

Capco 青山發電有限公司
Castle Peak Power Co. Ltd.

Black Point Gas Supply Project

EIA Study (EIA Study Brief ESB-208/2009)

Executive Summary (Rev 3)

8 February 2010

Environmental Resources Management

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FOREWORD

Approximately 25% of Hong Kong's electricity generating capacity presently comes from the Castle Peak Power Company Limited (CAPCO)'s Black Point Power Station (BPPS). This power plant is fuelled by natural gas supplied via pipeline from the Yacheng 13-1 field off Hainan Island. Depletion of the Yacheng 13-1 field is expected to start as early as 2012 and hence there is an urgent need for a replacement gas supply.

The HKSAR Government has signed a Memorandum of Understanding (MoU) with the National Energy Administration of the Central People's Government (NEA) which enables CAPCO to work with gas suppliers in the Mainland to obtain natural gas for BPPS. CAPCO, together with CLP Power Hong Kong Limited (CLP) which operates CAPCO's generating facilities, have commenced negotiation with both PetroChina Company Limited (PetroChina) and the China National Offshore Oil Corporation (CNOOC) to ensure that replacement gas could be made available in 2012.

CAPCO's present plan is to import gas from Mainland China to BPPS via two new submarine gas pipelines and associated gas receiving stations (GRSs). The first pipeline and GRS (i.e. First Phase) must be completed in 2012 to provide facilities to accommodate a timely replacement for the Yacheng 13-1 gas supply. It is expected that the Second Phase could commence construction within 24 months of commissioning of the First Phase.

On the HKSAR side, the submarine pipelines and the associated GRSs will require an Environmental Permit (EP) from the HKSAR Government under the Environmental Impact Assessment Ordinance (EIAO) (CAP 499) as well as approvals under the Foreshore and Sea-bed (Reclamations) Ordinance (FSRO) (CAP 127) and the Land Grant permitting processes. The EIA Permitting process is regarded as the first step for CAPCO to receive the replacement gas in 2012.

1 INTRODUCTION

1.1 BACKGROUND

Castle Peak Power Company Limited (CAPCO), a joint venture between CLP Power Hong Kong Limited (CLP) and ExxonMobil Energy Limited (EMEL), is presently pursuing a secure and sustainable supply of natural gas to replace its natural gas fuel supply from the existing Yacheng 13-1 field which is expected to be depleted as early as 2012.

The Hong Kong Special Administrative Region (HKSAR) Government's environmental policy includes the control of emissions from existing power stations in Hong Kong. Central to this effort is to increase the use of natural gas. As a consequence, natural gas is positioned to play an increasingly important role in the generation of electricity. A stable, cost-efficient way to supply natural gas to Hong Kong will play a key role in the continued use of gas at Black Point Power Station (BPPS) facilitating CAPCO's ability to comply with Government's air emission standards.

On 28 August 2008, the HKSAR Government signed a Memorandum of Understanding (MoU) with the National Energy Administration of the Central People's Government (NEA) in support of continuous supply of natural gas to Hong Kong in the coming two decades ⁽¹⁾. As part of the MoU, the NEA supports the China National Offshore Oil Corporation's (CNOOC) renewal of its supply agreement with Hong Kong for a further term of 20 years.

In addition, according to the MoU, it was agreed, in principle, that the feasibility of supplying natural gas to Hong Kong via the Second West-East Natural Gas Pipeline would be studied, and that the Mainland would jointly build with party(ies) in Hong Kong a LNG terminal on the Mainland for supplying natural gas to Hong Kong.

The MoU has enabled CAPCO to negotiate with Mainland gas suppliers to obtain replacement gas for BPPS via new submarine gas pipelines. This Project, namely *Black Point Gas Supply Project*, will provide necessary facilities to enable replacement gas supplies from Mainland China to CAPCO.

Preliminary discussion with Mainland gas suppliers has indicated that the gas export facilities are likely to be located in southern Guangdong Province, on the western Shenzhen and eastern Zhuhai coastline. The cross boundary nature of the proposed submarine pipelines linking the Mainland gas export facilities with BPPS is expected to involve the regulatory and permitting systems of both the Mainland authorities and HKSAR government.

(1) HKSAR (2008) Memorandum of Understanding on Energy Co-operation. Press Release. Accessed on <<http://www.info.gov.hk/gia/general/200808/28/P200808280188.htm>>

It is estimated that the BPPS can consume up to about 3.4 billion cubic metres (BCM) of natural gas a year. Increase in demand for electricity and progressive tightening of emission caps may further increase CAPCO's annual gas demand. The increasing gas demand and the depleting gas supply from Yacheng 13-1 field require replacement gas to be available in 2012. To meet the 2012 target, it is essential that the gas pipeline(s) between Black Point and Mainland China and associated facilities be timely permitted for construction.

The submarine pipeline(s) in Hong Kong waters and the GRSs will require an *Environmental Permit* (EP) from the HKSAR Government under the *Environmental Impact Assessment Ordinance EIAO (Cap. 499)*. In preparing this Environmental Impact Assessment (EIA) Report to support the Environmental Permit Approval, CAPCO has complied with the requirements of the *EIA Study Brief (ESB-208/2009)* and made cross reference to the design and environmental impacts previously presented in the EIA Report for the Hong Kong Liquefied Natural Gas (HKLNG) project (formally entitled *Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities*; Register No.: AEIAR-106/2007)⁽²⁾ which was submitted formally under the EIAO on 19 October 2006 and approved on 3 April 2007. An Environmental Permit to construct and operate the HKLNG project was awarded to CAPCO on 3 April 2007 under reference EP-257/2007.

Permits to construct and operate the submarine pipeline(s) and the associated gas export facilities in Mainland China will be handled by PRC gas suppliers and are therefore not the subject of this EIA. However, where appropriate, an assessment of potential water quality impacts associated with the facilities construction in Mainland waters has been included to examine project-specific cumulative impacts.

1.2 PURPOSE & NATURE OF THE PROJECT

This Project will provide facilities to import replacement gas from the Mainland. The present proposal will involve the construction and operation of two submarine natural gas pipelines connecting BPPS with gas export facilities in Mainland China, and two GRSs at BPPS.

The following elements of the Project addressed in this *EIA Report* are classified as Designated Projects under the *Environmental Impact Assessment Ordinance (Cap. 499)* (EIAO):

- Schedule 2, Part I, Item H.2 – Installation of submarine gas pipelines connecting the proposed Gas Receiving Stations at the Black Point Power Station (BPPS) and gas export facilities in southern Guangdong Province.

(2) ERM (2006) *Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities: EIA Study (EIA Study Brief ESB-126/2005)*. Prepared for CAPCO

- Schedule 2, Part I, Item C.12 – A dredging operation exceeding 500,000 m³ for the reclamation and pipeline trenches.

