A = Um/Ub (If there is no value of Ub or if Ub	> Um, A = 1) =	3.22 m
H = Building Height	=	See Table Below
W = Building Width	=	See Table Below
K = Lesser of building height or building width	=	See Table Below
T = Height of disturbed flow over building = H	+ 1.5K =	See Table Below
Tmax = Maximum T considering all relevant bu	uildings =	27.5 m
Hmax = Maximum H considering all relevant bu	uildings =	11.0 m
Consider all relevant Buildings (please refer to enclosed plan of s	ite)	

Building ID	Building Height	Building Width	Κ	Т
Pump House	11	90	11	27.5

Hmax =

11.0

Therefore : C = Final corrected discharge stack height =

Tmax =

27.5

15.35 m

Calculated By: Neil Titley Checked By: Ian James Approved By: Ian James Job Number: 47092-005 Client: BP

<u>General Introduction</u> <u>Stack Height Determination for a Solar Mars 100 Gas Turbine - PM emissions</u>

The following base conditions for each turbine unit have been used within the stack height calculations.

Exhaust gas flow=	34.65 kg/sec		
Temperature of Discharge=	784 K		
Moisture content of stack gas=	8.28 %		
Oxygen content of stack gas=	14.37 %		
Exhaust gas emission=	18 mg/Nm3	Reference Conditions=	<mark>15</mark> %, Dry
No/ of Units	1		

Calculate the Pollution Index (Pi)

Pi = ED / (Gd-Bc) (D1 eqn 1)

where: Pi = Pollution Index (m3/s)

ED = Sum of Discharge rates for CHP units included within CHP scheme (Actual) (g/s)

Gd = Guidance concentration of discharged pollutant (Actual Discharge conditions) (mg/m3)

Bc = Background Concentration of discharged emission (mg/m3)

Need to Determine Pollutant Concentration at Stack Discharge Conditions (Cd)

 $Cd = Cs \ x \ (273/Td) \ x \ ((100-H2Od)/100) \ x \ ((20.9 - O2d) \ / \ (20.9 - O2s))$ (D1 App B)

Where :	Cs = Pollutant Concentration at Standard Conditions	=	18	mg/m3
	Td = Temperature of Discharge Gas	=	784	K
	H20d= Moisture content of discharge	=	8.28	%
	O2d= Oxygen content of discharge	=	14.37	%
	O2s= Oxygen content at reference conditions	=	15	%
Thus:	Pollutant Concentration at Stack Discharge (Cd) =	6.36 m	ng/m3	

Calculate Discharge Volume Flow Rate at Stack Discharge (V)

V =	Exhaust Gas Flow / Density of Gas at Discharge Temperature					
Where :	Where : Exhaust Gas Flow =					
	Density of Gas at Discharge Temperature	=	0.450 Kg/m3			
Thus :	Volume Flow Rate at Stack Discharge (V) =		76.97 m3/s			
Calculate Discharge Rate (D)						
$D = (V \times Cd)/100$	00 (D1 App B)					

Where: D = Discharge Rate at Discharge Conditions (g/s)

V = Discharge Volume Flow Rate at Discharge Conditions

76.97 m3/s

=

Calculated By:	Neil Titley					
Checked By:	Ian James					
Approved By:	Ian James					
Job Number:	47092-005					
Client: BP						
		Cd = Pollutant Concentratio	n at Stack Discharge	=	6.36 mg/m3	
	Thus:	Discharge Rate =	0.49 g/s			
Calculate Pollution Index (Pi)						
Pi = (((D/(Gd-	-Bc))x1000) (I	D1 Eqn 1)				
Where : D = COMBINED Discharge Rate of Pollutant FROM ALL STACKS IN STUDY				0.49 g/s		
Gd = Guidance Concentration of Pollutant AT STACK CONDITIONS			0.25 mg/m3	(80/779/EEC)		
	Bc = Background Concentration				0.002 mg/m3	(D1 Tab.2)
	Pi =	1974.77 m3/s				

A value for Bc was obtained from Table 2 (D1 guidance notes), which details *Typical Background Levels of Common Pollutants*' by the type of district. The area around the site was deemed to fall within the '*Partialld developed area*' category.

Gd based upon EU standards for the 98th percentile of all daily mean values taken throughout the year (80/779/EEC).

Determine Discharge Stack Height

Calculate Heat	Release		
Q = ((V(1-(283)	'Td))/2.9)x No. of S	tacks) (D1 Eqn 3, D1 para. 6.4.2))	
Where :	V = Total Volume	Flow at Discharge Conditions	76.97 m3/s
	Td = Temperature	of Discharge	784 K
	Q =	17.0 MW	
RULE :	Q minimum = 0.0 Qactual > Qmini)3 MW mum, therefore proceed with Ub calculation	(D1 5.2.1)
Calculate Unco	orrected Stack Hei	ght for Buoyancy (Ub)	
Ub = 10^a Pi^b	(D1 Eqn 6)		

Where for values of Q<1 MW:		a = -1.11 - 0.19log10^Q	(D1 Eqn 6)
		$b = 0.49 + 0.005 log 10^Q$	
Where for value	es of $Q > 1$ MW	a= -0.84-0.1*exp(Q^0.31)	(D1 Eqn 6)
		b= 0.46+0.011.exp(Q^0.32)	
Q>1			
Therefore :	a =	-1.95	
	b =	0.59	
Therefore	Ub =	1.00 m	
RULE :	Ub	1 m min 200 m max	(D1 5.3.3)
	Q	0.03 kW min	

Calculated By: Neil Titley

Checked By: Ian James

Approved By: Ian James

Job Number: 47092-005

Client: BP

 100 MW max

 Pi
 50 min

 10000000 max

 Either Ub, Q or Pi do not comply with this rule, see D1

Calculate Uncorrected Stack Height for Momentum (Um)



Calculated By: Neil Titley				
Checked By: Ian James				
Approved By: Ian James				
Job Number: 47092-005				
Client: BP				
Ub < Um, Therefore base Stack Height Cal	culation on Ub (D1 5	5.4.1)	Therefore U =	1.00 m

Determine Final Stack Height For Multiple Buildings and Tall Buildings

Im/Tm)[U + (Tm -	U)(1 - A^-U/Hm)]		(D1 Eqn 19)			
C = Corrected Stat	ek Height (m)					
U = Uncorrected I	Discharge Stack Heig	ht		=	1.0	0 m
A = Um/Ub (If the	ere is no value of Ub	or if Ub	> Um, A = 1)	=	6.8	6 m
H = Building Heig	ht			=	See Ta	able Below
W = Building Wid	th			=	See Ta	able Below
K = Lesser of build	ding height or buildi	ng width		=	See Ta	able Below
T = Height of distu	urbed flow over build	ling = H -	+ 1.5K	=	See Ta	able Below
Tmax = Maximum	T considering all re	levant bu	ildings	=	27.5	m
Hmax = Maximun	n H considering all re	elevant bu	ildings	=	11.0	m
evant Buildings (ple	ase refer to enclosed	plan of si	te)			
Building Height	Building Width	К	Т			
	Im/Tm)[U + (Tm - C = Corrected Stac U = Uncorrected E A = Um/Ub (If the H = Building Heig W = Building Wid K = Lesser of build T = Height of distu Tmax = Maximum Hmax = Maximum evant Buildings (ple Building Height	Im/Tm)[U + (Tm - U)(1 - A^-U/Hm)] C = Corrected Stack Height (m) U = Uncorrected Discharge Stack Heig A = Um/Ub (If there is no value of Ub H = Building Height W = Building Height K = Lesser of building height or buildin T = Height of disturbed flow over build Tmax = Maximum T considering all re Hmax = Maximum H considering all re want Buildings (please refer to enclosed Building Height Building Width	Im/Tm)[U + (Tm - U)(1 - A^-U/Hm)] C = Corrected Stack Height (m) U = Uncorrected Discharge Stack Height A = Um/Ub (If there is no value of Ub or if Ub H = Building Height W = Building Width K = Lesser of building height or building width T = Height of disturbed flow over building = H - Tmax = Maximum T considering all relevant building Hmax = Maximum H considering all relevant buildings (please refer to enclosed plan of similar to the second s	Im/Tm)[U + (Tm - U)(1 - A^-U/Hm)] (D1 Eqn 19) C = Corrected Stack Height (m) U = Uncorrected Discharge Stack Height A = Um/Ub (If there is no value of Ub or if Ub > Um, A = 1) H = Building Height W = Building Width K = Lesser of building height or building width T = Height of disturbed flow over building = H + 1.5K Tmax = Maximum T considering all relevant buildings Hmax = Maximum H considering all relevant buildings Wath Buildings (please refer to enclosed plan of site) Building Height Building Width K T	Im/Tm)[U + (Tm - U)(1 - A^-U/Hm)] (D1 Eqn 19) C = Corrected Stack Height (m) = U = Uncorrected Discharge Stack Height = A = Um/Ub (If there is no value of Ub or if Ub > Um, A = 1) = H = Building Height = W = Building Width = K = Lesser of building height or building width = T = Height of disturbed flow over building = H + 1.5K = Tmax = Maximum T considering all relevant buildings = Hmax = Maximum H considering all relevant buildings = Building Height Building Width K T	Im/Tm)[U + (Tm - U)(1 - A^-U/Hm)](D1 Eqn 19)C = Corrected Stack Height (m)=U = Uncorrected Discharge Stack Height=A = Um/Ub (If there is no value of Ub or if Ub > Um, A = 1)=6.8H = Building Height=W = Building Width=See TaK = Lesser of building height or building width=T = Height of disturbed flow over building = H + 1.5K=Tmax = Maximum T considering all relevant buildings=Hmax = Maximum H considering all relevant buildings=Building Height Building WidthKTTHeight Building WidthK

Building ID	Building Height	Building Width	K	Т
Pump House	11	90	11	27.5

Hmax =

Tmax =

27.5

Therefore :

11.0

C = Final corrected discharge stack height =

14.14 m

Calculation of Dry Air Density

From 3rd Edition SI Units; GFC Rogers, 'Thermodynamic Properties of Fluids' NB Do not use on emmisions or gases above 1000K

Temp (K)	Density (kgm-3)
175	2.017
200	1.765
225	1.569
250	1.412
275	1.284
300	1.177
325	1.086
350	1.009
375	0.9413
400	0.8824
450	0.7844
500	0.706
550	0.6418
600	0.5883
650	0.543
700	0.5043
750	0.4706
800	0.4412
850	0.4153
900	0.3922
950	0.3716
1000	0.353



Temp (°C)



APPENDIX E ENVIRONMENTAL IMPACTS AND MITIGATION

ANNEX III CULTURAL HERITAGE MANAGEMENT PLAN

FOR BP BTC AND SCP PROJECTS

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ATTACHMENTS

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Attachment II	Scope of Work for Phase I Monuments Investigation

Appendix E Annex III

CULTURAL HERITAGE MANAGEMENT PLAN FOR BP BTC AND SCP PROJECTS

1 INTRODUCTION

1.1 BACKGROUND

The project has developed a **Cultural Heritage Management Plan (CHMP)** to avoid and/or minimise project impacts to archaeological and historic monument sites as a result of the construction of the pipeline facilities and associated features such as access roads. These two categories of historic resources, also referred to by partially overlapping terms cultural properties, cultural resources, or physical cultural resources, are defined as follows:

- Archaeological sites are primarily buried cultural remains (historic or prehistoric)
- Monuments are above-ground historic or prehistoric structures in variable states of preservation along with associated landscapes

British Petroleum (BP) developed the plan and its supporting information as part of the Environmental and Social Impact Assessment (ESIA) process and in line with applicable Georgian law and the environmental standards of multilateral lending agencies. Specifically, the CHMP complies with International Finance Corporation (IFC) cultural properties protection standards identified by IFC Operational Policy Note OPN 11.03 (1986) entitled "Cultural Property". It is the general corporate policy of BP to advance the objectives of cultural heritage protection in all of its projects, and to comply with all specific applicable national and international heritage requirements. BP contractors are required to conform to BP policy.

BP developed the Georgian project CHMP in consultation with the Centre for Archaeological Studies (CAS), the Georgian government agency currently charged with archaeological protection. For this project CAS is also charged with coordinating monuments protection, which is normally the task of the Georgian Department Monuments Protection. CAS and the Georgian Monuments Protection Department have agreed to the to the CHMP and have also agreed to the Phase I and Phase II scopes of work for archaeological and monuments protection which are attached, in part, to this report. Subsequent scopes of work required under the plan will be developed in turn by a similar process of consultation with appropriate authorities. Implementation of the scopes of work has included the direct involvement of CAS.

Invitation to Tender (ITT) documentation for prospective project construction contractors has included guidance on the scope and importance of known and potential heritage resources in the project area, and the heritage protection requirements with which BP contractors must comply. BP project heritage planning includes anticipated budget and schedule impacts of heritage issues to be addressed prior to and during the construction process.

BP has organized CHMP activities in a phased manner in which findings from earlier phases provide a basis for specific actions to be taken in later phases. BP is employing contractor research teams consisting of international and Georgian archaeologists, monuments specialists, and cultural resource management specialists to implement the various phases of the CHMP. BP has also employed a project heritage specialist to assist in coordination with CAS and other issues. BP continues to identify and evaluate additional means of assuring that the plan, and the work that results from it, conforms to accepted international standards referenced by the above World Bank/IFC guidance. Other standards and guidance being considered include those of the International Commission on Monuments and Sites (ICOMOS), as well as United Nations Educational, Cultural, and Scientific Organization (UNESCO) and European Union (EU) cultural properties guidelines. All CHMP activities will:

- Comply with World Bank/IFC cultural properties requirements
- Comply with BP Health, Safety and Environment (HS&E) requirements
- Meet with all BP reporting requirements
- Have clear and approved lines of communication with BP and BP contractors

The present document sets forth the project CHMP, identifying the phased series of investigations from baseline studies to late finds protocols, and outlining impact mitigation measures. General findings to date and specific future plans are also summarised. As of the writing of this document, Phase I of the plan has been completed and Phase II archaeological and monuments investigations have commenced. Phase II had been delayed by the onset of winter weather and commenced in the Spring of 2002. Table 1 is a schematic presentation of activities planned and concluded for the four phases of the CHMP.

1.2 HERITAGE RESOURCES IN PROJECT AREA

The following types of resources are known to be present in the project area:

• Archaeological Sites:

Late Neolithic (5,000-3,500 BC) and Bronze Age (3,500-800 BC) settlements and burial features including large and small tombs grouped together in *necropoli* (burial grounds), and ruined and abandoned medieval settlements are confirmed. (Potential sites include rock shelters and remains of open air camps and villages, all of the prehistoric period.)

• Historic Monuments:

Bronze Age, Iron Age (800-400 BC) Medieval, and Modern Period monuments have been identified in the 10-km wide pipeline corridor. Most numerous are vaulted churches. There are some basilicas and cruciform domed churches. Most important are the Bronze Age fortified settlements, also known as cyclopean structures due to their boulder construction technique, which date from III and II Millennia BC. Some of the latter Bronze Age features were originally below the ground surface but were excavated by archaeologists; these monuments probably ako retain associated archaeological deposits below the surface. Other Bronze Age monuments survive as ruined structures evident at the surface. None of the monuments, however, is crossed by the proposed pipeline alignment.

2 PROJECT CULTURAL HERITAGE SITES DATABASE

A key tool for the implementation of the CHMP will be the project heritage sites database. All known archaeological sites and monuments which have been identified by baseline studies as in

or near the project area have been entered into the heritage database. This is the basis for a heritage Geographic Information Systems (GIS) layer. The database and corresponding GIS layer are being updated continually as the project progresses. Updating includes the changing status of resources already identified (and at which work is progressing), and the addition of newly identified resources. The database includes a standard set of attributes including type and importance of site (if known), work completed at site, construction status, UTM coordiantes and location in relation to the current right-of-way, and chainage. These data are available in tabular or map format and in electronic and paper form to assist all elements of the larger project with CHMP implementation.