1.3 PURPOSE OF THIS EIA REPORT

This *EIA Report* is prepared by ERM-Hong Kong, Ltd (ERM) for CAPCO in accordance with the *EIA Study Brief* (No. ESB-208/2009), issued in July 2009, and the *Technical Memorandum of the Environmental Impact Assessment Process* (EIAO-TM).

The purpose of this EIA Study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities that take place concurrently. This information will contribute to decisions by the Director of the Environmental Protection on:

- The overall acceptability of any adverse environmental consequences that may arise as a result of the Project and the associated activities of the Project;
- The conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
- The acceptability of residual impacts after the proposed mitigation measures are implemented.

The detailed requirements of the EIA Study are set out in *Clause 3* of the *EIA Study Brief*. As specified in the *EIA Study Brief*, the EIA Study has addressed the key environmental issues associated with the construction and operation of the Project in Hong Kong waters and land.

1.4 THE NEED FOR THE REPLACEMENT GAS SUPPLIES

Since 1996 with the commissioning of the Black Point Power Station (BPPS), natural gas has been an important component of CAPCO's fuel supply. Use of natural gas has delivered significant environmental benefits as well as added diversity to the fuel mix used for electricity generation, thereby enhancing the security of electricity generation.

Fuel diversity has enabled air emissions reductions to be achieved while maintaining competitive tariffs and world-class reliability in the supply of electricity. Often taken for granted, these factors are key contributors to Hong Kong's quality of life, competitiveness in the global market, and ability to attract investment. Businesses in Hong Kong ranging from large multi-national companies to small local shops are all dependent on a cost-competitive and a safe and secure supply of electricity.

There are a number of benefits to utilising natural gas as a fuel in power generation, including:

- **Proven Use in Power Generation:** Natural gas has been employed in the combined cycle gas turbines (CCGT) at BPPS. This has enabled optimal use of CCGT which have higher thermal efficiency than coal or oil fired power stations with the same generating capacity.
- **Adequate Reserves Available:** World gas reserves are large and LNG technology makes them available to consumers in locations remote from existing sources. This, along with coal and nuclear capabilities, continues to provide a diverse fuel supply to CAPCO.
- **Environmental Benefits:** Natural gas is one of the low emission and most efficient forms of energy available, producing virtually no particulates and less nitrogen oxides (NO_x), carbon dioxide (CO₂) and SO_x than other fossil fuels.

The Government's environmental policy includes the control of emissions from power stations in Hong Kong. Central to this effort is the increasing use of natural gas for electricity generation.

Extensive technical studies carried out by consultants substantiate that the existing source of CAPCO's gas supply, the Yacheng 13-1 field off Hainan Island in the South China Sea, will be depleted as early as 2012, depending upon the rate of offtake and actual reserve levels. Consequently, reliable new sources of natural gas will be required as a successor to Yacheng 13-1.

As Black Point Power Station (BPPS) provides about 25% of Hong Kong's total electricity needs, having a reliable supply of natural gas that fuels this power station is critical for maintaining secure electricity supply to Hong Kong. In the event that timely supply of replacement gas is not available to BPPS, CPPS coal-fired generation will not be sufficient to meet electricity demand needs. Besides, high reliance on coal-fired generation will increase emission beyond existing levels and given emissions caps. Therefore, timely availability of replacement gas supply to BPPS is essential for addressing Hong Kong's electricity demand needs and environmental targets.

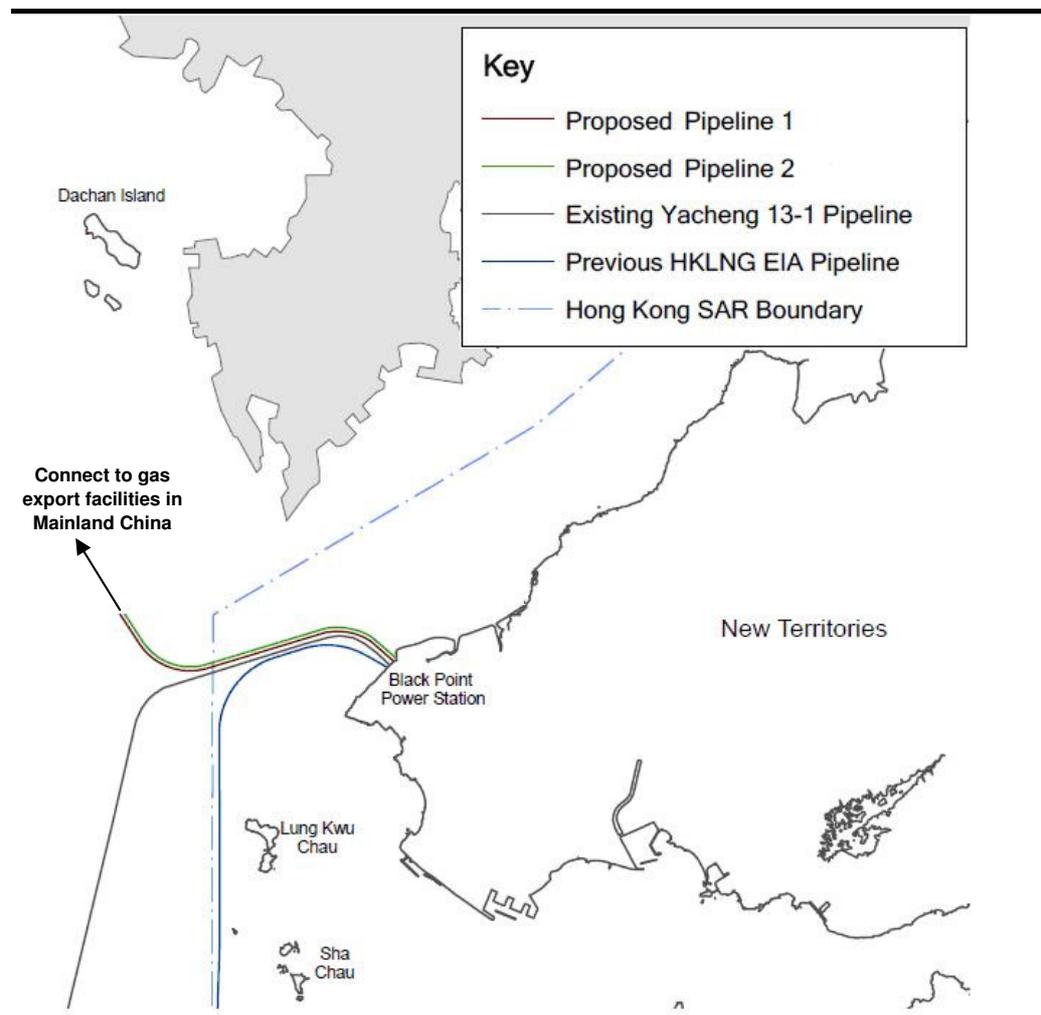
2 PROJECT DESCRIPTION

2.1 PROJECT FACILITIES

2.1.1 Submarine Pipelines

The proposed pipelines will traverse from the BPPS to natural gas export facilities in southern Guangdong Province, across the Urmston Road shipping channel and the Tonggu Waterway. They will be installed to the north of the existing Yacheng 13-1 Pipeline by approximately 100 – 200 m ⁽³⁾, and will be about 200 – 300 m to the north of the proposed pipeline that was included in the HKLNG EIA ⁽⁴⁾. Indicative routing of the proposed pipelines is depicted in Figure 2.1.