3 PHASE I ACTIVITIES (PRE-CONSTRUCTION-COMPLETED)

3.1 OVERVIEW

Phase I involved local consultation, baseline literature review and walkover field reconnaissance for archaeological sites and historic monuments. These initial steps in the project heritage management process have provided the baseline information and, necessarily, a basis for this CHMP.

Results of the Phase I heritage investigations were used to input to engineering design and routing, often resulting in re-routes to avoid heritage impacts (see Section 4 of ESIA for discussion of route alternatives). Results of Phase I also defined the scope of Phase II.

3.2 ARCHAEOLOGICAL SITES

The first phase of work for archaeological resources involved:

- Literature review
- Review of aerial photographs
- Initial fieldwalk along proposed pipeline right-of-way
- Inclusion of CAS archaeologists on topographic and reroute survey teams, and geotechnical field investigations of proposed AGI sites

Phase I archaeological work did not involve subsurface reconnaissance.

3.3 HISTORIC MONUMENTS

The first phase of monuments investigation involved:

- Literature review
- Fieldwalk along portions of the right-of-way

3.4 PHASE I SUMMARY

Using data from its baseline studies BP has created an inventory of heritage resources identified along the pipeline corridor to date including 51 archaeological sites and 206 historic monuments (aka Heritage Database). In the case of archaeological sites, the total includes those lying along previous and present alignments, approximately 45 of which are within or near to the present

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alignment. The historic monument total includes those lying within a 10km-wide corridor centred on the pipeline right-of-way. Of the 206 monuments, 25 lie within 0.5km of the alignment centreline, none being within the alignment itself. Known archaeological sites in the vicinity of the pipeline corridor date from the Late Neolithic or aeneolithic (approximately 5,000-3,500 BC) onward; monuments date from the Bronze Age onwards. Significant Bronze Age (3,500-800 BC) and later archaeological sites are relatively easy to recognize due to rubble and occasional in-place stone structures that are visible at the ground surface. Earlier sites with less substantial structural remains are more difficult to identify without subsurface investigation. Remote sensing techniques such as magnetometry and ground penetrating radar, although sometimes used by archaeologists for site identification, are impractical for preconstruction survey of the right-of-way. Other more specific applications of such techniques are being considered to assist with later phases of archaeological work on the project. It is likely that previously unreported pre-Bronze Age archaeological sites will be encountered during the construction process. A summary of prehistoric and historic time periods applicable to Georgia are shown in Table 2.

4 PHASE II ACTIVITIES (PRE-CONSTRUCTION)

4.1 OVERVIEW

Phase II involves more detailed investigation of archaeological sites and historic monuments identified by baseline research as well as additional reconnaissance work on new potential impact areas defined outside of the pipeline corridor (eg proposed camp sites, pipe dumps, access routes). The purpose of Phase II investigations is to evaluate potentially impacted sites for the purpose of confirming the need for subsequent mitigation measures and for defining the scope of such pre-construction measures if they are required. Requirements and specific scopes of work for the Phase II work have been defined by BP in consultation with the Centre for Archaeological Studies (CAS). Phase II work began in March of 2002.

BP has designed Phase II investigations to collect sufficient data to make final decisions about the importance of each site and subsequent measures that may be required. The objective of Phase II archaeology and monuments work is to identify specific potential project impacts to resources identified by Phase I investigations. These data will, in turn, allow measures to be put in place that would either avoid or mitigate those impacts. For monuments, Phase II investigation will define monument boundaries and a buffer zone for the placement of protective fencing and warning signs. For archaeological sites, Phase II data would either negate the necessity of further protective actions, or would provide detailed information to allow effective avoidance of the site, or would allow design of Phase III data recovery strategy to mitigate project impacts to the resource. Possible reasons for negating further actions are determination that a site does not possess subsurface deposits within the right of way or that its stratigraphy has been seriously disturbed by processes such as soil erosion or agricultural activities.

4.2 ARCHAEOLOGICAL SITES

Phase II archaeological work will involve subsurface investigations of 15 archaeological sites identified by the baseline research and judged by CAS to be the most significant sites identified within the present right- of-way and at other project facilities sites. Potentially significant sites

have been avoided by pipeline re-routes, some of which were done specifically to avoid the known archaeological sites. Two specific instances of archaeological re-routes are: 1) Approximately 2 kilometres to the east of Tetritskaro, 8 large archaeological features were avoided by rerouting to the south; and 2) Along the north shore of the Tsalka Reservoir, 6 probable Bronze Age features were avoided by rerouting to the north. Phase II work at the 15 sites may be the last work done at some sites and, in other cases it may lead to data recovery projects at the sites during Phase III. This will depend on the type, integrity, and precise location of the resources identified at each. The 15 sites are identified in Table 3 and their locations are shown in Figure 1.

4.3 HISTORIC MONUMENTS

Phase II monuments work will involve reconnaissance-level field survey. The fieldwork will focus on 14 potential construction camp and pipe dump sites and will confirm that sites, and their planned access roads do not contain historic monuments, as was indicated by the Phase I literature search. The fieldwork will also focus on 5 concentrations of monuments identified by the literature search in the pipeline corridor. These 5 concentrations, based on Phase I investigations, appear to be the most significant monument resources in the vicinity of the pipeline corridor. Listed from east to west, the latter are: 1) Mugiti-Samshildi concentration in Tetritskaro Region; 2) Santa-Bashtasheni concentration in Tsalka Region; 3) Avranlo-Kozil Kilisa Concentration in Tsalka Region; 4) Sadziri-Tadzsrisi concentration located between Tsikhisjvari and Atskuri; and, 5) Arali-Naokhrebi near the Turkish border. The 14 areas are shown on Figure 1.

5 PHASE III ACTIVITIES (PRE-CONSTRUCTION)

5.1 OVERVIEW

Phase III investigations and activities will mitigate specific impacts identified and confirmed during the previous two phases of desktop and field survey. Potential impacts addressed are likely to be within the right-of-way for archaeological sites, and along access roads and possibly in the vicinity of proposed camp and pipe-yard sites for monuments. In general, it is anticipated that potential heritage impacts to be addressed will be more substantial for archaeological sites than for monuments. This is because monuments are above ground and can be identified and avoided more easily and inexpensively than is the case for archaeological sites, which are underground.

5.2 ARCHAEOLOGICAL SITES

Phase III work will be carried out at those sites found by Phase II investigations to contain significant remains within the 44m project right-of-way, or within construction areas for above ground facilities. Significance will be established in consultation between BP and CAS using information generated by Phase II investigation. Phase III investigations will involve the level of work known as "archaeological data recovery", in which cultural valueables are recovered from the sites in the form of data and artefacts. Phase III investigation of a site will result in a scientific report accompanied by artefacts prepared for museum curation. Phase III work will therefore mitigate impacts to such archaeological sites. An alternative mitigation measure is site avoidance by rerouting of the right-of-way. Mitigation by avoidance, however, could require

investigations outside of the project right-of-way to determine site boundaries, since Phase II work focuses on those site areas that lie within the right-of-way.

Archaeological sites not yet identified in the right-of-way or at other pipeline facilities could be impacted by project construction. Such impacts will be addressed by Phase IV, construction-phase heritage programs.

5.3 HISTORIC MONUMENTS

Potential impacts to historic monuments are most likely to be located along access routes and in the vicinity of proposed construction camps and pipe dump sites. (Phase II investigations are identifying such impacts and propose mitigation measures.) Possible impacts include: 1) accidental damage to standing monument structures by vehicle impacts; 2) degradation of monument landscapes due to vehicular traffic causing loss of historic and scenic value of historic monuments; 3) vibration from the passing of heavy vehicles. Likely mitigation measures are identification with warning signs and the placement of protective fencing, and the placement of access roads a safe distance away from monuments. Additional impacts and mitigation measures may be identified as design and construction proceed.

6 PHASE IV ACTIVITIES (DURING CONSTRUCTION)

6.1 OVERVIEW

Construction-phase heritage protection activities have the same objectives as pre-construction activity but will be organised somewhat differently. The process will operate on a compressed time schedule. Protection of known cultural properties in Phase I–III investigations will addresses those resources identified prior to the start of construction. Phase IV, however, will include resources that are only identified as a result of the construction process itself. The archaeological component of this phase of the plan addresses the "chance finds" or issue.

6.2 ARCHAEOLOGICAL SITES

Right-of-way preparation, the construction steps immediately prior to pipe-trench excavation, typically leads to discovery of additional archaeological resources that are not identifiable by desk-based survey or surface techniques such as those employed by Phase I of the plan. To address this situation systematically, archaeological monitors will be present with right-of-way clearance (ie clearing, topsoil stripping, grading, etc) and trenching teams throughout the construction process. Their purpose will be to assist with the initial evaluation of archaeological chances find, helping to distinguish archaeological finds from non-archaeological anomalies and to communicate initial data on such findings to appropriate project personnel. Time available to evaluate and address potential chance finds will depend on the spatial gap maintained between the progress of the clearing crews (clearing being the operation likely to make most chance finds) and the trenching crews (trenching being the operation that would most severely impact an archaeological site in the right-of-way). Consideration will be given to maintaining a wider gap between the clearing and trenching operations in archaeologically sensitive areas: those areas which, based on the concentration of sites identified in Phase I, have the greatest potential to yield chance finds. The wider gap will allow more time to evaluate a chance find, and potentially to implement mitigation by data recovery or additional re-routes. In addition, should
the time gap between identification and trenching not prove adequate to design and implement measures needed to protect a particular significant chance discovery, then work around procedures would be employed to allow that extra time. This will be clarified with the contractor during the negotiations process. Archaeological work-arounds, although included in construction schedule and budget planning, will only be used when absolutely necessary.

The archaeological monitors, who will be part of the construction team, will identify and report archaeological chance finds and communicate these finds to appropriate project staff (including project heritage specialists) for timely evaluation and formulation of any appropriate site specific response that may be needed. Prior to the start of construction, the project will develop a specific written set of monitoring and protection protocols, including notification and reporting requirements for project team and appropriate government authorities.

6.3 MONUMENTS

Archaeological monitors will also be responsible for verifying the implementation and effectiveness of all monuments protection measures that were put in place during Phase II and Phase III monuments work, and they will call on appropriate monuments expertise to accomplish this objective.

6.4 CHANCE FINDS REPORTING AND ACTION PROTOCOLS FOR THE PHASE IV ARCHAEOLOGICAL MONITORING

The archaeological construction monitoring programme will be integrated into the overall environmental monitoring plan for pipeline construction. Specific protocols for the heritage resource issues (archaeology and monuments) will thus be developed as an integral part of the overall environmental construction monitoring program. Key elements of the required protocols are: 1) current archaeology and monuments list with resource coordinates and status of each resource; 2) infield archaeological monitors available to consult with contractors and with the authority, in consultation with BP, to stop work for short periods time; 3) flagging and/or fencing and signs at known and newly discovered resources; 4) a formal process for timely evaluation and salvage of potentially threatened resources reported through the late finds process; 5) on-call archaeologists and monuments specialists under contract for timely salvage work; 6) a contractor orientation programme to assure understanding guidelines and lines of communication regarding cultural issues. The plan is based on previous pipeline experience and will be subject to review and update based on needs of the project and its general field work organization and reporting structure.

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	Phase I >	Phase II >	Phase III >	Phase IV >
Task Description:	Identification of known resources in pipeline corridor	Evaluation of Resources	Mitigation of Impacts	Monitoring Program & Late Finds Program
Status:	Completed	Ongoing	Will implement recommendations from Phase II	Simultaneous with construction
Comment:	Resources Identified by literature search only; Georgian Intemational Oil Company (GIOC) has designated CAS as coordinator of project monuments issues.	Evaluation effort per monument very low in comparison with archaeological sites. Resources may include combined monuments and archaeological sites.	Mitigation measures include special construction techniques; data recovery excavations, and possible reroutes.	Will be part of environmental management plan for construction process.
Documents Associated with Phases of the Plan	Environmental and Social Impact Study (ESIA) Archaeology and Monuments Baseline; Heritage Resources Database	Phase II Archaeology and Monuments Reports	Phase III Archaeology and Monuments Report	Monitoring Plan with Chance Finds Protocol; Evaluation and Data Recovery Reports

Table 1 Summary of BP cultural heritage management planPhase I >Phase II >Phase II >Phase III >

Project Time Line

EIA Process >	
	Construction >
IFC Cultural Properties Requirements:	Primary international regulatory guidance for project cultural heritage issues is the International Finance Corporation's (IFC) Cultural Property Operational Policy Note (OPN 11.03) (September 1998) which is part of that agency's recommended Environmental and Social Review Procedure (December 1998). Additional general guidance is found in World Bank Environmental Assessment Sourcebook Update Number 8 (September 1994) entitled Cultural Heritage in Environmental Assessment. Both sources emphasise full integration of the archaeological (cultural properties) compliance activities with project environmental documentation and consultation process, "EA Process." The guidance also states that damage to cultural properties (including monuments) is "irreversible but avoidable." The subject WB/IFC guidance is intended to be coherent with the UNESCO World Heritage Convention of 1972 which "has become the standard for national and other legislation" regarding cultural properties, including archaeological sites As of April 2002 OPN 11.03 is still in place. Its use and interpretation by IFC, however, is currently being influenced by the World Bank's Draft OP 4.11 (May 2001) entitled Physical Cultural Resources. The latter draft guidance does not substantially differ from the present IFC OPN but is more detailed, emphasizing the need to develop a programmatic approach to archaeological "chance finds" after the start of a construction project, which this CHMP address as a matter of course.

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Table 2 Periods of Georgian prehistory and history

Lower Palaeolithic (2,000,000-200,000 years ago). This is a time before the emergence of anatomically modern humans. Early members of the genus Homo (*Homo erectus*) lived in small bands, apparently foraging radially from a home base located near some key environmental feature.

Middle Palaeolithic (200,000-30,000 years ago). This very long period corresponds to the emergence of archaic *Homo sapiens* such as *neanderthalensis*.

Upper Palaeolithic (30,000 years ago - 12,000 BC). The Upper Palaeolithic corresponds to the Late Pleistocene period and saw the appearance in Europe, Southwest Asia and Georgia, of anatomically modern humans.

Mesolithic (12,000-8,000 BC). The start of Mesolithic Period is marked by the end of the Pleistocene epoch and the start of the Holocene. Retreat of the Würm glaciation created a more moderate climate allowing exploitation of a wider range of environments.

Neolithic Period (8,000-3,500 BC). The beginning of the Neolithic Period is sometimes referred to as a revolution because of the dramatic shift in the human economy that it brought—agriculture and the domestication of animals.

Bronze Age (3,500-800 BC/IV-I Millennia). Bronze Age cultures throughout Europe, the Mediterranean and Southwest Asia depended on the plant and animal domesticates and associated technical advances such as pottery and the working of native metals, to build a new type of society. This new society was ruled by a military and priestly elite who apparently practised a religion that included elaborate burial rituals and specific belief in an afterlife in which worldly material goods were of value.

Iron Age (800-400 BC). Technological changes led to a larger more sedentary population which also appears to have made populations more prone to regional economic independence.

Ancient Period (500 BC-AD 458). Prehistory ends and Ancient History begins with the advent of a written historical record. Greeks, Achaemenid Persians and Steppe Nomads were the key influences during this period.

Medieval Period (Late AD 400s-1450s). The Georgian Christian tradition began shortly before the start of the Medieval Period when St. Nino came from Cappadocia (north-eastern Turkey) to evangelize in Georgia in the early fourth century AD.

Modern Period (AD 1450s -present). Historical themes of the Modern Period include internal political fragmentation in Georgia, as well as influence and aggression from a new mix of foreign powers vying for control of the area including: Ottoman Turks, Safavid Persians, Russian Empire and later Soviet Union.

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Table 3 Archaeological sites identified for Phase II field investigation

SITE ID, UTMs & NEAREST KP PER	DISTRICT	SITE NAME	SITE DESCRIPTION BASED ON SURFACE OBSERVATION
ROW VERSION 010			
DD044	Tatritakoro	Deret Khoohini	Madisual Villaga Ota, Otausturea, tile and earomia
BPGA-1	Tetritskaro	Daget Khachini	Medieval village Site. Structures, the and ceramic
(8461347-4598737)			fragments visible on surface. Pipeline appears to
Nedlest $rr = r4$			April '02 field visit
BPGA-2	Tetritskaro	Pump Station 2	Four apparent Early Bronze Age Tombs in Pump
(8450155-46026)			Station construction area; obsidian artifacts also
Nearest KP=87			found on surface in construction area. Confirmed
	<u> </u>		by April '02 field visit.
BPGA-3	Tetritskaro	Tkemlana	Medieval Village Site with crude boulder-work wall
((844 9450 – 460			visible on surface. Site straddles creek and lies on
3250) Noarost KP-88			South sloping hillside in forest. Confirmed by April
BPGA-4	Tetritskaro	Nadarbazevi	Medieval Village Site located on south side of hill
(844 8240 - 460	Tornettere	Village	approximately 1km south of well known
4632)			Nadarbazevi Palace which was avoided by earlier
Nearest KP=90			reroute. AD twelfth century, many structural
			remains visible on surface. Confirmed by April '02
			field visit.
BPGA-5	Tetritskaro	Takhtitskaro	Medieval Site. Crude boulder-work walls visible on
(8447991 – 460 6088)			surface. On South facing hillside. Confirmed by
Nearest KP=92	Taallia		April '02 field visit.
BPGA-0 (9420431-4614000)	Isaika	Ell-Baba (marginal areas)	Late Bronze Age Site. Late second millenmum bo,
Nearest KP=114		(Illaryillar areas)	area of Eli Raba was avoided by earlier re-route
			This may be a multi-component site with remains
			on both sides of Beulchai Creek. Confirmed by
			April '02 field visit.
BPGA-6	Tsalka	Aia Ilia	Late Bronze/Early Iron Age Site. Early first
(842 2566 – 461			millennium BC Cyclopean walls, Medieval Period
2741)			site includes crude boulder-work, ruined church.
Nearest KP=122			Confirmed by April '02 field visit.
BPGA-7	Tsalka	Santa Village	Middle Bronze Age Site. Third through second
(841 8371 - 461			millennium BC, burial mounds and ritual roads,
Z041) Nooroet KD-126			possible multiple build tombs. This is a very large
Nediest Kr = 120			sile that stretches about 2-3km along the pipeline
			Larger even more substantial, remains of the
			same period were avoided by re-route. Confirmed
			by April '02 field visit.
BPGA-9	Borjomi	Mt. Tavkvetili	Middle Bronze Age Site. Third through second
(838 2802 – 461			millennium BC, burial mounds. Apparently 2.5km S
8698)			of present ROW. Field confirmation pending.
Nearest KP=165	<u> </u>		
BPGA-10	Borjomi	Mt. Msraiimta	Middle Bronze Age Site I nira through second
(030 3231-401 5137) Nearest KP-167			surface. Field confirmation pending

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SITE ID, UTMS & NEAREST KP PER ROW VERSION 010	DISTRICT	SITE NAME	SITE DESCRIPTION BASED ON SURFACE OBSERVATION
BPGA-11/ (838 0111 - 461 4516 838 0400 - 461 4516 838 0400 - 461 4382 838 0553 - 461 439 838 0570 - 461 4304 838 0643 - 461 4335 838 0817 - 461 4452) Nearest KP=169	Borjomi	Moliti	Middle Bronze Age Site Third through second millennium BC, seven burial mounds. Field confirmation pending.
BPGA-12 (8354540 – 4622800) Nearest KP=201	Borjomi	Siliani	Bronze Age Tombs, Possible Iron Age Tomb and Muslim Settlement. Site is 40m East of BPGA-13. CAS/URS field confirmation pending.
BPGA-13 (835 4575 – 462 2807) Nearest KP=201	Borjomi	Dgvari	Middle Bronze Age Site. Third through second millennium BC; burial mounds and pit tombs. Site is 40m West of BPGA-12. CAS/URS field confirmation pending prior to subsurface evaluation.
BPGA-14 (8345738 – 4619349) Nearest KP=213	Akhaltsikhe	Agara	Medieval Village Site. Located on south facing hillside overlooking Kura River. Confirmed by CAS/URS April site reconnaissance.
BPGA-15/(8318868– 4608872) Nearest KP=247	Akhaltsikhe	Orchosani	Multi-Component site Bronze Age, Third through second millennium BC burial mounds; AD first millennium site settlement; AD 1600s site including ruined church with crypt. Confirmed by CAS/URS April '02 site reconnaissance.

(NOTE: BPGA-X is proposed as the internal project archaeological site code for Georgia to be used in archaeological field investigations and subsequently as a basis for artifact coding and subsequent curation. BPGA-x signifies 'BP Pipeline Archaeology.' The X signifies a sequential site number.)

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BAKU – TBILISI – CEYHAN OIL PIPELINE PROJECT

Oil Spill Response Planning

Framework for Development of a Comprehensive Oil Spill Response Capability for the BTC Project

Document Number: BTC-PRO-REP-004

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			C&H	J Daniels	

APPENDIX E ENVIRONMENTAL IMPACTS AND MITIGATION

ANNEX V OIL SPILL RESPONSE PLAN

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Attachment A

Table of contents of BP Baku IMP

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	Acronyms and Abbreviations
AGT	Azerbaijan – Georgia – Turkey Pipeline Project (includes BTC Oil Pipeline and
	SCP Gas Pipeline)
BMES	Briggs Marine Environmental Services
BMT	Business Management Team
BOTAS	Boru Hatlari ile Petrol Tasima A.S. (Petroleum Pipeline Corporation
	established by the Turkish Petroleum Corporation)
BP	British Petroleum
BTC	Baku-Tbilisi-Ceyhan Pipeline Project
CEM	Crisis and Emergency Management
CONCAWE	Conservation of Clean Air and Water in Europe
C&H	Corbett and Holt LLC
СМ	Crisis Manager
EARL	East Asian Response Ltd
ESIA	Environmental and Social Impact Assessment
ESPOO	Convention on EIA in a Transboundary Context (Espoo, 1991)
EU	European Union
GCT	Group Crisis Team
HGA	Host Government Agreement
IC	Incident Commander
IFI	International Financial Institution
IGA	Inter Government Agreement
IMO	International Maritime Organisation
IMP	Incident Management Plan
IMT	Incident Management Team
IPIECA	The International Petroleum Industry Environmental Conservation Association
Kura River	Also known as the Mtkvari River in Georgia
LLC	Limited Liability Company
LSTKA	Lump Sum Turn Key Agreement
MAP	Mediterranean Action Plan
MEP	Main Export Pipeline
MOIG	Mediterranean Oil Industry Group
NREP	Northern Route Export Pipeline
OC	On-scene Commander
OSIS	An oil spill modelling System
OSR	Oil Spill Response
OSRO	Oil Spill Response Organisation
OSRP	Oil Spill Response Plan
OSRL	Oil Spill Response Ltd
RA	Risk Assessment
REMPEC	Regional Marine Pollution Emergency Response Centre for the Mediterranean
	Sea
SCP	South Caucuses Gas Pipeline Project (formally Shah Deniz Gas Pipeline
	Project)
SOCAR.	State Oil Company of the Azerbaijan Republic
SRT	Site Response Team
TPAO	Turkiye Petrolleri Anonim Ortakligi (Turkish Petroleum Corporation)
WREP	Western Route Export Pipeline

1 INTRODUCTION

This document provides the Framework for the development of the Oil Spill Response Plan (OSRP) for the Baku-Tbilisi-Ceyhan (BTC) project. It relates directly to the Risk Assessment (RA) for determination of release sizes and frequencies and to the potential environmental and social consequence of potential releases for the proposed BTC pipeline and its marine terminal at Ceyhan.

It describes existing and proposed actions needed to develop the BTC (OSRP), considering:

- Existing spill response arrangements for the Western Route Export Pipeline (WREP) and the terminals at Sangachal and Supsa
- Existing arrangements for the port of Ceyhan
- Specific oil properties relevant to
 - the behaviour of the oil once spilt
 - the future selection of appropriate response equipment and techniques

A key element in this initiative is the harmonization of the elements of the existing contingency plans for the WREP and its terminals, augmented where necessary to satisfy the additional requirements of the new BTC pipeline and its terminals. The final product is envisaged to be a single over-arching OSRP in Azerbaijan, Georgia and Turkey. This OSRP will cover not only BTC but also other projects operated by the BP Baku Business Unit.

BP has prepared this report with assistance from Corbett and Holt, LLC.

1.1 LAYOUT OF THE REPORT

This report has been set out in the following manner:

Section 1	Provides details of the BTC in context and also sets out the key elements of the
	Oil Spill Response Planning process including and important definitions
Section 2	Provides details of the Policy, Legal and Administrative framework
Section 3	Sets out an overview of the BP incident management system
Section 4	Outline of the Baku Business Unit Incident Management Plan (IMP)
Section 5	Provides a Framework for the OSRP's that will be developed for Azerbaijan,
	Georgia and Turkey
Section 6	Provides details of draft framework for relevant sections of operations manuals
Section 7	Philosophy for selection of OSR equipment and locations
Section 8	Containment manuals
Section 9	Provides an overview of Preliminary Resource Estimates
Section 10	Overview of the proposed OSR during the construction phase of BTC
Section 11	Provides an overview of the approach to training
Section 12	Establishes the proposed schedule for further development of the OSRP documents and implementation of the Plan
	1

1.2 OVERVIEW OF BTC PROJECT

The initial stages of the BTC project is being progressed by a group of oil companies including SOCAR, BP, Delta Hess, TPAO, Itochu, Unocal and Statoil. BP is the largest foreign oil company stakeholder and is leading the project development at this stage. For the purposes of this document, this group of sponsors is referred to as the BTC sponsors. Discussions with these and other potential stakeholders are ongoing in an effort to form a partnering group of oil companies to fund the project beyond the design phase.

The Project will comprise the following main facilities:

- Approximately 1,700 kilometers of pipeline of nominal diameter between 42 and 46 inches commencing at Sangachal passing through Azerbaijan, Georgia and Turkish territory to Ceyhan
- Pump stations (approximately 8, one of which may be deferred for several years)
- Intermediate pigging stations
- Associated block valves and other above ground facilities
- A marine terminal and loading facility at the Mediterranean port of Ceyhan

The detailed engineering design is currently being undertaken with the intention that construction will commence in the latter part of 2002 / beginning of 2003. Commencement of pumping is planned for 2005.

Operation of the pipeline in Azerbaijan and Georgia will be the responsibility of an operating company currently being created by the International Oil Companies. BOTAS will be responsible for operation of the Turkish section of the BTC project.

1.3 THE BTC BOUNDARIES

For the purposes of this framework and subsequent OSRP's, the extremities of the project areas are considered to be the fence line at Sangachal Terminal and the end of the loading arms at Ceyhan Terminal. Other notional boundaries will be important for determining BP and BOTAS' responsibilities and assessing actual and potential environmental impacts. The latter are addressed in the BTC Environmental and Social Impact Assessments (ESIAs).

In consideration of the international and regional regimes established for oil pollution preparedness and response, it is assumed that BTC OSRP will address spills emanating from the Sangachal terminal, the pipeline, and the Ceyhan Terminal loading or storage facilities, as described above, unless local requirements place additional legal responsibility on the BTC partners. Other spills, particularly those within Ceyhan Port, for example originating from a tanker, are assumed to be the responsibility of the ship operator and the host government. Non-withstanding the foregoing, BP and BOTAS should be prepared to act in accordance with internal corporate policy should an oil spill occur outside the confines of the BTC project area.

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Figure 1 Overview of BTC project

1.4 OSRP IN CONTEXT

It is recognized by BTC that it is necessary to both minimize the risk of a spill, and should a spill occur to reduce the potential for environmental damage. Such an integrated approach requires the following to be taken into consideration:

- Designing the pipeline system to ensure that the risks of incidents during operation are minimized
- Constructing the project in a manner that minimizes risks of incidents
- Ensuring the pipeline is operated and maintained in a manner that minimizes the risk of incidents
- Recognizing that incidents may occur and being aware of their consequences
- Ensuring appropriate emergency response resources and procedures are in place
- Ensuring appropriate training is undertaken

This framework has been developed as part of the preliminary work programme to address the latter two items. The other items are being addressed as part of the engineering design process for BTC.

1.5 AIMS AND OBJECTIVES

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 extent of movement of the released oil spill from the source, by timely containment
- Minimise the environmental impact of primary releases by timely containment and recovery response
- Maximise the effectiveness of the recovery response through the selection of both the appropriate equipment and the technique to be employed. This will be based on the 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
- Maximize the effectiveness of the response through trained and competent, operational and response teams

1.6 OTHER PROJECTS IN THE REGION

BP and its partners, which include other oil companies, as well as governments and commercial entities active in the region, are considering a number of significant and related projects. Those of most relevance to BTC include:

- The offshore full field development of the Azeri, Deepwater Gunashli, Chirag (AGC) field in the Caspian
- The proposed offshore Gas development of the Shah Deniz field
- The proposed gas export pipeline project from the Shah Deniz field to Turkey the South Caucasus Pipeline Project (SCP)

The SCP and BTC projects follow similar proposed corridors, and have a number of common issues. Each project has a different partner set and schedule. Both are lead by BP and possible synergies are constantly assessed, particularly with regard to minimising the cumulative impacts.

The aspects of the OSRP discussed in this document, which are directly relevant to SCP include: Incident Management Planning and Oil Spill Response Planning activities associated with construction.

2 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This section provides an overview of the relevant policies, legal and administrative framework in which the project as a whole is being implemented. Country specific information is provided in Section 6, Legislation and Policy Framework.

2.1 OVERVIEW

The Project is being implemented within the framework of the Inter-Government Agreements (IGAs) and Host Government Agreements (HGAs). In addition, a Lump Sum Turnkey Agreement (LSTKA) with BOTAS forms the contractual basis for the construction phase of the Turkish section of the Project. Figure 2 depicts the framework under which these documents have been enacted.

Azerbaijan Georgia **Turkey** Inter-Inter-Inter-Signed and ratified Governmental Governmental Governmental by the three States Agreement Agreement Agreement Host Host Host Unexecuted forms attached to Intergovernmental Agreement Signed by relevant Government and Government Government Government **BTC Investors** Agreement Agreement Agreement Signed by Turkish Government Government and Guaranty **BTC Investors** Turnkey Signed by BTC Contract Investors and BOTAS (BOTAS) Signed by BTC Funding & Co-operation Agreement Investors and (including Business Framework) SOCAR

Figure 2 Administrative framework

2.2 HOST GOVERNMENT AGREEMENTS (HGA)

The HGA for each country is a key document setting out the obligations of the BTC partners and the Government within each respective country. Whilst the HGA for each country differs slightly, each contains words relating to the OSRP similar to the following:

"Prior to the completion of the Facilities and in relation to Pipeline Activities, a plan for Petroleum spill response capability ("Spill Response Plan") as to spills within or that could affect the Territory will be created and implemented by the MEP Participants. The Spill Response Plan will include:

- (i) Environmental mapping of habitats vulnerable to potential petroleum spills in the entire MEP system
- (ii) Situational scenarios of potential spillages and responses, taking into consideration local circumstances
- (iii) Plans for the provision of relevant Petroleum spill clean-up equipment, materials and services
- (iv) Plans for the deployment of relevant equipment and emergency response notification details of the organisation required to handle Petroleum spill response
- (v) Plans for the treatment and disposal of resulting contaminated materials."