Figure 2.1 *Indicative Alignment of the Cross-Boundary Submarine Gas Pipelines Connecting the BPPS and the New Gas Export Facilities in Mainland China*



(3) The proposed Pipeline 1 will be located at about 100 m north of the existing Yacheng 13-1 Pipeline.

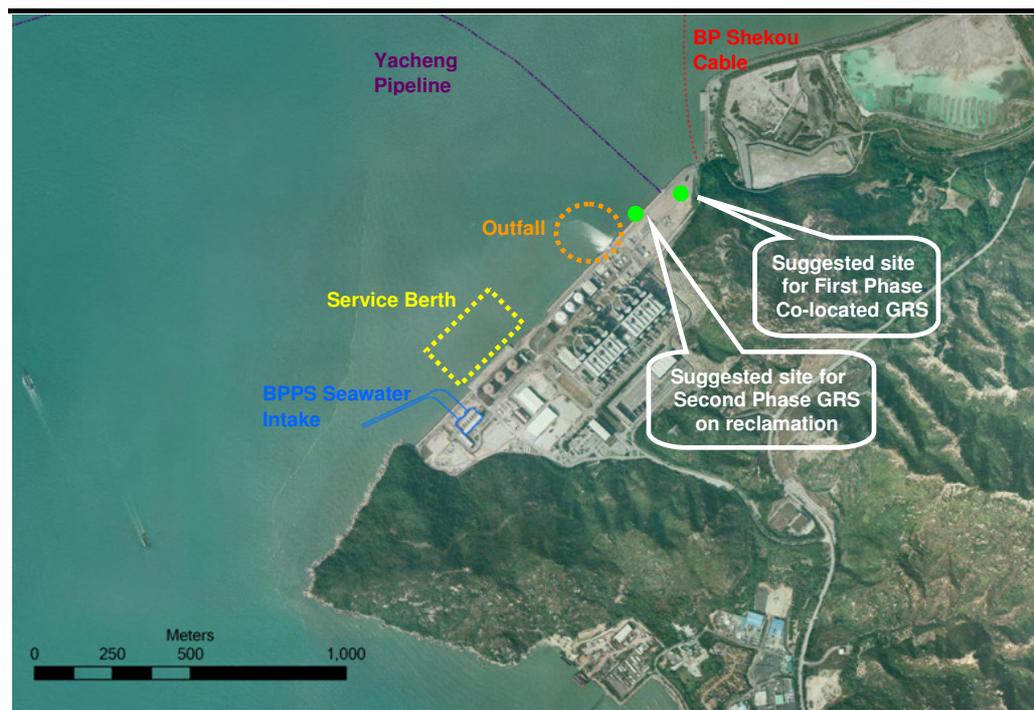
(4) ERM (2006) *Op cit*

The proposed submarine gas pipelines are expected to be in a size range of 32" – 42" (about 813 mm – 1067 mm) diameter and of the whole alignment around 5 km will be in HKSAR waters. It is envisaged that the pipelines will be installed in two parallel seabed trenches.

2.1.2 Gas Receiving Stations

The two GRSs are proposed to be located at the BPPS and it is expected that they will be constructed in two phases. The First Phase GRS will be constructed and operated within the site boundary of the BPPS, co-located with the existing GRS operated by CNOOC (hence referred to as the *Co-located GRS*). The Second Phase GRS will be constructed and operated on newly reclaimed land (approximately 0.5 ha of land area) constructed along the existing artificial seawall of the BPPS (hence referred to as the *GRS on reclamation*). It should be noted that the site for the new reclamation will be the same as that proposed for the GRS of the South Soko option in the HKLNG EIA ⁽⁵⁾. The proposed locations of the GRSs are presented on Figures 2.2, 2.3 and 2.4.

Figure 2.2 Suggested Location of the Gas Receiving Stations (GRSs)



Note: The Outfall, Service Berth and Seawater Intake are existing facilities of BPPS and hence are not part of this Project.

(5) ERM (2006) *Op cit*



Figure 2.3

Location of the Proposed Gas Receiving Stations (GRSs)

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Figure 2.4

Existing Artificial Shoreline of the Proposed Second Phase GRS on Reclamation

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2.2 SITE LOCATION & HISTORY

Black Point is the western-most part of the New Territories, and is comprised of a headland extending from the east (land) to the west (sea) with granitic soil underneath, which is typical of the Tuen Mun and Castle Peak areas. The major development at Black Point is the BPPS (the first natural gas-fired plant in Hong Kong), which is located to the north of the headland. The lowland areas at the southeastern edge of the headland are occupied by an orchard, concrete batching plant and cargo storage site. To the west of Black Point lies the route of the Urmston Road shipping channel and Tonggu Waterway, both of which have a depth of > -15 mPD at present.

2.3 PROJECT LAYOUT

The preliminary layout plan for this Project is presented in *Figure 2.5*. Major work elements of this Project include:

- Marine dredging and jetting;
- Land reclamation;
- Submarine gas pipeline installation, testing, commissioning and operation; and
- GRS construction, testing, commissioning and operation.

Table 2.1 presents a summary of the project details.

Table 2.1 *Summary of Project Description*

Detail	Summary
First Phase Construction – Pipeline 1 & Co-located GRS	
Area of Seabed Affected by Pipeline Footprint	7.8 ha
Dredging Volume (<i>in situ</i> volume)	0.194 Mm ³ for Submarine Gas Pipeline Trench
Length of Submarine Pipeline (km)	About 5 km in HKSAR waters
Second Phase Construction – Pipeline 2 & GRS on Reclamation	
Reclaimed Land (ha)	0.5 ha
Area of Seabed Affected by Reclamation Footprint	1.35 ha
Area of Seabed Affected by Pipeline Footprint	7.8 ha
Length of New Artificial Seawall	200 m