MEP stands for Main Export Pipeline.

2.3 OPERATING AGREEMENT FOR TURKEY

In defining the terms for operation of the Turkish section of the system BP is in the process of negotiating an Operating Agreement with BOTAS. This document will set out the basis in which the OSR capabilities will be adopted and will include the requirement to:

- Prepare an OSRP
- Establish the legal framework for response to oil spills
- Purchase OSR equipment
- Maintaining OSR equipment
- Undertaking training and providing for the necessary resources to enable an appropriate response to an oil spill

Transboundary oil spill response issues, such as those between Azerbaijan and Georgia and Georgia and Turkey will also be addressed to facilitate an efficient oil spill response.

2.4 INTERNATIONAL INSTITUTIONS AND CONVENTIONS

International, regional, and national legal regimes for oil spill preparedness and response have been established to address the basic principles of responsibility (liability), communication, and activities that need to be addressed in the OSRP. The host countries may be signatory to many or all of these conventions. The OSRP for each host country will have to address the institutional and legal requirements that may exist in each host country. For example, Turkey is signatory and party to the Barcelona Convention, and Georgia is signatory to the International Convention on Oil Spill Preparedness Response and Cooperation.¹

Details of policies and conventions applicable in each country are provided in Section 6, Legislative and Policy Framework. An overview of the international instruments that may apply in one or more host countries and which may need to be addressed in each OSRP include:

- Convention on the Transboundary effects of Industrial Accidents (Helsinki, 1992)
- Convention on EIA in a Transboundary Context (Espoo, 1991)

¹ Azerbaijan is not currently signatory to these conventions, however, it may decide to accede to these or other conventions in the future.

- Convention on the Protection and Use of Transboundary Watercourses and International lakes (Helsinki, 1992)
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979)
- Convention on Persistent Organic Pollutants (Stockholm, 2001)
- International Convention on Oil Pollution Preparedness Response and Cooperation (OPRC)
- International Convention for the Prevention of Pollution from Ships, 1973, as amended (MARPOL 73/78)
- International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971 and Protocol

In addition to the treaties and conventions that may apply in each country, certain international institutions have established programmes that are available to assist countries in dealing with oil spills. In developing of the country specific OSRPs the following established policies and practices may be of relevance:

- United Nations Environment Programme recent activities include ship/shore interface issues, chemical dispersants
- Mediterranean Action Plan (MAP) implementing the Barcelona Convention for pollution assessment and nature conservation
- International Maritime Organisation vessel related oil spill incidents
- Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) the regional oil spill combating centre for facilitating mutual assistance in the event of large oil spills

A key aspect of these conventions is the determination of who pays for the clean-up effort. In this regard, international instruments generally follow the principle of the "polluter pays" (to a prescribed limit of liability). Nation states, including the host governments of the BTC project, have an obligation to deal with oil spills within their territory and around their coasts in a manner consistent with the international laws and regional schemes to which they are party. Some governments, while not acceding to a particular convention, often apply its provisions as a matter of "customary law." The reward for performing in a manner consistent with international law is the opportunity to claim reimbursement for costs and damages incurred for an incident from either the party responsible for the oil spill or, in certain instances from the existing Global Compensation Regimes.

2.5 OTHER APPLICABLE REGIONAL INITIATIVES

There are a number of initiatives currently in place or being developed including:

- Convention on the Protection of the Black Sea against Pollution (Bucharest, 1994)
- Convention for the Protection of the Mediterranean Sea against Pollution, 1976 (the Barcelona Convention). The Barcelona Convention and Protocol have been developed as mechanisms through which the members undertake to use their best endeavours to provide each other with assistance in the event of a oil spill incident in the geographic areas covered by the agreement
- Protocol Concerning Cooperation in Combating Pollution of the Mediterranean Sea by Oil and Other Harmful Substances in Cases of Emergencies
- Mediterranean Oil Industry Group (MOIG). The International Petroleum Industry Environmental Conservation Association (IPIECA), comprising petroleum companies and associations around the world, established the Mediterranean Oil Industry Group (MOIG) as the means for providing a regional oil industry forum on oil spill preparedness and response for the Mediterranean Region. It provides a regional industry interface with REMPEC. BP and other BTC partners are key members of both IPIECA and MOIG

In addition BP is a member of an industry lead initiative on oil spill response related issues for the Caspian and Black Sea "region". Members of Oil Companies operating in the region have established a Steering Group and working groups for the Caspian and Black Sea areas.

2.6 EUROPEAN UNION

Whilst none of the host countries are members of the European Union it is possible that one or more of these countries will join the EU during the life of this project. Should this occur, a EU host country will be bound by relevant EU legislation.

2.7 PARTNER POLICIES AND INITIATIVES

Notwithstanding the various legal regimes that might apply to the BTC project, it is anticipated that the HGA and internal BP policies and practices, which represent industry "best practices," will apply to oil spills from the BTC project in the absence of other more rigorous international or regional standards. Subsequent sections of this report describe how the OSRP developed as part of the BTC project development will be implemented in accordance with the BP Group Crisis Management System.

3

OVERVIEW OF THE BP CRISIS AND EMERGENCY MANAGEMENT SYSTEM

BP has instituted a Crisis and Emergency Management (CEM) System throughout its global operations. Emergency management plans are maintained to cover all of BP's facilities, locations and products. Plans prepared under the CEM System identify equipment, training and personnel necessary to protect the workforce, customers, public, and environment, and BP's reputation in the event of an incident. The expectations underlying the development of such a plan are:

- Emergency Management Plans are based on the risks that potentially impact the business. These plans are documented, accessible, clearly communicated and align to the BP Group's emergency management system
- Equipment, facilities and personnel needed for emergency response are identified, tested and available
- Personnel are trained and understand emergency plans, their roles and responsibilities, and the use of crisis management tools and resources
- Drills and exercises are conducted to assess and improve emergency response/crisis management capabilities, including liaison with and involvement of external organizations
- Periodic updates of plans and training are used to incorporate lessons learned from previous incidents and exercises

In a crisis event, there will be a maximum of three levels of management, with a clearly defined team leader at each level.

The Global Business Centre has a Crisis Management Plan detailing response to any crisis (in this case a potential or actual spill on the BTC system).

Each Region, in this case the Caspian Region, has a Regional Support Plan to enable the Regional Director and the Business Units in the area to link and assist each other.

Each Business Unit or group of Units will have a Business Support Plan. The Azerbaijan Business Unit (of which BTC is a part) has developed a Business Support Plan that will assist the BTC in implementing the OSRP.

Each facility will have an Incident Management Plan (IMP) within an overall Incident Management System. The BTC OSRP will form part of the Baku Business Units IMP.

All plans are regularly tested through exercises to measure their effectiveness and to provide training for the response organisation.

4

OUTLINE OF THE AZERBAIJAN BUSINESS UNIT INCIDENT MANAGEMENT PLAN

Responsibility for construction and operation of the BTC project falls within the remit of the BP Azerbaijan business. Development of the necessary plans for BTC will therefore also be undertaken within the framework of the Azerbaijan Business units Incident management Plan and any associated plans. The following sections provide an overview of the existing documents with particular emphasis on the OSRP's currently in place.

4.1 INCIDENT MANAGEMENT PLAN (IMP)

The BP Azerbaijan Business Unit IMP has been developed during the Early Oil Project and covers the procedures to be followed in the events such as:

- Fires / Explosions
- Spills (Oil) / Releases (Gas)
- Injury / Casualty / Medevac
- Transportation Accident
- Natural Disasters

The IMP includes:

- Policy and Expectations
- Response and Organization
- Notification and Callout
- Incident Management System
- Roles and Responsibilities
- Response Action Plans
- Forms
- Status Boards
- Meeting Agendas and Protocols
- Standard Operating Procedures

Relevant information from the existing Azerbaijan Business Unit IMP is included in this Framework document with a detailed table of contents included in Attachment A. The IMP will be updated to include BTC (including Turkey) within the same timeframe as for the OSRP as indicated in Section 12.

Key roles are set out in the existing IMP documents and are detailed in Table 1, with an organization chart shown in Figure 3.

Team	Location	Role	Leader	Title	
Site Operations, or Project Site Response Team (SRT)	Incident Command Post, Emergency Scene	Initial Response, implementation of tactics, on-scene safety	Facility, Operations or Project Manager or designate	On-scene Commander (OC)	
Incident Management Team (IMT)	Incident Management Center (IMC), Baku Tbilisi office Ankara / Ceyhan	Strategy, tactics, logistics, agency liaison, finance/ admin., planning, ongoing operations	Incident Commander	Incident Commander (IC)	
Business Management Team (BMT)	Business Management Center (BMC), Baku	Crisis Management, Policy, political liaison, externalaffairs, finance and legal	BU Leader of Affected Business Unit or his nominee	Crisis Manager (CM)	
Group Crisis Team (GCT) Headquarters, London		Establish business response Strategy ensure that Group Concerns are appropriately managed	BP Group GCT member	Group Crisis Manager	

Table 1	Key	roles	as inclu	ded in	the	Azerbaijan	business	units]	IMP
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Figure 3 BP Incident management team and Azerbaijan management team organisation

4.2 LINKAGES BETWEEN THE IMP AND OIL SPILL RESPONSE PLAN

Table 2 provides an overview of the linkages between the various plans that will comprise the individual country OSRP with more details provided in Figure 4. Specific elements of these plans as they relate to response to incidents are described in subsequent sections of this report.

Table 2 Overview of linkages between the Azerbaijan business unit IMP and the OSRP documents



4.3 EXISTING RESPONSE PLANS

Whilst this framework document is primarily focused on the BTC project the integration of BTC documentation into the IMP will be undertaken with due regard to the following existing plans:

- WREP River containment and deployments manuals
- The Azerbaijan and Supsa shoreline containment manuals
- Continued use of the OSIS model for oil spill trajectory prediction into the response arrangements for the Caspian Sea and at Ceyhan
- The work on weathering effects on the Caspian Crude oil now underway in Baku
- 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

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Figure 4 Linkages between the Azerbaijan IMP and country specific OSRP's



Note

For clarity this organization chart does not show the linkages with other documents associated with Incident Management ie

- Medical emergencies etc
- Medical emergencies w
 Other BP operations in the Caspian ie Alov, Inam, etc

5 FRAMEWORK FOR THE OSRPS

5.1 INTRODUCTION

For each country in the BTC system, a country specific OSRP will be developed to cover all of the facilities operated by BP and BOTAS. It is currently proposed that each OSRP will be structured in a similar manner to the IMP but will contain more specific information relevant to oil spill response. The contents of the OSRP are likely to include:

- Response and Organization
- Notification and Callout Procedures
- Contact Details
- Roles and Responsibilities
- Definition of Event Severity
- Risk Assessment
- Response Action Plans

The first 4 items in this list will include extracts from or linkages to the IMP and will be augmented by OSR specific elements. Further details on the latter 3 items in the list are set out below.

5.2 DEFINITION OF EVENT SEVERITY

Definition of a spill event in terms of Tier 1, 2 and 3 is recognized practice and is used to define spill size in the existing Azerbaijan and Georgia OSRP. Extracts from the existing OSRP definitions are set out below:

- Tier 1 eventA small local spill requiring no outside intervention and can be dealt
with on site by local staff and stockpiled equipment.
- Tier 2 event A larger spill that would require additional outside resources and manpower.
- Tier 3 event A large, possibly ongoing spill, which will require additional regional and possibly international resources. Such spills are very rare 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 operation for a Tier 3 event will utilise all BTC OSR manpower and resources, and be augmented by additional resources from external contractors. Possible contractors include Briggs Marine Environmental Services (BMES) in Baku, Oil Spill Response Ltd. (OSRL) from Southampton, UK or the East Asian Response Ltd (EARL) in Singapore.

5.3 RISK ASSESSMENT

The OSRP will include relevant sections of the environmental risk assessment work undertaken as part of the BTC design. For onshore spills this section will discuss the various aspects that define the risk including:

- Failure modes (3rd party damage, natural hazards, corrosion, operator error)
- Environmental receptors
- Spill volumes assessment
- Risk profiles

Similarly for offshore spills, the environmental risk assessment will address:

- Likely causes of oil spills from the terminal and loading facilities
- Maximum and most probable release volumes

Further detail on the linkages between Risk Assessment and OSR planning to be used for BTC is set out in Section 7.

5.4 **RESPONSE PLANS**

There will be a number of specific response plans prepared as part of the overall OSRP including response plans for onshore and offshore spills as set out below.

5.4.1 Inland spill response (containment manuals)

For each country, an Inland Spill Response Plan will be prepared that provides background information for OSR staff and operations staff. The dissemination of this information in the plans and in training modules will provide relevant members of the ORSP team with the necessary knowledge to make informed decisions in the event of an incident. The more mechanical aspects of oil spill response will be provided in the very specific containment manuals. Key elements to be included in the Inland Spill Response plans for each country may include:

- Guidance on the Risk Models
- Guidance on the use of the GIS
- Guidance on the methods for prediction of oil movement from source of leak
- General information on containment and recovery of released oil either, on or within:
 - Land
 - Rivers
 - Wetlands
 - Lakes
 - Forest
 - Archaeological sites
- Disposal of waste arising from oil spill recovery operations
- Trans-boundary response
- Contractor guidance
- Secondary response

5.4.2 Marine and terminal operation and spill response

The Marine and Terminal Spill Response may include:

- Guidance on the Risk Models
- Oil Spill Tracking ie OSIS and other methods for Prediction of oil movement
- Contain ment and recovery of oil on:
 - Sea
 - Wetlands
 - Beaches
- Containment of oil at risk of release from marine installations and ships (marine salvage)
- Selection and operation of shoreline cleaning techniques for the various shoreline types at risk, or actually polluted
- Disposal of recovered oil and contaminated beach materials
- Trans-boundary response
- Contractor guidance
- Secondary response

A discussion on some of the key elements of the onshore and offshore plans is set out below with the equipment selection process described in Section 7.

5.5 TRANS-BOUNDARY RESPONSE

Sufficient response capabilities will be established in each country to enable a Tier 2 incident to be handled using in country resources. Notwithstanding, BP will continue to consult with the boundary authorities in Azerbaijan, Georgia and Turkey to ensure Tier 2 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. An example of such an event could be an oil spill:

- Into the Azerbaijan section of the Kura with potential to flow into the Caspian and hence to the waters of a Caspian littoral state other than Azerbaijan
- Into the Kura River in Georgia with oil potentially passing into Azerbaijan
- Into the Kura or Posov Rivers in Turkey potentially passing into Georgia
- Into the Euphrates River in Turkey with oil potentially passing into Iraq
- An oil spill at the Turkish / Syrian border potentially effecting Cyprus and Syria

Appropriate provision will be included in the IMP and OSRP including:

- Roles and responsibilities
- Contact numbers lists
- IMP Mobilization of appropriate external response in the event that an oil plume may impact on territories in which no OSRP capability or Inter- Government 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)

5.6 MONITORING OF SPILL PROGRESS

The OSIS model can be used to follow movement at sea and natural dispersion as a function of time and temperature. To complement the predictions from the OSIS modelling mechanisms for deployment of vehicles, vessels or aircraft will be established.

5.7 SALVAGE

Salvage is an important component of marine oil spill response activities, in that they serve as the principal means of securing the source of the release and minimising the amount of oil that may be lost. It is the responsibility of an affected ship's owner to provide salvage resources, but it is incumbent on BP to be aware of salvage arrangements and activities in the event of a spill from a vessel associated with the BTC project. The OSRP will provide a summary of the main shipping company contacts and available salvage arrangements.

5.7.1 Waste disposal

BP is currently undertaking a review of waste management issues to ensure adequate facilities will be in place to deal with wastes generated during the construction and operation of existing and proposed facilities in the region through which the BTC pipeline passes. In undertaking this assessment consideration of possible wastes arising in the unlikely event of an oil spill is being addressed.

Should an event occur an important part of the secondary response will be consideration of where wastes are transported to and how they are treated. In making this assessment it will be important for the decision maker to understand that there will be environmental impacts associated with any disposal option and these will be to be assessed as part of the decision making process.

5.8 EXTERNAL CONTRACTOR GUIDANCE

External contractors are likely to be identified as an important resource to be called on in the event on an oil spill or other incident. The OSRP will provide details of the contractors with which BP and or BOTAS has agreements with to assist in such events. Reference will be made to documents that clearly set out the account manager and terms of engagement for the various contractors.

6 FRAMEWORK FOR RELEVANT SECTIONS OF OPERATIONS MANUALS & PROCEDURES

6.1 OVERVIEW

Figure 5 provides a generic structure of the various documents, which control the Management, Operational, Repair and Emergency activities on a typical pipeline system. The BTC documentation system will be structured to provide information, guidance and instruction to ensure that the safety, operability and integrity of the pipeline is maintained throughout its lifetime.

6.2 LINKAGES BETWEEN OPERATIONAL & EMERGENCY DOCUMENTS

Where required, linkages between the Operational & Emergency documentation, will be provided, within the text of the documents, to ensure that, in the event of an emergency, the Pipeline Operators are provided clear directions to enable them to take the appropriate actions quickly and efficiently.

6.3 INTEGRITY MANAGEMENT

BTC will develop an Integrity Management System, which will outline the processes by which the technical integrity of the BTC pipeline will be managed and assured.

The Integrity Management System will address the management and assurance processes required to:

- Maintain the technical and operational integrity of the system
- Identify the system boundaries and components
- Demonstrate, by independent review, the delivery of technical and operational integrity
- Identify the roles and responsibilities of those persons involved in maintaining and assuring the integrity of the system
- Ensure that the appropriate level of inspection, testing and review is maintained
- Ensure that operating limits and philosophies are consistent with the design intent and reflect system changes and modifications
- Ensure that changes and modifications, to the system, are engineered and implemented such that the integrity of the system is not compromised

The Integrity Management System plays a critical role in the prevention of oil spills. A primary element in developing the Integrity Management System, will be the Pipeline Risk Assessment Process where, for each component of the pipeline system, the threats and the probability and consequences of the threats will be evaluated to derive the maintenance and inspection intervals for the various elements of the pipeline system.



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7 PHILOSOPHY FOR SELECTION OF OSR RESOURCES

7.1 INTRODUCTION

The immediate response and containment actions developed will be based on the following parameters:

- Linking the response capability to the risk assessment process
- Further defining what constitutes Tier 1, 2, and 3 for the different components of the BTC system
- Assuring that response activities are planned with due regard to logistical and safety considerations
- Considering oil properties and national and regional priorities in selection of response strategies

7.2 PLANNING STANDARDS

The parameters required to achieve an effective response will be defined in the OSRP planning standards. Development of these standards will include consideration of travel times, people and equipment and will be linked to the Risk Assessment process as discussed below.

7.2.1 Linking risk assessment to OSRP

As described in the ESIA, an assessment has been undertaken to understand the possible spill scenarios that could be expected along the BTC pipeline. The assessment is considered conservative as it is based on historical pipeline performance data (CONCAWE) and does not take into consideration:

- Improvements in pipeline design techniques
- Improvements in asset management methodologies including the use of intelligent pigging

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 the risk assessment will be used to determine what "Tier 2" resources shall be employed. In consideration of the outputs from the risk assessment consideration will be given to having different response strategies dependant not only on the probable leak size but also on the sensitivity of the environment in the leak location.

An environmental risk assessment is also being undertaken for the terminal and loading facilities. The findings from this assessment will be used in defining the appropriate OSRP resources and particularly the Tier 2 response capability to be obtained and operated by BOTAS on behalf of the BTC partners.

7.2.2 Logistics

In development of the complete OSRP and the associated selection of equipment and storage locations the following aspects will be considered:

- Access -There are several long reaches of pipeline that have no access excepting the BTC right-of-way itself. In these reaches of pipeline, it is likely that during the winter months oil spill response personnel and equipment will have to be transported to the spill site via helicopter, or surface vehicles suitable for over-snow transport. This will influence the size and type of containment equipment selected. Where the pipeline parallels or crosses waterways, or where a spill may enter a major waterway, waterborne transport may be required. This will also affect the type of containment equipment selected
- Local infrastructure varies significantly along the BTC alignment. Where available and competent local infrastructure will be incorporated in the plan
- Terrain also varies significantly along the BTC alignment with the mountainous areas in Georgia and Turkey inhibiting the ease of access

The logistics of equipment deployment will be based on:

- Amounts and types of equipment available for use in the three countries involved
- Availability of equipment in immediately contiguous regions
- Cross border clearance times
- Availability of equipment from out of area stockpiles

It is necessary to have enough equipment to adequately respond to a Tier 2 spill located in each BTC country, due to the difficulty of moving equipment across borders. Additionally, this equipment will be strategically placed at locations that allow response personnel to deploy it at appropriate sites. The equipment will be generally dedicated to the BTC, and purchased and maintained by the systems operators, however, it must be acknowledged that oil spills do not lend themselves to predicable responses and may require other types of equipment and procedures not normally thought of as dedicated equipment, such as earth moving equipment. BTC personnel and equipment will be augmented by regional response organizations. When future regional Oil Spill Response Organizations (OSROs) are organized, BTC will arrange for them to also augment internal BTC resources.

7.2.3 Safety

Notwithstanding the above strategies, BP has developed procedures to ensure the safety of personnel and the public and include:

- Restrictions on vehicle speeds with vehicles towing trailers stipulated to travel at slower speeds. Restriction on the amount of night driving
- Safety issues associated with working in the vicinity of high pressure gas pipelines (ie the SCP)

These policies will be considered in determining appropriate storage locations of OSR equipment and staff.

7.3 OIL SPILL CONTAINMENT AND CLEAN-UP EQUIPMENT

7.3.1 Overview

Oil spill containment and clean-up equipment is typically associated with marine spills. Much of the equipment used to deal with Inland spills, such as those which may occur from a pipeline, are modified versions of equipment developed for offshore use. To complement equipment designed for clean-up of spills on water general construction equipment, such as earth moving machinery, is often the most effective equipment in dealing with onshore spills.

Mechanical equipment, such as booms and skimmers, are effective in protected waters around harbours and bays, but have limited utility offshore. Additionally, most spills occurring in "near shore" areas can be expected to come ashore, despite best efforts to contain and control free floating oil, making shore clean-up equipment, such as excavators, backhoes and other general construction equipment, of great value for removing stranded oil and contaminated material.

Offshore spills may respond favourably to treating with approved chemical dispersants, under prescribed parameters, such as time, rate, and method of application. Lighter crude oils can be effectively treated with dispersants when the chemical is applied early in the spill before the oil has the opportunity to develop into an oil/water emulsion (sometimes called "mousse").

Sometimes, the best option is the "no action" option. Certain sensitive environments can be more damaged by response activity than by the presence of oil alone. This response option needs to be carefully coordinated with national authorities to ensure that concurrence is obtained before the "no action" option is pursued.

Equipment required to deal effectively with an oil spill^{*} may include:

Immediate Response Equipment

- Transportation (boats, trucks, trailers, planes, helicopters)
- Communications equipment
- Maps and positioning equipment
- Containment and removal equipment (booms, excavators, etc)
- Pumping equipment and associated hoses / pipes
- Storage facilities

Repair Equipment (welding machines, pipe patching kits, etc)

Spill Monitoring Equipment (aircraft, boats, trucks)

Secondary Response Equipment

• Oil water separators

^{*} The list of possible equipment is not intended to be exhaustive, but to be representative of the type of equipment that may be considered in the OSRP. Specific response requirements will be articulated in the OSRP based on the assessed risk and the planning standards (section 7.1).

• Earth moving equipment and other mechanisms for cleaning and removing contaminated soils and sand

In addition equipment may be required for final restoration of impacted habitats, flora and fauna and cultural resources (reseeding capability, etc)

7.3.2 Oil property considerations

The oil properties which determine the relative difficulty and extent of the response problem and hence the type and capacities of the required response equipment for any given release volume, location and ambient temperature are:

- The pour point temperature, which determines whether the released oil will remain liquid or solidify after release
- The distillation temperature profile which determines the extent of evaporative loss on exposure to the air and hence the extent of reduction in the volume requiring recovery
- The viscosity, asphaltene and wax content, of the transported oil which influence the viscosity and stability of the water-in-oil emulsions which form on contact agitation with water, and which subsequently determine the rates of natural dispersion
- The value of the viscosity of the fully developed emulsions which also determine the selection of equipment for optimal recovery rates and whether dispersants are a viable option

7.3.3 Number of response units required

The decision as to how many response units of the various types should be provided, for the various application sites and conditions will be based on:

- Expected spill volumes
- Expected treatment rates inherent to the equipment design and type
- Logistics of delivery to response sites

8 CONTAINMENT MANUALS

As set out in Figure 4 the key containment manuals for each country will be the onshore containment manuals and Coastal Sensitivities and Shore Protection Manuals. An outline of the information that will be included in these is set out below.

8.1 ONSHORE CONTAINMENT MANUALS

This volume will graphically display Maps and/or aerial photographs, and photographs will depict oil drainage pathways, specific immediate response and containment sites. This hard-copy volume will be supported by an interactive GIS system, which will display spill volumes and pathways for an event at any location along the BTC pipeline and terminals.

Specific response for all types of environmental receptor shall be included ie:

- Rivers
- Lakes
- Wetlands
- Agricultural land
- Forests
- Areas used for extraction of groundwater
- Archaeological sites

At a minimum, each map and/or aerial photograph will display the following information:

- Location
- Time and distances to each containment site
- Rendezvous point
- Forward holding positions
- Pipeline crossing location
- Containment sites
- Transfer station
- Site characteristics
- Access
- Storage

Details of the environmental aspects of the receptor and containment sites are also given ie:

- River flow data.
- Environmental sensitivities.
- Other sensitive receptors ie power station intakes

Details of site specific oil spill response equipment is also given ie:

- Limitations
- Recommended equipment (containment and recovery)
- Ancillary equipment
- Consumables

8.2 COASTAL SENSITIVITY AND MARINE RESPONCE MANUALS

The development of the Coastal Sensitivities and Marine Response Manuals will be undertaken in accordance with the regulations described in Section 2. In terms of specific BTC requirements the HGA and operating agreements set out the main provisions for preparation of these reports and maps.
9 PRELIMINARY RESOURCE ESTIMATES

A preliminary assessment of possible concepts for provision of oil spill response facilities has been undertaken as part of this framework assessment and is set out below.

9.1 EMERGENCY RESPONSE CENTRES

Emergency response centres are likely to be located in Baku, Tbilisi and Ceyhan.

9.2 TIER 2 RESPONSE EQUIPMENT STORAGE LOCATIONS

Oil spill response equipment will be located at various locations within all three countries with possible locations as set out in Table 3.

Country	Location	OSR Equipment for Offshore and Coastal Clean-up	OSR Equipment for Spills from Onshore Facilities
Azerbeilen		0111	
Azerbaijan	Baku / Sangachal	clean-up equipment as part of the ACG response capabilities	BTC and SD as determined from assessment of response times and risks set out in this document
	WREP PS 5		WREP equipment augmented with equipment for BTC and SD as determined from assessment of response times and risks set out in this document
	WREP PS 8		WREP equipment augmented with equipment for BTC and SD as determined from assessment of response times and risks set out in this document
Georgia	BTC PS G1		Equipment for BTC and SD as determined from assessment of response times and risks set out in this document
	BTC PS G2		Equipment for BTC and SD as determined from assessment of response times and risks set out in this document
	WREP PS 13		WREP equipment
	WREP PS 15		WREP equipment
	Supsa	Offshore and Coastal clean-up equipment as part of the WREP response capabilities	WREP equipment

Table 3 Preliminary assessment of locations for tier 2 response equipment

Country Location OSR Equip Offshore ar Clear		OSR Equipment for Offshore and Coastal Clean-up	OSR Equipment for Spills from Onshore Facilities				
Turkey	BTC PS T1		Equipment for BTC as determined from assessment of response times and risks set out in this document				
	BTC PS T2		Equipment for BTC as determined from assessment of response times and risks set out in this document				
	BTC PS T3		Equipment for BTC as determined from assessment of response times and risks set out in this document				
	BTC PS T4		Equipment for BTC as determined from assessment of response times and risks set out in this document				
	Ceyhan	-BTC specific Offshore and Coastal clean-up equipment - Offshore equipment associated with existing facilities					

9.3 LOCATIONS FOR LANDING TIER 3 EQUIPMENT

A preliminary assessment of possible landing locations for OSRL planes has been undertaken during the development of this framework document. On the basis of this assessment it is considered likely that Tier 3 equipment could be landed at the following locations:

Country	City/Town	Distance from Pipeline (km)	Category	Operator	Elevation (m)	Approximate Open Hours
Azerbaijan	Baku Airport		International Airport			20 hours
	Ganja		National Airport			
Georgia	Tbilisi		International Airport			20 hours
Turkey	Istanbul		International Airport	State		20 hours
	Ankara		International Airport	State		20 hours
	Sivas	34	Military/Civil	State/Air Force	1,596	Summer/ Winter different
	Adana	53	Civil	State	19.7	24 hour

Table 4 Landing locations for tier 3 equipment

Country	City/Town	Distance from Pipeline (km)	Category	Operator	Elevation (m)	Approximate Open Hours
	Erzincan	16	Military/Civil	State/Army	1153	Summer/ Winter different
	Erzurum	2	Military/Civil	State/Air Force	1757	Summer/ Winter different
	Kahramanmaras	50	Civil	State	525.1	Summer/ Winter different
	Kars	22	Civil	State	1795	Summer/ Winter different
	Kayseri	90	Military/Civil	State/Air Force	1052	Summer/ Winter different
	Ardahan	6.1	Planned			

10 OSR DURING THE CONSTRUCTION PHASE OF BTC AND SD

Whilst the risk of oil and fuel spills during construction is significantly lower than that of the operations phase, there is some risk of spills from storage and transport of fuels and oil and during the refuelling process. To ensure an appropriate response to small events the construction contractors shall be required to maintain Tier 1 response equipment. This response capability will be augmented by the existing Tier 2 capability in place in Azerbaijan and Georgia.

A bridging document will be prepared for each significant contract to ensure appropriate incident response can be undertaken within the BP incident management system. These bridging documents will include the following elements / sections:

- Purpose and Scope
- Call out procedure
- Call out of the BP Incident Management Team
- Call out of the Project Management Team
- Contact list for the Contractor's sites (Site Response Teams)

11 TRAINING

The IMP and or OSRP and the Operations and Maintenance Manuals will include details of an ongoing training program. The documentation will be revised as required to reflect lessons learned during construction and operation of the system (ie continuous improvement).