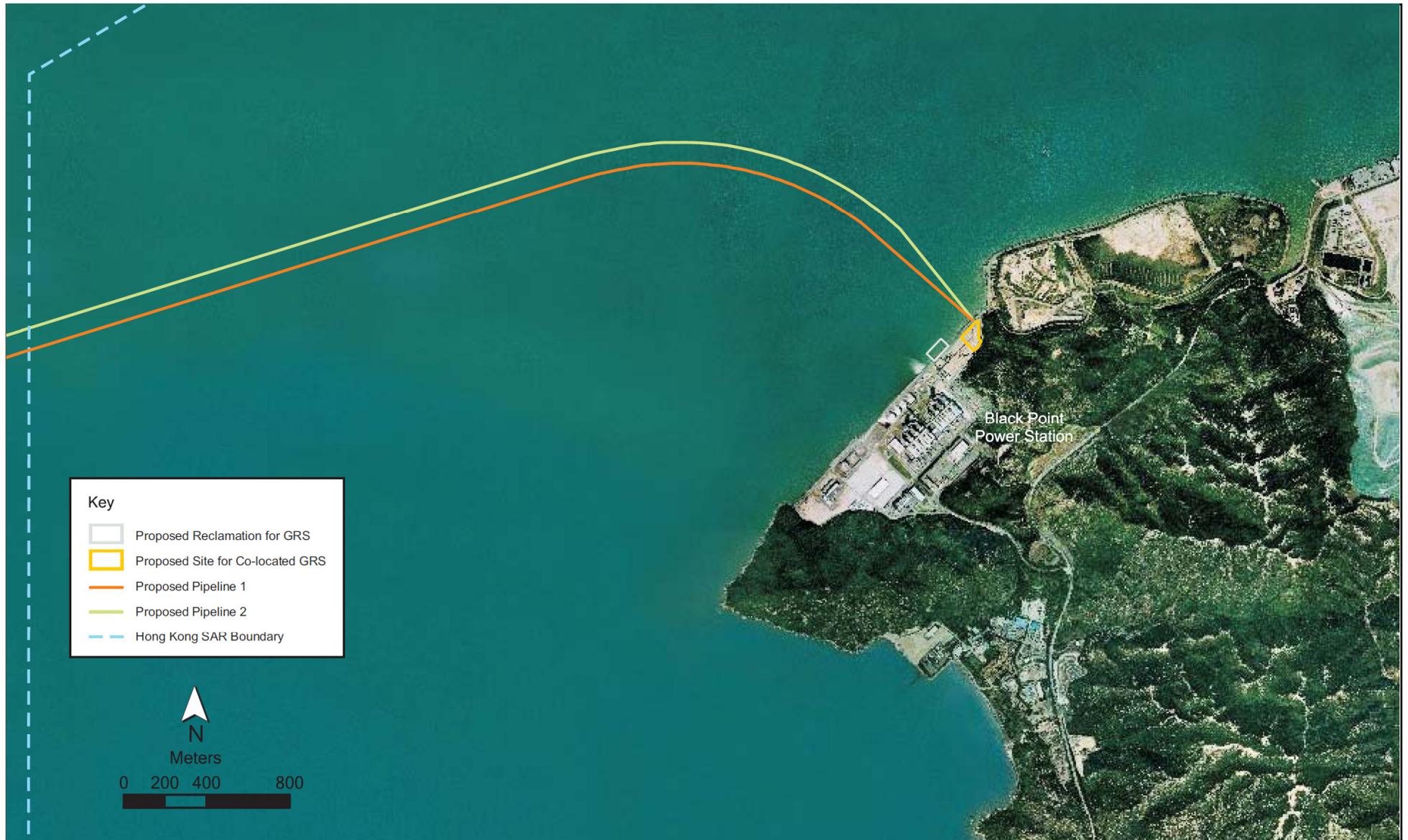


Figure 2.5

Preliminary Indicative Layout for the Proposed Black Point Gas Supply Project

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Detail	Summary
Length of Existing Seawall Lost due to Reclamation	100 m
Dredging Volumes (<i>in situ</i> volume)	Gas Receiving Stations & Associated Seawalls = 0.12 Mm ³
	Submarine Gas Pipeline Trench = 0.194 Mm ³
Length of Submarine Pipeline (km)	About 5 km in HKSAR waters

2.4 PROJECT PROGRAMME

The Project will involve two phases of construction works:

- **First Phase:** installation of the first pipeline (Pipeline 1) and construction of the co-located GRS; and
- **Second Phase:** installation of the second pipeline (Pipeline 2) and construction of the reclamation and the associated GRS.

At this stage the construction of the two phases are not expected to be concurrent. First Phase construction will commence in 2011 in order to receive the replacement gas in 2012, while Second Phase construction is expected to commence within 24 months following commissioning of the First Phase.

The preliminary construction programme is provided in *Figure 2.6*.

2.5 CONSIDERATION OF ALTERNATIVE GRS LOCATION, CONSTRUCTION METHODS & SEQUENCE OF WORKS

An assessment was conducted to investigate the environmental considerations of alternative GRS location and alternative construction methods and works sequences for this Project. Alternatives considered were as follows:

- Siting the GRSs on existing land within or outside of the BPPS Boundary;
- Siting the GRSs on newly reclaimed land adjacent to the BPPS;
- Construction of the reclamation and associated seawalls by dredging or non-dredged methods; and
- Installation of the submarine gas pipelines by dredging / jetting or non-dredged methods.

The preferred scenario for the GRS location is presented in *Section 2* and *Figure 2.3*. The preferred construction method of the GRS reclamation will be by

First Phase Construction <i>Co-located GRS & Pipeline 1</i>	Month														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Construction of GRS															
- Installation of GRS Facilities															
Construction of Submarine Pipeline															
- Dredging															
- Installation															
- Jetting															
- Rock Dumping															
- Testing															

Second Phase Construction <i>GRS on Reclamation & Pipeline 2</i>	Month																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Construction of GRS																					
- Dredging																					
- Seawall																					
- Backfilling																					
- Installation of GRS Facilities																					
Construction of Submarine Pipeline																					
- Dredging																					
- Installation																					
- Jetting																					
- Rock Dumping																					
- Testing																					

Figure 2.6

Preliminary Construction Programme for This Project

dredging method, while the submarine gas pipelines are expected to be installed by grab dredging or jetting methods. The selection of the preferred alternative has brought about a series of environmental benefits to the Project, including:

- The use of jetting for certain sections of the pipelines alignment will reduce the volumes of dredged material substantially from 0.428 Mm³ to 0.253 Mm³ (bulk volume) per pipeline;
- The adoption of jetting will shorten the period for marine construction works and hence reduce the severity of impacts to marine ecological resources;
- A reduction in the seabed areal extent of the reclamation, as one of the new GRSs will be located on existing land within BPPS;
- Avoidance of potential impacts on terrestrial ecology as vegetation clearance and slope cutting is avoided;
- A reduction in the seabed footprint area through the use of vertical instead of sloping seawall for the reclamation, hence reducing the dredging volumes; and
- A reduction in dredging volumes through siting one GRS on existing land and through selection of reclamation design and construction methodology, hence reducing off site impacts during disposal of dredged muds.