The training programme will be designed to ensure that due regard is taken of outcomes from ongoing risk assessment with particular regard to environmental and socio-economic risks. The programme will be documented, accessible, clearly communicated and aligned to Business Unit and regional IMPs.

It is the intention to provide training of operatives at the various levels on a uniform basis across the three countries for both pipeline and terminal related spill responses, recognising that the solution to inland and shoreline spill response problems share much in common.

The training courses will be designed to ensure appropriate levels of understanding are achieved at the different levels within the OSR team and will include:

- Communications and decision-making
- Working with 3rd party contractors
- GIS and other tools
- Safety
- Region specific issues
- Discussions on the oil properties and how these change with environmental conditions along the pipeline
- The relationship of oil properties and the approach to undertaking a response
- The selection and operation of appropriate equipment and techniques
- Maintenance of equipment and trouble shooting
- Deployment of equipment
- Free product recovery
- Waste disposal

The exercises will be designed to ensure the teams are fully aware of the procedures to be followed and have a clear understanding of how to use the various tools and equipment within the total range of chosen techniques. The training will highlight the importance of appropriate equipment selection and procedures to ensure the potential environmental impact of an event is minimized.

It is recognised that the results of training can only be fully realised if opportunities are provided for those trained to use their knowledge in suitably constructed drills and exercises. Examples of training exercises that may be undertaken include:

- Notification exercises which, would involve unannounced checks on the communications systems and contacting key staff
- Incident Management Team Exercises
- Partial activation exercises

12 SCHEDULE

This framework document has described the position now reached and the approach to be adopted for the creation of a fully comprehensive OSRP with all its associated equipment, manuals, and the guidance to be provided through training, drills and exercises.

Table 5 outlines the forward schedule:

Table 5 Preliminary schedule for establishment of OSR capabilities for BTC

	Activity	Completion Date
Review of existing Prepare Framework Issue Framework Obtain acceptance Process Review existing e	Nov 2001 Dec 2001 Apr 2002 Aug 2002 4 Q 2002	
Identify types of s i ii iii r iii s iv v v s vi v vi v	4 Q 2002	
Consider number to spill volumes a ii a iii a iv a v r vi le	rs of the different types of equipment required, having regard and to: amounts and types already available in-house amounts and types held by contractors amounts and types held by Tier 2 Contractor amounts and types held by OSRL routes and capacities for waste recycling and disposal ogistics considerations	4 Q 2002
Finalise Planning	Standards	1 Q 2003
Complete Country	1 Q 2003	
Procure Equipme	2 Q 2003	
Update IMP to inc	clude Turkey	2 Q 2003
Undertake consu affected commun	Itation and data gathering with district leaders of potentially ities	3 Q 2003

	Activity	Completion Date
Development of BTC Response Manuals:		3 Q 2003
1. 2. 3. 4. 5.	Sensitivity mapping Pathway modelling Containment site selection Map preparation Identify equipment launch sites	
Receive Equipr	nent	4 Q 2003
Training for ope	erations staff and OSRP staff operatives for spills to:	1 Q 2004
i ii iv v v	inland river shorelines wetland sand/pebble washing waste management	
Training for ma	nagerial and supervisory staff on:	1 Q 2004
i ii iii iv	the content of the new Incident Response Plan the line operator's option to prevent or minimise releases the basis for selection of clean-up methods content of response manuals	
Linefill		Mid 2004

Attachment A

TABLE OF CONTENTS OF BP BAKU IMP

(Extracted from Document No UNIF-HSE-MA-400 Rev 0 April 2001 with proposed enhancements for BTC integrated plan in italics)

Section 0 Emergency Resources – Callout List

- Emergency Response Resources and Contacts
- Development & Production (D&P) Business Management Team (BMT)
- Business Management Team (BMT)
- Advisers Support Group to BTC (Business Management Teams (BMT's)
- Uxbridge/Sunbury, Shared Asset Emergency Support. Security Office Contact. Notification and Primary Support
- Personnel IMT Members
- Emergency Stand by Vehicles
- Expertise
- Facilities
- IMC BMC Contacts
- Response Resources in Georgia
- Response Resources in Turkey
- Other useful Offices
- National Agencies and Officials
- Helicopter Contractor
- Vessel Contractor
- Operations Base Contacts
- Equipment
- External National Contractors
- External International Contractors
- External International Contractors' Local Offices
- External Local Resources Baku
- External Local Resources Georgia
- External Local Resources Turkey
- FOC's Contacts

Section 1: Policy and Expectations

- 1.1 Policy
- 1.2 Background
- 1.3 Expectations
- 1.4 General Objectives
 - 1.4.1 Site Response Team (SRT)
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	BTC PROJECT ESIA GEORGIA FINAL ESIA					
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APPENDIX E ANNEX III ATTACHMENT I

PROPOSED STATEMENT OF WORK FOR PHASE II EVALUATION OF ARCHEOLOGICAL SITES IDENTIFIED IN GEORGIAN PIPELINE COMPANY'S PROPOSED GEORGIAN BTC AND SCP PIPELINE CORRIDORS

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Appendix E Annex III Attachment I

Proposed Statement of Work for Phase II Evaluation of Archaeological Sites Identified in Georgian Pipeline Company's Proposed Georgian BTC and SCP pipeline corridors

1 BACKGROUND

Pursuant to cultural heritage law of the Republic Georgia and applicable international cultural heritage protection standards, the BP has established an archaeological protection strategy in consultation with the Republic of Georgia's Center for Archeological Studies (CAS). The strategy will guide project archaeological work on the Georgian segment of the proposed Azerbaijan-Georgia-Turkey BTC and SCP pipeline corridors. CAS is the Georgian Government's cultural properties review and compliance agency, as specified in the *Georgian Law on Cultural Protection*.

Applicable international standards for the project include World Bank OPN 11.03 entitled *Cultural Property*, a brief document that is in force pending release of forthcoming IFC OP 4.11 entitled *Safeguarding Cultural Property in IFC-Financed Projects*. Compliance with and appropriate consultation on these standards, as well as for the Georgian Law on Cultural Heritage, are an integral part of the BP's Environmental and Social Impact Assessment process for the subject project.

Phase I of the project's Archaeological Strategy was carried out in order to identify potentially significant archaeological resources that could be impacted by construction. This identification study involved:

- Review of literature
- Review of aerial of photographs
- Initial baseline surveys along possible right-of-way corridors
- Subsequent field assessment of identified sites as part of the project topographic survey

Based on these four types of investigation, fifteen of the sites identified by Phase I should be investigated by Phase II studies, ie site evaluation. Table 1 presents a list of these sites including a brief description of each.

2 OBJECTIVES

Fifteen potentially significant archaeological sites have been identified to lie within the Georgian BTC and SCP pipeline corridors's archaeological area of potential effects (APE). This corridor is approximately 50m wide and approximately 240km in length. Construction damage to the subject sites could cause a significant loss to the Republic of Georgia's cultural heritage. To avoid such a potential negative impact, Phase II investigations are required at these sites to definitively evaluate the resources and to provide a basis for further protection measures if the sites prove to be significant. Such additional measures may include: site avoidance, data

recovery excavations prior to or during construction, or archaeological monitoring during construction.

Phase II investigations should collect sufficient data to make final decisions about the importance of each site; and in the case that a site is confirmed to be significant, the investigations should collect sufficient data on which to base a detailed work plan for archaeological impact mitigation measures, ie Phase III or Phase IV of the project Archaeological Strategy.

3 SCOPE OF WORK

The above objectives of Phase II work at each of the fifteen subject sites will be achieved by the following tasks:

Task 1: Mobilization and Setup. This task addresses standard logistical and specific archaeological supply and equipment needs for the initiation of fieldwork in the project area. The task includes acquisition and packing of project vehicles with: camping supplies and equipment, archaeological field supplies and equipment; Personal Protective Equipment; required food, first aid equipment, and other supplies. All required pre-field technical planning and technical briefing of crews by project senior technical staff will be carried out by this task. Senior staff of the field team will also review relevant literature reporting on previous investigations at the sites. Data collection procedures and forms will also be prepared and/or reviewed prior to departure for field. In sum, the task includes all preparatory activities required to initiate the fieldwork activities described in Task 2.

Beginning with Task 1 and continuing through the completion of Task 4, the field team will be subject to all normal BP consultant processes. For this project, these requirements will include, but not necessarily be limited to, the following: completion of BP land access process (including owner identification and owner compensation) for all fifteen sites to be investigated); BP logistics, planning and support process; BP security process; and BP HSE process.

In addition to the project technical report (Task 4), it will be the responsibility of the archaeological field team to prepare weekly status reports, monthly reports, valuations, and any required change orders.

All participants in the fieldwork will obtain or show evidence of having BP approved medical insurance prior to the start of fieldwork.

Task 2: Fieldwork. Depending on the type of resources involved, Phase II investigations may, based on the judgment of project technical staff, include some or all of the following types of archaeological operations:

<u>Initial Reconnaissance</u>. This includes walkover investigation of site to identify significant surface-apparent archaeological features and natural or possible anthropogenic topography indicative of subsurface resources. This and previous site documentation, if available, will provide a basis for establishing a plan for the sequenced investigation of the site. General surface collection of artifacts may be a part of this task. The task will also establish a permanent datum point from which to base site measurements and mapping operations. Subsequent base map

measurements and unit lay-out measurements may be made with a hand compass and cloth measuring tape, or with optical or laser surveying equipment depending on the circumstances. The task will also re-confirm that the site lies within the proposed corridor, identifying those portions of the site that is within the corridor and will therefore be investigated by Phase II fieldwork.

<u>Systematic Surface Collections</u>. This technique includes collection and or mapping-in-place of surface artifacts which may be indicative of horizontal location of subsurface remains. Artifact densities are tallied according to recording blocks that are laid out relative the site datum and mapped on the site map. Blocks may be laid out with hand compass and cloth measuring tape at an appropriate interval such as 5m, 10m, or 20m, which are marked with coloured pin flags.

<u>Test Boring</u>. This technique involves use of a hand auger and/or soil probe to identify possible natural and cultural soil characteristics including indicative soil characteristics such as colour, texture, compactness and possible artifact content. This technique can provide a general idea of the vertical and horizontal extent of possible natural and cultural stratigraphy of the site, but is usually <u>not</u> a reliable means of determining of the presence or absence, or vertical spatial configuration of subsurface artifact distributions.

Shovel Testing. This technique is used to identify the depth and horizontal extent subsurface artifact distributions. Shovel test locations are laid out at an appropriate interval such as 5m, 10m, and 20m using a hand compass and cloth measuring tape. Shovel test points are marked with pin flags or flagging tape. At each marked point on the measured grid, a shovel is used to excavate a circular hole approximately 0.5m in diameter and extending through the topsoil and several cm into the subsoil. Soil colour and texture is noted and all soil removed from the test pit is passed through 4cm-gauge hardware-cloth screen mounted on wooden shaker frame. Artifacts recovered from the screen are segregated by shovel test with their generalized depth and soil matrix noted on a standard recording form. To increase the horizontal precision of the technique, additional pits, placed at a lesser interval, may be placed around positive shovel tests on the original grid. Shovel testing is a quick and accurate means of determining the horizontal distribution of subsurface artifacts, and providing guidance for the placement of larger, stratigraphic excavation units. Results of shovel testing are usually plotted on a site map for ease of interpretation.

<u>Test Unit Excavation</u>. Stratigraphic test units are typically 1m x 1m or 2m x 2m units selectively placed to investigate the nature of cultural stratigraphy of areas indicated for investigation by boring, shovel tests, and or suggestive surface features. Smaller units are desirable for digging through deep stratigraphy to sterile soil. Larger units are appropriate where broader horizontal exposures are needed to support tentative spatial interpretations. Units are placed on the site grid and are placed with a hand compass or cloth measuring tape or by optical or laser surveying equipment. Units are marked for excavation with stakes and string to guide excavation and assist with three-dimensional recording of find locations. Units are excavated in arbitrary levels (5cm, 10cm, or 20cm), or in cultural levels. The starting and ending depths of the levels are measured from a local unit datum using a builder's string level or a transit and stadia rod depending on the circumstances. Recovered artifacts are segregated by level and special artifact finds

may be plotted in three dimensions and/or sketched *in situ* before removal. Soils and artifacts are described for each level and one or two wall profiles may be drawn in each unit to identify cultural and natural strata. Soil features of cultural origin such as hearths, storage pits, and middens may be sectioned and excavated separately. Such features are likely locations for the taking of charcoal samples for radio-carbon dating, and other types of special samples. Test units are usually not extended horizontally in Phase II work. Particularly productive Phase II units may be extended in Phase III. Test units are excavated using a range of manual tools ranging from shovel and pick to mason's trowel. Unit walls and floors are scraped clean for drawing and photos with a trowel and may occasionally be sprayed with water to improve the definition of soil colour and cultural features.

Linear Trenching. Linear trenches are used to determine the location of subsurface architectural features including buildings, walls, stone, or plaster flooring, etc over relatively broad site areas. They allow near-surface features to be identified with a minimum of excavation. Typical dimensions of such units are 0.5m wide by 0.5m deep. Because of their narrow width, these trenches may be extended rapidly over relatively great distances across a site. Several perpendicular trenches may be placed across the apparent site boundaries to start with, followed by trenches positioned specifically to follow or extend from walls or other features that are found in the initial trenches. The trenches are laid out and recorded on the site map using the same techniques as are employed for stratigraphic units. Linear trenches are typically not designed for stratigraphic recovery of artifacts and may be excavated in a single level depending on the circumstances.

<u>Mechanical Soil Removal (prior to manual investigation)</u>. A back-hoe Gradall or other mechanical equipment will be used to remove culturally sterile soil overburden. This technique would be necessary where the shallowest site deposits are buried beneath more than 20cm of culturally sterile soil. This speeds the site excavation process by avoiding the necessity of hand excavating large quantities of sterile soil. This would be especially needed in alluvial settings where soil accumulation has been relatively rapid since site abandonment.

<u>Note-Taking and Photography</u>. All daily fieldwork activities including, but not limited to, the implementation of the above tasks will be recorded in narrative form in dated notebook entries of the archaeological staff assigned to each team. In addition specific redundant "unit" data such as those for shovel tests and test units, will be recorded on standard forms to allow efficient and standardized recording. Unit sketches and interpretive summaries will also be compiled. A systematic photo record will also be kept for all operations, including sample recording of typical site activities in progress as well as standardized and specific purpose level, profile, and final unit photos. The site, date and subject of all photos will be recorded in a photo log. A photo board will also be used when needed. All daily notebook entries and field forms completed will be have date, site name (eg GECA-1), and investigator initials recorded along with all other required technical information.

<u>Site Mapping</u>, <u>Drawing and Spatial Recording</u>. All field operations will be recorded on a site map which may be created by several different mapping techniques: hand compass and cloth tape; theodolite with surveying tape; or optical or laser transit. Surface and subsurface architectural foundations and floors will be

drawn and relative elevations of the ground surface may also be recorded with point elevations or contour lines. Field finds and subsequent interpretative information established in Task 3 and Task 4 will be entered in a GIS archaeological data layer following BP project protocols for electronic mapping.

<u>Backfilling and Stabilization</u>. Following Phase II excavation, all units will be backfilled and stabilized to preserve unearthed archaeological features and to avoid danger to animals, humans and vehicles that my pass near the work site.

<u>Task Summary</u>. The guiding objectives of the fieldwork will be three-fold: 1) collect sufficient data to confirm significance of each site and, 2) if the site is significant, to collect sufficient data to support a detailed work-plan for Phase III data recovery investigations which would rescue the significant data and artifacts and 3) collect data in sufficient detail and in sufficiently organized manner to support the level of analysis and reporting described for Task 3 and Task 4 described below.