3 POTENTIAL ENVIRONMENTAL IMPACTS

3.1 AIR QUALITY

This EIA has examined construction and operation phase impacts to air quality. The impacts have been identified and analysed to be in compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 4 and 12* respectively.

Legislative requirements and assessment criteria relevant to the air quality assessment have been presented and baseline conditions within the Study Area described. One Air Sensitive Receiver (ASR) was identified (the Administration Building for the Black Point Power Station) and the potential impacts arising from the construction and operation phases of this Project to this ASR have been evaluated.

Potential nuisance from dust generating activities and gaseous emission during construction of the two proposed submarine gas pipelines and GRSs have been considered. With the implementation of standard mitigation measures, no unacceptable dust impact is anticipated. The gaseous emissions from the construction equipment are also minimal and no unacceptable impact is anticipated.

Results of operation-phase air quality modelling of key pollutants, such as NO₂ and CO, show that no exceedance of the Air Quality Objective (AQO) is anticipated at the ASR. Therefore no air quality monitoring will be required for either the construction or operation phases.

No unacceptable residual impacts have been predicted to occur during the construction and operation phases. Regular site inspections and audits will be undertaken during the construction phase to verify that proposed mitigation measures are being implemented.

3.2 NOISE

The potential impacts of noise caused by construction and operation activities of this Project have been assessed in this *EIA Report*. The impacts have been identified and analysed to be in compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 5 and 13* respectively.

Legislative requirements and assessment criteria relevant to the noise assessment have been presented and baseline conditions within the Study Area described. No existing Noise Sensitive Receiver (NSR) has been identified within the Study Area, and no planned NSR has been identified within 2 km from the Project Site.

Potential noise impacts arising from the construction and operation phases have been evaluated and it was considered that these are expected to be insignificant and acceptable. In view of the insignificant construction and operation noise impacts, mitigation measures are therefore not required and noise monitoring is also not considered to be necessary. No unacceptable residual impacts have been predicted to occur during the construction and operation phases.

3.3

WATER QUALITY

The EIA has described the water quality impacts associated with the construction and operation of the proposed submarine pipelines and the associated gas receiving facilities at Black Point. The purpose of the assessment was to evaluate the acceptability of predicted impacts to water quality. The impacts have been identified and analysed to be in compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 6 and 14* respectively.

Legislative requirements and assessment criteria relevant to the water quality assessment have been presented and baseline conditions within the Study Area described. Sensitive receivers potentially affected by construction and operational activities of the Project have been identified and the potential impacts have been evaluated. The key sensitive receivers (and distance from the project) include:

- Fisheries Resources:
 - oyster production area at Deep Bay (~ 4 km);
 - recognised spawning grounds of commercial fisheries resources in North Lantau (> 4.5 km);
 - artificial reef deployment area at Sha Chau (> 7.5 km);
- Marine Ecological Resources:
 - mangroves (Sheung Pak Nai, Ngau Hom Shek > 5 km);
 - Sha Chau and Lung Kwu Chau Marine Park (~ 3 km);
 - intertidal mudflats (Ha Pak Nai > 3 km);
 - seagrass beds (Ha Pak Nai, Pak Nai > 3 km);
 - horseshoe crab nursery grounds (Ha Pak Nai, Pak Nai, Sheung Pak Nai and Ngau Hom Shek > 3 km);
- Non-gazetted beaches (Lung Kwu Sheung Tan and Lung Kwu Tan > 2 km);

- Secondary Contact Recreation Subzone (NW WCZ); and
- Seawater intakes (Black Point Power Station, Castle Peak Power Station, Tuen Mun Area 38, Shiu Wing Steel Mill > 1 km).

The assessment, utilising water quality and hydrodynamic computational models, has examined the potential impacts caused by marine works (i.e. dredging, jetting, reclamation and pipeline installation) on water quality due to the increases of suspended solids concentrations, potential decreases of dissolved oxygen and increases in nutrients concentration, as well as those caused by operational activities such as the alteration of the hydrodynamic regime.

Potential impacts arising from the proposed marine construction works are predicted to be mainly confined to the specific works areas. Modelling results indicate that the suspended solids elevations as a result of the proposed marine works are expected to be compliant with the assessment criteria at the point specific sensitive receivers in both wet and dry seasons. The predicted elevations of suspended sediment concentrations during the construction phase are transient in nature and not predicted to cause unacceptable impacts to water quality at the sensitive receivers.

Results of operation-phase computational modelling indicated that unacceptable impacts to hydrodynamic regime, water quality and sedimentation pattern as a result of the proposed reclamation are not expected to occur as the reclamation is very small.

Projects that are planned to be constructed at the same time of this Project have been evaluated for potential cumulative water quality impacts and the assessment indicates that cumulative impacts are not expected to occur due to the large separation distance of these concurrent projects with this Project.

Unacceptable impacts to sensitive receivers have largely been avoided through the adoption of the following measures:

- *Siting*: The GRS reclamation and submarine pipelines are sited with the principal aim of avoiding direct impacts to sensitive receivers.
- *Reduction in Indirect Impacts*: The GRS reclamation and submarine pipelines are located at distances from water quality sensitive receivers where the dispersion of sediments from the construction works does not affect the receivers at levels of concern (as defined by the WQO and tolerance criterion).
- *Adoption of Acceptable Construction Rates*: The modelling work has demonstrated that the selected working rates for the dredging/ jetting operations will not cause unacceptable impacts to the receiving water quality.

Aside from these pro-active measures that have been adopted, a number of operational constraints and standard site practice measures for dredging / jetting and construction activities are also recommended. No unacceptable residual impacts have been predicted to occur during the construction and operation phases.

Water quality monitoring is recommended for the construction phase and the specific monitoring requirements are detailed in the *Environmental Monitoring and Audit (EM&A) Manual* associated with the *EIA Report*. As no unacceptable impacts have been predicted to occur during the operation of the GRSs and submarine pipelines, no mitigation measures or monitoring are considered necessary.

3.4

WASTE MANAGEMENT

The potential impacts to waste management caused by construction and operational activities of this Project have been assessed in this *EIA Report*. The impacts have been identified and analysed to be in compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 7 and 15* respectively. Legislative requirements and assessment criteria relevant to the waste management assessment have also been presented.

Optioneering was conducted at the early stage of the Project to try to reduce waste generation and to maximise opportunities for reuse and recycling of waste from the construction of the proposed Project. Part of this exercise involved the consideration of options for layout, construction methods and programmes so as to optimise the waste management process.

The key potential impacts during the construction phase are related to wastes generated from dredging, reclamation, seawall construction, filling and concreting. The storage, handling, collection, transport, disposal and/or re-utilisation of these materials and their associated environmental impacts have been the primary focus of the assessment. The types of waste associated with construction and operational activities identified and quantified. A marine sediment sampling and testing programme has been undertaken to determine the quality of dredged sediment.