Task 3: Laboratory Processing and Analysis. Crew will return from field to commence laboratory work immediately following fieldwork. Laboratory work will include the following procedures.

<u>Field Note Review</u>. On return from the field all field notes will be reread for clarity and to resolve inconsistencies. Notes will be entered into word processing software for ease of reference. All field photographs will be printed and labelled.

<u>Special Analyses</u>. Special samples collected for pilot analyses will be presented to specialized laboratories for analysis.

<u>Artifact Processing</u>. Artifacts will be washed and labelled with catalog numbers using standard archaeological laboratory techniques.

<u>Artifact Cataloging</u>. Artifacts will be identified using standard cataloging techniques. They will be assigned to standard categories corresponding to material, artifact form, and morphological part present. Diagnostics will be identified as to date and cultural affiliation.

<u>Data Entry and Quantitative Summary of Catalog Data</u>. Catalog data will be entered in an electronic spreadsheet to facilitate printing of paper catalog and to support quantitative summary of artifact data in tabular and chart form.

<u>Graphics</u>, <u>Drafting and Photography</u>. Site maps, and selected plan and profile drawings will be finalized for inclusion in report. Field photos will be selected to include in the report.

The overall objective of this task is to process and stabilize artifacts for museum curation, and prepare numerical and graphical data for narrative interpretation for report of investigations as described below under Task 4.

Task 4: Technical Report Preparation. Findings and interpretations resulting from the previous tasks will be summarized and presented in a report following appropriate and customary archaeological procedures and conforming to text, graphical, and

data presentation standards of contemporary consulting archaeology reports. The report will present data and interpretation regarding the site's age, cultural affiliation, and function. Data will be presented in graphics, text, tables, and photos. A major focus of the report will be the coherent presentation of apparent vertical and horizontal extent of the each site and its apparent depositional history. The report will also include a site map, artifact drawings and or photographs, and soil profile drawings.

The report should include the following or equivalent chapters and sections:

I. Abstract - Brief summary of salient report data including any recommendations for additional work (1-5 pages).

II. Introduction - Background data needed to understand report context, description of pipeline project, summary of study objectives, summary of report contents (5 pages).

III. Regulatory Background - Description the National and International requirements (5 pages).

IV. Environmental Setting - Description of overall all environmental setting of pipeline with emphasis on features likely to support archaeological interpretation (10 pages).

V. Cultural Background - Brief overview of archaeological and cultural sequence of the project area. Emphasizing past cultural developments related to studied archaeological remains (15-20 pages).

VI. Methodology - Description of general field methodology employed in the course of the fieldwork (10 pages).

VIII. Fieldwork Description - Narrative description of work actually conducted at each site with brief reference to findings. Will serve as description of scope of work executed (10-15).

IX. Discussion and Evaluation of Site Findings - Include site-by-site description of artifacts, stratigraphy and soil or architectural features. stratigraphic drawings, site maps and architectural and (20-25 pages).

X. Recommendations - Detailed recommendations for future work, if needed, will be provided for each site. In the case that additional work is recommended, this section will provide specific recommendations regarding scope-of-work (15 pages).

XI. Bibliography

XII. Appendices including: artifact catalog; results of special analyses and studies; and any extended tabular or numerical data not appropriate for chapter presentation.

The above-described technical report will be prepared in draft and final forms. Client comments will be addressed and the report finalized by the project team within three weeks of receipt of comments.

Scoping assumptions

This scope of work is based on the key assumptions listed below:

- a) The present proposal addresses Phase II investigation of the fifteen subject sites lying within the approximately 50m-wide project corridor only. Any sites lying within the impact zone of proposed temporary or permanent project infrastructure facilities are not included in the present scope of work.
- b) Phase I investigation of the BTC and SCP pipeline corridors has not included subsurface site prospect ion. It is therefore anticipated that subsurface archaeological resources without obvious surface indications may be encountered during construction. Investigation of such resources is not included in Phase II. Phase IV of the project's Archaeology Strategy would address protection of such resources.
- c) All fieldwork and associated preparatory and support activity will be planned and executing following the HSE plan to be developed by the archaeological team prior to award of contract.
- d) It is understood that Phase II fieldwork will continue only as long as seasonally variable weather conditions allow. Early suspension of fieldwork, or the prospect of it, may require modifications in approach to the fieldwork.
- e) Duration of site investigations should vary between a 2day minimum and 3week maximum. The decision as to the investigation time required for each site will be made in the field by the Expedition Leader based on the findings of initial reconnaissance and any subsequent tasks that he may choose to initiate. Factors to be taken into consideration include the following: evident size, importance, and complexity of the site; progress and finding of investigation at other sites assigned to the field team; anticipated fieldwork time remaining prior to onset of inclement weather. This proposal assumes an average investigation time falling between 1-2 crew weeks per site and thus 14 to 28 crew weeks in total and 5-10 calendar weeks for fieldwork completion.
- f) Collection of special samples for analysis will be limited to that amount needed to evaluate future analytical potential for Phase III. This includes, but is not limited to: charcoal from cultural contexts for radio-carbon dating; soil samples for recovery of micro- and/or macro botanical remains, or other chemical analyses; deposits containing paleo-zoological remains for species identification; physically fragile or chemically unstable materials that may need immediate and specialized conservation. In general, the recovery of special archaeological samples will be limited to small amounts required by any "pilot analyses" that may be required to define the scope of possible Phase III investigations.
- g) Any articulated human remains and/or recognizable human burials of any type that are found by Phase II investigations will be left in place for possible subsequent excavation in Phase III.

- h) Approximately 1,000 artifacts per site will be recovered by the field investigation and will require cleaning, labelling, cataloging and basic conservation. The present scope of work includes clearing cataloging and simple conservation methods. Artifacts deemed to require special conservation treatments such as impregnation or other consolidation and stabilization treatments that may be required, are not included in this scope of work.
- i) The level effort for processing and analysis (Task 3) and reporting (Task 4) will depend on the amount of excavation actually completed in the field and the quantity of artifacts recovered. As a guideline, approximately one week's work each in processing and analysis (Task 3) and reporting (Task 4) is required for every week spent in the field (Task 2) using manual techniques. Mechanical excavation may require a proportionally greater amount of corresponding processing and reporting time due to its more rapid recovery of artifacts and stratigraphic information.
- j) Vehicle and heavy equipment used for fieldwork will be dictated by availability of suitable equipment that meet technical and safety requirements of the work. Dedicated drivers for the vehicles may be required, or drivers may be drawn from other staff positions described above depending on typical driving time required between site and field lodging site of the crew. Long daily drives to site would be incompatible with a crew members' doubling as a driver.
- k) The cost of purchase for existing 1:10,000 and 1:5,000 topographic maps covering each of the 14 Phase II sites will be included in the proposal so that each archaeological field team conducting the work may add new data to the maps during investigation; or maps will be provided by BP.
- It is understood that the project sponsor will assist the field team by precisely locating the 500m project corridor at each of the fifteen sites subject to Phase II investigation at the outset of the fieldwork.
- m) It is understood that the corridor for investigation is to be 50m in width. Phase II archaeological work will be carried out within that corridor, except in the case of investigation of a possible minor re-route needs to be investigated and cleared, or that a minor expansion of investigation was required outside of the corridor for reasons archaeological interpretation.

4 SCHEDULE

Based on the above task descriptions and assumptions, it is estimated that the entire Phase II project will take 15-30 weeks to complete following notice to proceed: 5-10 weeks in the field (assuming the use of multiple field teams working in parallel); and 10-20 weeks in artifact processing and preparation of the draft report.

Site ID and KP	District	Site Type	Site Description
SCPA-1	Tetritskaro	Daget Khachini	Medieval. Found some tile and
		Settlement	ceramic fragments.
SCPA-2 /(844 9450 -	Tetritskaro	Tkemlana	Medieval. Crude boulder-work
460 3250)		Settlement	(wall).
SCPA-3/(844 8240 –	Tetritskaro	Nadarbazevi II	Medieval. Crude boulder-work.
460 4632	'	Settlement	
SCPA-4/(844 7991 –	Tetritskaro	Takhtitskaro	Medieval. Crude boulder-work
460 6088)		Settlement	(the walls of different directions).
SCPA-5/(842 2566 -	Tsalka	Aia-Ilia Settlement	The beginning of I millennium BC.
461 2741)			Cyclopean settlement, medieval
		ļ	church.
SCPA-6/(841 8371 –	Tsalka	Santa, graves,	III-II millennium BC. Burial
461 2541)		tombs, ritual roads,	mounds, ritual roads, possible
		III-II millennium BC	burial tombs.
SCPA-7	Tsalka	Eli-Baba	The second part of II millennium
		Settlement, tombs	BC, cyclopean settlement.
SCPA-8/(838 2802 -	Borjomi	Tavkvetili, burial	III-II millennium BC.
461 8698)		mounds	
	L'		
SCPA-9/(838 3231-	Borjomi	Mt. Msrali mta, 2	III-II millennium BC (?).
461 5137)	↓ '	burial mounds	
SCPA-10/	Borjomi	Moliti, 7 burial	III-II millennium BC (?)
		mounas	
838 0400 - 461 4516			
838 0400 - 401 4382			
838 0570 - 401 4304	1		
838 0043 - 401 4333			
8380017 - 4014432)	Pariami	Ciliani tomb	Bronzo ago tomb, popoible l
SCPA-11/(030 4040 -	Водони	Siliani, tomo	Bronze age torno, possible i
462 2000)			Muelim (2) pottlomont
SODA 12//925 4575	Pariami	Davari tomb	Muslim (?) settlement.
162 2807)	БОЛОНИ	Dyvan, tomb	(2) pit tombs
402 2007) CCDA 12/(834 5738 -	Akhaltsikho	Agara tombe	V III millonnium BC I millennium
30FA-13/(034 3730 -	AKIIditsikiie	Agara, iumus,	AD softlamont
401 3343) CCDA 14/(221 2502	Akhaltsikho	Orchosoni burial	AD Settlement.
160 9720)	AKIIAILSIKIIE	mounds settlement	mounds I millennium AD
400 0120)	1	mounus, semement	

Table 1 Archaeological resources for Phase II site evaluation

APPENDIX E ANNEX III ATTACHMENT II

PROPOSED STATEMENT OF WORK FOR PHASE I FIELD RECONNAISSANCE OF MONUMENTS

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Proposed Statement of Work for Phase I Field Reconnaissance of Monuments

1 BACKGROUND

In consultation with appropriate government authorities, and pursuant to cultural heritage law of Georgia and to international environmental standards, BP has established a heritage protection program for its Georgian energy project. Heritage resources include two general types of properties: 1) archaeological sites which are below ground; and 2) monuments, which are above ground. This statement of work addresses monuments, which may be standing structures or formerly standing structures in a dilapidated or ruined state.

The Center for Archaeological Studies (CAS) is responsible for both archaeological sites and monuments for the BP Georgian project. Although normally concerned with archaeological resources only, CAS has been formally requested by the Georgian International Oil Company (GIOC) to act also as the Georgian Government coordinator for the BP project's monuments issues. Such issues are normally handled by Georgia's Department of Monument Protection.

For historic monuments, the first step of BP's protection strategy was to establish baseline conditions in the project area using literature search only This has resulted in the preliminary identification of 219 monuments which could be impacted by the project. For this first effort, the project area of influence for monuments was taken to be a 10km-wide corridor centered on the proposed project right-of-way. The initial, desk-based research, indicates that the project area in general contains a substantial number of monuments that could be impacted by the BP project. The present document describes what would be the next step of monuments investigation, including 1) fieldwork to be focused on specific areas of potential project impacts and 2) fieldwork in selected areas which the desk-based reconnaissance has shown to contain concentrations of monuments in the vicinity of the pipeline corridor or in the vicinity of proposed Camps and Pipedumps.

The overall project monuments strategy, including the work described in this document, complies with Georgian Law on the Conservation of Cultural Legacy and with international standards. The latter include World Bank OPN 11.03 entitled *Cultural Property*, a brief document that is in force pending release of forthcoming IFC OP 4.11 entitled *Safeguarding Cultural Property in IFC-Financed Projects*. Compliance with these standards, as well with the Georgian Law on Cultural Heritage, is an integral part of the BP's Environmental and Social Impact Assessment process for the project.

2 BASELINE CONDITIONS

2.1 HISTORICAL CONTEXT

The proposed route of the Georgian energy project passes through historical provinces of Kvemo Kartli, Trialeti, Tori and Samtskhe where there are numerous monuments of religious, ethnic and historical significance, reflecting Georgia's history, values, and national aspriations

over the centuries. N. Berdzenishvili has stated that "Kvemo Kartli" was not only an advanced province of Medieval Christian Georgia, but also a cradle of the ancient culture of Eastern Georgia" (Volume I, Historical Geography Collection). Historical Kvemo Kartli now consists of the Marneuli and Tetritskaro districts, historical Trialeti – Tsalka district, and Tori – Borjomi district, finally, Samtskhe – now consists of the Akhaltsikhe and Adigeni districts.

2.2 DATA SUMMARY

Project literature search identified a total 219 architectural monuments located within the 10km potential impact corridor of the proposed BP pipeline corridor. The monuments are summarized by district and period of construction in Table 1. The monuments were identified by BP through published literature sources supplemented by unpublished but previously validated field data. A common project area monument type is the vaulted church. There are also some basilicas and cruciform, domed churches. Also present are Cyclopean walls, forts and other structures, which date to Bronze Age and continue into the Medieval period. Of lesser importance, but still of significance, are grave yards and religious shrines, as well as medieval engineering works such as roads and bridges. As stated the monuments appear to vary in their likely present condition form well preserved and still usable to surface evident foundations and rubble.

Monuments consisting of individual structures are proposed to have protection zones of 50m in radius while protection zones of monastery complexes and castles vary from 150m to 250m in radius, which also ensures protection of the adjacent cultural landscapes and associated subsurface deposits, which are integral to site historic values. The monuments include those judged to be of national and local significance. With one exception, no reserves or multiple-use protected areas have been designated in relation to any of the monuments located in the zone of influence of the proposed corridor. The exception is an historical-architectural museum in the Tsalka district. The corridor contains no resources classified, or likely to be classified, as World Heritage Sites.

A brief description of each of the monuments is presented in tabular form in a BP sponsored project documentation entitled "Monuments Baseline and Literature Review" (March 2001), which was prepared by Mr. Baadur Kupreishvili of Georgia's Department of Monuments Protection.

2.3 METHODOLOGY

The desk reconnaissance phase of the project's monuments strategy (which led to identification of the 219 monuments) was carried out in order to identify potentially significant resources that could be impacted by project construction. This identification study involved:

- Review of project maps
- Review of reports and publications
- Consultation with relevant experts

The present site list was thus derived from various literary sources which were themselves based on fieldwork conducted at different times in the past and under different conditions. The resources listed are therefore unconfirmed as to their present condition or exact location. Furthermore, because the resource list is not the product of systematic field survey of the project area, it is probable that additional unreported resources are present within the corridor. This was demonstrated to be the case recently as CAS has informally reported to BP the identification of 35 additional monuments lying within a 2km-wide corridor centered on the proposed right-ofway. CAS reports that these additional monuments are not listed among the 219 summarized in Table 1. A brief field check of reported monuments in the eastern portions of the project area conducted on October 17th and 19th confirmed the presence of monuments listed among the 219 and of additional monuments among the 35 that were subsequently identified.