The Project is planned to take place in phases. For the First Phase of the Project, Sections 1 and 3 of the pipeline would be installed by dredging while Sections 2 and 4 of the pipeline would be installed by jetting. About 0.253 Mm³ (bulk volume) sediment will be generated from Sections 1 and 3 of the pipeline. The final volumes will be subject to detailed sediment sampling, testing and analysis in accordance with the *PNAP 252* and disposal method reviewed prior to the commencement of the dredging activities. About 0.029 Mm³ (bulk volume) of the dredged sediment is expected to be Category L sediment. MFC has no objection in-principle to allocating disposal space for the M_{fail} sediment dredged from Sections 1 and 3 of the pipeline route (about

0.060 Mm³ bulk volume), subject to the availability of disposal space at the time of CAPCO's application and at the proposed programme for disposal. CAPCO is exploring alternative disposal sites (such as cross boundary disposal to Mainland China ⁽⁶⁾) for the remaining 0.164 Mm³ (bulk volume) of Category M_{pass} sediment. A dumping permit will be applied from the DEP prior to the commencement of the dredging work.

The Second Phase of the Project is expected to also generate approximately 0.253 Mm³ (bulk volume) from the installation of the submarine pipeline. At present the dredging works for the reclamation for the second GRS are expected to give rise to a bulk volume of 0.156 Mm³ of contaminated mud.

As for C&D materials, the small amount generated will be sorted on site into inert waste (public fill) and non-inert waste (construction waste). Public fill will either be reused or be disposed of at public fill reception facilities (e.g. Tuen Mun Area 38 or other locations as agreed with CEDD). Construction waste, such as timber, paper, plastics and general refuse, cannot be reused and need to be disposed of at the West New Territories (WENT) Landfill. It is estimated that a total bulk volume of 0.828 Mm³ of fill materials are required for this Project, and surplus public fill material is not anticipated. A few hundred litres of used lubrication oil is expected to be generated per month and about 0.65 kg of general refuse will be generated per worker per day. In view of the small quantity of waste generated, the handling and disposal of the waste generated from construction activities, chemical wastes and general refuse will not cause any significant environmental impacts.

With the implementation of the recommendations in *Section 7.5* of the EIA, the potential environmental impacts arising from storage, handling, collection, transport and disposal of wastes generated during the construction phase is expected to meet the criteria specified in the *EIAO-TM*. With standard site practice, the potential environmental impacts associated with the storage, handling, collection, transport and disposal of a small quantity of industrial and chemical wastes arising from the operation of the GRSs at BPPS will meet the criteria specified in the *EIAO TM* and no unacceptable waste management impact is anticipated.

No adverse waste management impact is anticipated based on the information available. No residual and cumulative environmental impacts and hazards associated with handling and disposal of wastes from the proposed Project are anticipated. A Waste Management Plan will be prepared by the Contractors and will be audited through the environmental monitoring and auditing (EM&A) programme recommended in *Section 7.7* of the EIA to reduce the potential environmental impact arising from waste management.

(6) At the time of this EIA CAPCO is preparing a submission to the relevant authorities to determine the feasibility of this option.

3.5

MARINE ECOLOGY

The EIA has described the marine ecology impacts associated with the construction and operation of the proposed submarine pipelines and the associated gas receiving facilities at Black Point. The purpose of the assessment was to evaluate the predicted impacts to marine ecological resources as per the criteria and guidelines stated in the *EIAO-TM Annexes 8* and *16* respectively.

Legislative requirements and assessment criteria relevant to the marine ecology assessment have been presented and baseline conditions within the Study Area described. Ecologically sensitive receivers (and approximate distance from the Project) include:

- Mangroves (Sheung Pak Nai, Ngau Hom Shek > 5 km);
- Sha Chau and Lung Kwu Chau Marine Park (~ 3 km);
- Intertidal Mudflats (Ha Pak Nai > 3 km);
- Seagrass Beds (Ha Pak Nai, Pak Nai > 3 km); and,
- Horseshoe Crab Nursery Grounds (Ha Pak Nai, Pak Nai, Sheung Pak Nai and Ngau Hom Shek > 3 km).

A series of detailed field surveys were conducted during the dry and wet seasons of 2009 to update the baseline conditions of the habitats and assemblages within and around the Project's footprint. A comprehensive data review of marine mammal baseline conditions was also undertaken using data collected from January 2005 to June 2009 in the Deep Bay and western Northwest Lantau areas to provide up-to-date data for the Indo-Pacific humpback dolphin *Sousa chinensis* in the vicinity of the Project Site. Findings of the field surveys and data review confirm that marine ecological resources in close proximity to the proposed Project are regarded to be of low to low-to-moderate ecological value.

Potential impacts to marine ecological resources, as well as to marine mammals, have been assessed. Permanent habitat loss due to reclamation and short-term disturbance to benthic habitats in the marine works areas are considered acceptable since the areas affected are relatively small in the context of the extent of similar habitat available in the vicinity and the generally low ecological value of the affected assemblages. Disturbed habitats are also expected to be recolonised by similar assemblages. Results of the water quality modelling activities indicate that impacts arising from the marine works will be transient and confined to the works areas. It is therefore predicted that there will be no unacceptable indirect impacts to the marine ecology (including marine mammals) of the Study Area as a result of construction activities. During the operation phase, since unacceptable

impacts to water quality are unlikely to occur, indirect impacts to marine ecology are also not anticipated.

Projects that are planned to be constructed at the same time of this Project have been evaluated for potential cumulative impacts and the assessment indicates that cumulative impacts are not expected to occur due to the large separation distance of these concurrent projects with this Project.

Unacceptable impacts to marine ecological sensitive receivers have largely been avoided through the adoption of the following measures:

- *Avoid Direct and Reduce Indirect Impacts to Ecologically Sensitive Habitats:* The site for the GRS reclamation has been selected based on a review of alternative locations and has avoided natural coastline, key habitats for the Indo-Pacific humpback dolphin (e.g. Sha Chau and Lung Kwu Chau Marine Park) and areas of high marine mammal sighting density. The location of the reclamation at BPPS has a low sighting density of marine mammals. The dispersion of sediment from dredging/ jetting and backfilling does not affect the receivers at levels of concern.
- *Pipeline Alignment:* The alignment chosen for the pipelines is at a sufficient distance from key ecological sensitive habitats, such as the Sha Chau and Lung Kwu Chau Marine Park, so that the transient elevation of suspended sediment concentrations from the installation works is not expected to result in unacceptable impacts to sensitive receivers.
- *Installation Equipment:* The use of optimal techniques during the installation of the pipelines will reduce the severity of perturbations to water quality and hence allow compliance with the impact assessment criteria at sensitive receivers. The careful selection of installation equipment and optimisation of works schedule will help avoid impacts to sensitive ecological receivers, such as marine mammals.
- *Adoption of Acceptable Working Rates:* The modelling work has demonstrated that the selected working rates for dredging/ jetting works will not cause unacceptable impacts to the receiving water quality. Consequently, unacceptable indirect impacts to marine ecological resources have been avoided.

Potential impacts to marine mammals have been reduced through the adoption of specific mitigation measures including the use of predefined/ regular routes and speed limit by all marine works vessels in this Project, and the adoption of marine mammal exclusion zones during marine dredging / jetting works. The mitigation measures designed to mitigate impacts to water quality to acceptable levels (compliance with assessment criteria) are also expected to mitigate impacts to marine ecological resources.

The following residual ecological impacts have been identified:

- The loss of approximately 100 m of artificial shoreline which is of low ecological value. The residual impact is considered to be acceptable, as the loss of these habitats will be compensated by the provision of 200 m of seawalls that are expected to become recolonised by intertidal and subtidal assemblages of a similar nature after construction.
- The permanent loss of approximately 0.5 ha of subtidal soft bottom assemblages within the reclamation site. The residual impact is considered to be acceptable as the habitat is of low ecological concern and very small in size in the context of surrounding similar habitat.
- The loss of about 0.5 ha of marine waters within the reclamation site which may serve as marine mammal habitats. The residual impact is considered to be acceptable since the habitat which would be lost is not considered as key marine mammal habitat and with relatively low dolphin densities.

Approximately 16.5 ha of benthic habitats along the pipeline route and reclamation works area will be lost during dredging/ jetting, but similar subtidal benthos will recolonise over time. The residual impacts are considered to be acceptable as the habitats are of low ecological value and because infaunal organisms and epibenthic fauna are expected to recolonise the sediments after the pipelines have been laid.

Overall, no unacceptable residual impacts have been predicted to occur during the construction and operation phases.

Monitoring activities designed to detect and mitigate any unacceptable impacts to water quality during construction phase are also expected to serve to protect against unacceptable impacts to marine ecological resources. An additional programme of marine mammal monitoring has also been recommended for the pre-construction, construction and post-construction phases of the Project. Due to the low severity of impacts marine ecology specific operation phase monitoring is not considered necessary.

3.6

FISHERIES

The EIA has described the impacts to fisheries resources and fishing operations associated with the construction of the proposed submarine pipelines and the associated gas receiving facilities at Black Point. The purpose of the assessment was to evaluate the predicted impacts to fisheries resources and fishing operations as per the criteria and guidelines stated in the *EIAO-TM Annexes 9 and 17* respectively.

Legislative requirements and assessment criteria relevant to the fisheries assessment have been presented. Fisheries sensitive receivers (and approximate distance from the project) include:

- Oyster production area at Deep Bay (~ 4 km);

- Recognised spawning ground of commercial fisheries resources in north Lantau (> 4.5 km); and
- Artificial reef deployment area at Sha Chau (> 7.5 km).

Findings of the desktop review of baseline conditions of commercial fisheries resources and fishing operations suggest that the Project Area is of low importance to the Hong Kong fishing industry.

Potential impacts to fisheries resources and fishing operations have been assessed. No unacceptable impacts associated with permanent loss of habitat due to reclamation, short-term disturbances to fishing grounds and increased underwater sound during marine works are expected to occur since the areas affected are relatively small. Results of the water quality modelling activities indicate that impacts arising from the marine works will be transient and confined to the works areas. It is therefore predicted that there will be no unacceptable indirect impacts to any fishing grounds or species of importance to the fisheries as a result of construction activities. During the operation phase, since unacceptable impacts to water quality are unlikely to occur, indirect impacts to fisheries are also not anticipated. Potential obstruction to fishing activities due to pipeline armour rock placement is not anticipated as it will be installed below or flush with the existing seabed. The seabed temporarily affected by the pipeline works is, therefore, expected to be restored to its original configuration.

No fisheries-specific mitigation measures are required during construction or operation activities as impacts to the fisheries resources and fishing operations are small and of short duration. The mitigation measures designed to mitigate impacts to water quality to acceptable levels (compliance with assessment criteria) are expected to mitigate impacts to fisheries. To confirm that the seabed affected by the pipeline works has restored to its original configuration, a geophysical survey is recommended to be conducted following completion of pipeline works.

The following residual fisheries impacts have been identified:

- The identified residual impact occurring during the construction phase is the permanent loss of approximately 0.5 ha of seabed associated with the GRS reclamation.
- The magnitude of this residual impact is considered to be within acceptable levels given the small size and low fisheries importance of the area being lost.

No unacceptable residual impacts have been predicted to occur during the construction and operation phases.

Monitoring activities designed to detect and mitigate any unacceptable impacts to water quality during construction phase are also expected to serve to protect against unacceptable impacts to fisheries. No fisheries-specific monitoring measures are required during construction or operation activities.

3.7

LANDSCAPE & VISUAL

The EIA has described the landscape and visual impacts associated with the construction and operation of the proposed submarine pipelines and the associated gas receiving facilities at Black Point. The purpose of the assessment was to evaluate the predicted impacts to landscape resources and visual sensitive receivers as per the criteria and guidelines stated in the *EIAO-TM Annexes 10* and *18* respectively

Legislative requirements and assessment criteria relevant to the landscape and visual impact assessment have been presented and baseline conditions within the Study Area described. The EIA has identified the following Visually Sensitive Receivers (VSRs), Landscape Resources (LRs) and Landscape Character Areas (LCAs):

- **Three Recreational VSRs:** Recreational Transient Vessels, Hikers to Lookout above BPPS and Hikers to Castle Peak - these include views seen by visitors when passing through the vicinity
- **Four Occupational VSRs:** Employees at BPPS, Fishermen, Workers on transient marine vessels and Workers at West New Territories Landfill - these include views seen by workers in the vicinity
- **Seven LRs:** Mixed Shrubland, Shrubby Grassland, Bare Rock Slopes, Grassland, Highly Modified Area, Artificial Rocky/ Hard Shoreline and Seascape
- **Three LCAs:** Inshore Waters Landscape, Industrial Urban Landscape and Upland and Hillside Landscape

The potential landscape and visual impacts to the sensitive receivers caused by the presence of the GRSs at BPPS have been assessed. Potential impacts, including the alteration of the landscape caused by the reclamation, the introduction of the GRSs in the industrialised landscape around BPPS and the impacts on existing and planned sensitive receivers during construction and operation of the GRSs, are evaluated to be of negligible to slight significance and unacceptable impacts are not expected.

The analysis has shown that all seven VSRs selected for analysis will experience a slight visual impact. The following Visual Mitigation Measures (VMMs) are proposed to reduce the slight impacts identified and improve the overall amenity of the development:

- VM 1: The colours of the proposed GRS should be selected to complement the existing industrial surroundings.