3 APPROACH

3.1 POTENTIAL IMPACTS

As a result of BP right-of-way siting criteria, which include the avoidance of any standing structure or obvious surface ruins, construction activities in the corridor itself have a relatively limited potential to directly impact historic monuments. The principal area of concern with respect to potential monuments impacts are accidental and/or secondary project impacts along the access roads, vicinity of camps and pipe dumps, as well as at tip sites and borrow pits. Potential project impacts to the monuments include:

- Impacts from heavy vehicles traversing access roads and potentially colliding with standing structures or accidentally driving over surface ruins
- Impacts to vegetation and ground surfaces of landscapes surrounding monuments by project vehicles and unofficial vehicles, such impacts are especially likely during inclement weather and are, overall, more likely than impacts from direct collision
- Impacts as a result of misuse of monuments by people moving into the area. These could include BP employees and contractors as well as unofficial persons who enter the area as a consequence of project activity. Unoccupied monuments without watchmen or caretakers are particularly vulnerable to casual and inappropriate use such as squatter settlement and the robbing of fuel and building material for temporary unofficial camps
- Impacts to standing structures from the vibration, shock, and falling rock from blasting in the pipeline corridor
- Impacts to standing structures from vibration of continuous heavy vehicle passage on access roads and along the right-of-way
- Accidental construction impact to subsurface (archaeological) deposits associated with older monuments

District	Historical Period of Monument						Total
	Bronze Age	Iron Age	Ancient	Medieval	Modern	Uncertain	
Marneuli	0	0	0	3	2	0	5
Bolnisi & Tetretskaro	2	0	0	60	25	0	87
Tsalka	0	2	0	12	26	0	40
Borjomi	0	0	0	20	5	0	25
Akhaltsike &Adigeni	2	1	0	31	13	15	62
Total	4	3	0	126	71	15	219

Table 1 Summary of historic monuments located within the 10km wide Project Corridor

3.2 MITIGATION MEASURES

Potential Mitigation Measures would include:

- Placement of protective fencing and signs around vulnerable monument properties
- Including monuments protection guidance in HS&E communication to all employees and contractors. Develop specific rules for contractors code of conduct
- Develop site specific evaluation and damage avoidance measures for monuments that are vulnerable to vibration damage. These could include local vehicle speed and blasting restrictions. Restoration of fragile monuments and installation of ground-based or structural anti-vibration features would be last resort measures
- Re-siting and/or partial re-routing of access routes to locations further away form monuments

3.3 INVESTIGATION STRATEGY

Identification and potential evaluation of monuments normally required in order to establish and verify baseline resource conditions and to establish the likelihood of potential project impacts. Such studies typically involve three levels of study:

- Desk and map survey to identify previously recorded monuments
- Reconnaissance level field survey to confirm the presence and location of previously recorded or newly identified monuments
- Intensive level field survey to formally evaluate the importance and condition of monuments

As mentioned, a literature based survey already conducted has indicated a substantial number of monuments in the project area. What is needed next is field reconnaissance in the project area to confirm and precisely locate monuments. BP will take the approach of doing reconnaissance in selected parts of the project area only, including areas in which substantial concentrations of monuments have been indicated by the literature search, and in the immediate vicinity of Camp and/or Pipedumps and associated access roads, ie those areas outside of the right-of-way that will receive most substantial project ground-disturbance. BP will assume that any apparent monument identified by desk study or field reconnaissance is significant. This approach saves project time and resources by avoiding the blanket application of intensive field survey level that is required for resource evaluation. Rather, intensive level survey is reserved for resources where a likely project impact to monuments is identified. Further, if likely impact mitigation measures are straightforward to implement, eg fencing and the posting of warning signs, then BP may choose to implement those measures without an intensive field investigation of the resource.

Field reconnaissance of areas not investigated in the this next phase of work could be conducted subsequently, as part of construction look-ahead work that would also, simultaneously, address surface apparent archaeological resources. A specific scope-of-work for that potential investigation would be described in a subsequent document, which would benefit from the experience of the pre-construction heritage studies.

4 SCOPE OF WORK

The above preconstruction monuments reconnaissance will be implemented with the following Tasks:

- Task 1: Preparation of Draft Historic Context. This task will include brief review of project area maps and of readily available secondary historical and architecturalhistorical sources on the area. The purpose will be to establish a suitable periodized historic narrative applicable to the project area. The narrative will include brief geographic description of the region, emphasizing past and present land-use, ethnic, and population patterns. This historic background will serve as a basis for predicting and understanding what types of monuments are likely to be present in the project area and what national historic themes may be of relevant to them. The draft context that results will be completed prior to the survey and later modified in content and emphasis based on the particular monuments that are identified during the field reconnaissance. The context will in its draft form emphasize monuments likely to be found in the specific survey areas indicated, namely along the access roads, and in the vic inity of camps and pipe dumps, as well as areas that the desk study indicated have the largest concentrations of monuments. The task will also include location and marking of survey areas on 1:10,000 and/or 1:5,000 scale topographic maps.
- **Task 2: Mobilization and Setup**. This task addresses standard logistical and specific supply and equipment needs for the initiation of the monuments field reconnaissance. The task includes acquisition and packing of project vehicles with: field supplies and equipment, and archaeological supplies and equipment; Personal Protective Equipment; required first aid equipment, and other supplies. All required pre-field technical planning and technical briefing of crews by project senior technical staff will be carried out by this task. Senior staff of the field team will also review relevant literature reporting on previous investigations at the sites. All needed data collection procedures and forms will also be prepared and/or reviewed prior to departure for field. In sum, the task includes all preparatory activities required to initiate the fieldwork activities described in Task 3.

Beginning with Task 2 and continuing through the completion of Task 3, the field team will be subject to all normal BP consultant processes. For this project, these requirements will include, but not necessarily be limited to, the following: completion of BP land access process (including owner identification and owner compensation) for all fifteen sites to be investigated); BP logistics, planning and support process; BP security process; and BP HSE process.

In addition to the project technical report (Task 4), it will be the responsibility of the monuments field team to prepare weekly status reports, monthly reports, valuations, and any required change orders.

All participants in the fieldwork will obtain or show evidence of having BP approved medical insurance prior to the start of fieldwork.

Task 3:Fieldwork. Proposed survey areas listed in Table 2 represent the proposed survey
coverage for the monuments reconnaissance, which will be subject to review as
part of Task 1. Fieldwork in the survey areas will include the following subtasks:

<u>Initial Monument Reconnaissance</u>. This includes a combination of driving and walkover investigation of the access routes, pipe dumps, camp sites, as well as selected areas that have high concentrations of monuments, as indicated by the desk-based inventory and by the map review in Task 1. The purpose of the initial reconnaissance will be to identify presumed historic monuments within the survey areas for recording. Any above ground ruin or historic structure found within the survey areas that appear to have the potential for being a protected monument will be recorded.

<u>Rough Monument Data Record</u>. Presumed monuments identified will be annotated on topo maps, digitally photographed (2-4 photos), and quickly sketched in plan view. The sketch will be scaled by pacing rather than tape measure. Coordinates of the approximate centre of the monument property will be taken with GPS. A brief narrative description of the monument of not more than 50 words will be prepared, referencing apparent age, condition, type and size. Monument will be given a unique project resource number. Rough notes will be completed on single dated page with the initials of individual making observations.

<u>Photo Log</u>. Photo log will be maintained in paper form corresponding to an MS-Excel spreadsheet version of photo log, in which all "paper form data" will be entered. Each photo will be given a unique code which will include the unique resource number of the corresponding monument. Photo log will also include date, name photographer, brief subject description, azimuth of photo orientation, and a free comment space.

<u>Monument Report</u>. Based on rough notes, photo designation, and coordinates, the required technical information will be entered in paper version of a monument report. The report will later be entered in an electronic record. A dual record of GPS points (on paper and in the electronic memory of instrument) will be maintained for security. This data record will be the basic site data for each field recorded monument. The record will include data required for GIS Monument Data Record needed BP spatial constraints mapping. The latter will be prepared for loading in appropriate project GIS data layer. A draft of the Monument Report (suitable for monuments and archaeological sites) is presented in Appendix I of this proposal.

Table 2 Proposed survey areas

Reconnaissance of all potential camp and/or pipedump sites including access roads:

- 1) Gardabani 1 Facility (Camp & Pipedump)
- 2) Gardabani 2 Facility (Camp & Pipedump)
- 3) Gatchiani Facility (Camp)
- 4) Marneuli Facility (Camp)
- 5) Kotishi Facility (Camp)
- 6) Tetritskaro Facility (Pipedump)
- 7) Tsalka 1 Facility (Camp & Pipedump)
- 8) Tsalka 2 Facility (Camp & Pipedump)
- 9) Andezit Facility (Pipedump)
- 10) Tsikisjvari Facility/Concentration (Pipedump)
- 11) Atskuri Facility/Concentration (Pipedump)
- 12) Akhaltsike Facility (Camp & Pipedump)
- 13) Vale Facility (Pipedump)
- 14) TBD

Level of effort assumed for the fourteen sites eight crew days of fieldwork. (14 sites @ 3-4 per day + 2 days each for Tskisijvari & Atskuri= 8 days fieldwork):

Reconnaissance of five selected areas of monument concentration:

- 1) Mugiti-Samshildi concentration in Tetretskaro Region
- 2) Santa-Bashtasheni concentration in Tsalka Region
- 3) Avranlo-Kozil Kilisa Concentration in Tsalka Region
- 4) Sadziri-Tadzsrisi concentration located between Tsikishvari and Atskuri
- 5) Arali-Naokhrebi Concentration

Level of effort will be 20 crew days (5 concentrations @ 4 days each = 20 days fieldwork)

<u>Survey Area Summary</u>. Each survey area, whether Camp or Pipedump and Access Route, or monument concentration, will be summarized on a survey area summary sheet which delineates the survey zone spatially on the project topo map and summarizes the survey activities and findings within the zone. Photo of typical field conditions in the area will also be included in survey area report. Negative findings will be fully documented along with positive field findings.

<u>Expedition Field Book</u>. All daily activities will be recorded in single field journal entry. This will include date, field conditions, areas surveyed, monuments identified, field personnel participating in the work, and any special challenges or issues encountered during the day.

<u>Electronic Text Record</u>. All text notes taken in field, whether free text or formatted data will be electronically entered in word processing software in the field.

Task 4:Processing of Field Data. Crew will return from field to commence processing
and write-up immediately.

<u>Field Note Review</u>. On return from the field all field forms and field notebooks will be reviewed for clarity and completeness. Field Sketches will be scanned and all electronic notes, photos and GPS coordinates will be backed up onto CD.

<u>Monument Reports</u>. Standard report with one photograph on each site will be produced in electronic form, and in paper form for inclusion in the report.

<u>Preparation of Monuments GIS Data Table</u>. This standard subset of the heritage report data will be prepared in electronic form, and in paper format for inclusion in the report.

<u>Mapping of Monuments</u>. All monuments identified and recorded by the reconnaissance will be mapped on 1:100,000 project maps for inclusion in the report.

Task 5: Monuments Reconnaissance Report Preparation. Findings, tables, maps, Monument Reports and interpretations resulting from the previous tasks will be summarized and presented in a report following appropriate and customary procedures for reconnaissance level field recording of historic monuments.

The report should include the following or chapters and sections:

I. Abstract - Brief summary of salient report data including any recommendations for additional or contingent work (2-3 pages).

II. Introduction - Background data needed to understand report context, description of pipeline project, summary of study objectives, summary of report contents (1-2 pages).

III. Regulatory Background - Description the National and International requirements (1-2 pages).

IV. Project Survey Area Description - Brief description of overall all geographic and environmental setting of pipeline indicating physiography geographic and political features of over entire length of right of way. Specific areas surveyed should be indicated as well. Include a small illustrative map of project area (2-3 pages plus map).

V. Historic Context - Brief narrative overview of historical sequence as a background for basic understanding of historic periods in which the different monuments in the project area. Emphasizing past cultural developments related to chronology and location of monuments identified. Draft context produced in Task 1 will be revised based on field findings (10 pages).

VI. Methodology – Description of field recordation technique with sample data collection form (2 pages).

VII. Fieldwork Description - Narrative description of work actually conducted at survey area with brief reference to findings. Including personnel involved. Schedule of work executed and any special conditions, special results, or difficulties encountered. Will serve as description of scope of work executed (3-5).

VIII. Presentation of Site Findings - Summary of all monuments found organized by survey area and age of monument (3-5 pages).

IX. Recommendations - Recommendations for future evaluation and protection work at each monument will be provided. Present generic description of preservation contingencies or mitigation measures recommended along with a list of monuments that may require such treatments (3-4 pages).

X. Bibliography.

XI. Appendices including: Monument Report for each site identified, table of GIS Heritage Data Records for monuments identified.

The above-described technical report along with all supporting data will be presented to BP for review. Client comments will be addressed and the report finalized by the project team within two weeks of receipt of comments. Two additional copies of all rough notes, final report, and electronic data will be prepared and will become the property of CAS and the Department of Monuments protection.

Scoping assumptions

This scope of work is based on the key assumptions listed below:

- a) All fieldwork and associated preparatory and support activity will be planned and executing following the HSE plan to be developed by the monuments team prior to award of contract.
- b) It is understood that field reconnaissance will commence only when suitable weather conditions allow. Early suspension of fieldwork, or the prospect of it, may require modifications in approach to the fieldwork.
- c) Investigation of monuments identified along survey corridors should take an average of one hour per monument or Camp or Dump site, not including travel time. It is assumed that the field survey itself would require four weeks time.
- d) The level effort for the monument team estimated to be as follows:

Task 1- Preparation of Draft Context (one week) Task 2- Mobilization and Setup (one week) Task 3- Fieldwork (five weeks) Task 4- Processing and Analysis (one week) Task 5- Report Writing (three weeks) Total Ten Weeks

- e) For processing and analysis (Task 3) and reporting (Task 4) will depend in part on the number of monuments recorded. As a guideline, the basic processing and write-up time for one monuments specialist and one field assistant, excluding research for the draft context, would require approximately 1 week of effort for processing, 1 week for reporting, plus one day for each 20 monuments recorded. Assuming that 100 monuments will be recorded, this would require approximately 4 weeks
- f) The cost of purchase for existing 1:10,000 and 1:5,000 topographic maps covering each of the survey areas included in the proposal so that each archaeological field team

conducting the work may add new data to the maps during investigation. Or, maps will be provided by BP at no cost to the contractor.

- g) It is understood that the project sponsor will assist the field team by precisely locating the project survey areas. By providing maps and infield assistance from the land team.
- h) It is understood that the survey area will consist of the planned location of all proposed or planned Camp and/or Dump Sites and associate access roads as well as monuments concentrations. The final selection of survey areas will be based on the best available at the start of the Monuments Reconnaissance Project.

5 SCHEDULE

Based on the above task descriptions and assumptions, it is estimated that the entire Project will take 10 weeks to complete following notice to proceed.

Appendix I Proposed contents of monument report

- 1. Traditional Name of Monument:
- 2. Administrative Location of Monument:
- 3. Nearest BP Project Facility:
- 4. Easting:
- 5. Northing:
- 6. Reference Chainage:
- 7. Distance North or South of Reference Chainage:
- 8. Type of Monument:
- 9. Apparent Age of Monument:
- 10. Digital Photograph Reference:
- 11. Photo Title:
- 12. Photo:
- 13. Brief Monument Description:
- 14. Scanned Field Sketch:
- 15. Data Source:
Appendix II

Draft data field list for heritage layer GIS record

Field 1: Site Number

Field 2: Site Description

Field 3: Map Symbol

Field 4: Arch./Mon./Both

Field 5: Data Source

Field 6: Northing

Field 7: Easting

Field 8: On Route Y/N

Field 9: On Route Y/N

Field 10: North or South of Route

Field 11: Comment



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