To reduce the potential impacts on the existing LRs and LCAs and provide a potential enhancement of the existing landscape quality, Landscape Mitigation Measures (CM) are proposed in accordance with future Landscape Specification and relevant best practice guidelines:

- CM1: Site hoardings to be compatible with surrounding landscape.
- CM2: Edges of the new reclamation to be constructed to match the existing Rocky Seawall
- CM3: The tree requiring removal is to be compensated in accordance with relevant government guidelines

With the implementation of the recommended mitigation measures, no unacceptable residual impacts have been predicted to occur during the construction and operation phases.

3.8 CULTURAL HERITAGE

The potential impacts to cultural heritage caused by construction and operational activities of this Project have been assessed in this *EIA Report*. The impacts have been identified and analysed to be in compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 10 and 19* respectively.

Legislative requirements and assessment criteria relevant to the cultural heritage assessment have been presented and the baseline conditions within the Study Area described. A Marine Archaeological Investigation has been undertaken and it confirms that no marine sites of cultural heritage / archaeological value are present within the Project Site.

The potential impacts to cultural heritage caused by construction and operational activities of this Project have been assessed. Since no sites of cultural heritage/ archaeological value were identified, construction and operational impacts are not expected. No mitigation or monitoring measures are required. No unacceptable residual impacts have been predicted to occur during the construction and operation phases.

3.9 HAZARD TO LIFE

Safety is the principal consideration in the design and operation of the GRSs and submarine pipelines. These facilities will be classified as a Notifiable Gas Installation and hence subject to the requirements under the *Gas Safety Ordinance (Cap. 51)*.

As per the requirements of the *EIAO-TM*, a detailed quantitative risk assessment (QRA) was carried out examining the installation of the submarine gas pipelines and GRS facilities at BPPS. The assessment has concluded that the risks related to the operation of the submarine gas pipelines and the GRSs are acceptable as per the individual and societal risk criteria set out in *Annex 4* of the *EIAO-TM*.

3.10 ENVIRONMENTAL MONITORING & AUDIT (EM&A)

The EIA Study of the proposed Project has been demonstrated to comply with the *EIAO-TM* requirements. Actual impacts during the construction works will be monitored through a detailed Environmental Monitoring and Audit (EM&A) programme. Full details of the programme are presented in the *EM&A Manual* associated with the *EIA Report*. This programme will provide management actions and supplemental mitigation measures to be employed should any impacts arise, thereby ensuring the environmental acceptability of the construction and operation of this Project.

During construction of the Project, regular site inspections and audits will also be conducted. Water quality monitoring will be necessary to assess the effectiveness of measures implemented to mitigate potential impacts. An additional programme of marine mammal monitoring has also been recommended for the pre-construction, construction and post-construction phases of the Project.

CONCLUSION

This Environmental Impact Assessment has critically assessed the overall acceptability of the environmental impacts likely to arise as a result of the construction and operation of the proposed Project. The EIA has demonstrated the acceptability of any residual impacts from this Project and the protection of the population and environmentally sensitive resources. Where appropriate, EM&A mechanisms have been recommended to verify the accuracy of the EIA predictions to ensure the effectiveness of the recommended mitigation measures.

4.1

ENVIRONMENTAL OUTCOMES

For each of the components assessed in the *EIA Report*, the assessments and the residual impacts have all been shown to be acceptable and in compliance with the relevant assessment standards/criteria of the *EIAO TM* and the associated *Annexes*. A summary of the environmental outcomes and residual impacts of this Project is presented in *Table 4.1*.

4.2

ENVIRONMENTAL & OTHER BENEFITS OF THE PROJECT

There are a number of advantages to the commissioning of this gas supply project for BPPS, which are summarized below.

1. **Support of Government policy:** Natural gas is widely recognised as a comparatively clean burning fuel and its use is encouraged in the 2005 Policy Address and the current Air Quality Objective Consultation to control emissions from existing power stations in Hong Kong. As such, this Project is critical to meet the Government policy in a sustainable manner.
2. **Fuel security and reliable supply of electricity:** Dependable fuel sources are critical to maintain reliable power supply to our customers while providing environmental benefits. This Project allows CAPCO to secure sufficient and dependable replacement gas in a timely manner and to meet ongoing and future needs.
3. **Environmental benefits:** With sufficient replacement natural gas, CAPCO will be able to maintain compliance with air emission standards. As natural gas emits virtually no particulates and negligible SO₂, as well as less NO_x and CO₂ than other fossil fuels, it will contribute to further improvements in the regional and local air quality.

Table 4.1 Summary of the Environmental Outcomes and Residual Impacts of the Black Point Gas Supply Project

Environmental Attribute	Environmental Outcomes & Residual Impacts
Air Quality	<ul style="list-style-type: none"> No unacceptable residual impact is predicted to occur during the construction phase and operation phase.
Noise	<ul style="list-style-type: none"> No unacceptable residual impact is anticipated from the construction phase and operation phase.
Water Quality	<ul style="list-style-type: none"> With the implementation of the recommended mitigation measures and construction phase water quality monitoring, no unacceptable residual impact is predicted to occur during the construction phase and operation phase.
Waste Management	<ul style="list-style-type: none"> For both phases of construction a total of approximately 0.662 Mm³ (bulk volume) of marine sediment will require offsite disposal. With the implementation of the recommended mitigation measures, in particular the establishment and implementation of the Waste Management Plan, no unacceptable residual impacts are anticipated from the construction and operation of this Project
Marine Ecology	<ul style="list-style-type: none"> Permanent loss of approximately 100 m of artificial sloping seawall, compensated by the provision of 200 m of vertical seawalls. Permanent loss of approximately 0.5 ha of subtidal habitats and marine waters (marine mammal habitats) within the reclamation site. Short-term disturbance of approximately 16.5 ha of benthic habitats within the marine works area for reclamation and pipeline route. With the implementation of the recommended mitigation measures and construction phase marine mammal monitoring, the residual impacts are considered to be acceptable.
Fisheries	<ul style="list-style-type: none"> Permanent loss of approximately 0.5 ha of fishing ground within the reclamation site. Short-term disturbance of approximately 16.5 ha of fishing ground within the marine works area for reclamation and pipeline route. With the implementation of the recommended mitigation measures, the residual impacts are considered to be acceptable.
Landscape & Visual	<ul style="list-style-type: none"> With the implementation of the recommended mitigation measures, the residual impacts are considered to be acceptable.
Cultural Heritage	<ul style="list-style-type: none"> No unacceptable residual impact is anticipated from the construction phase and operation phase.
Hazard to Life	<ul style="list-style-type: none"> No unacceptable residual impact is predicted to occur during the construction phase and operation phase.

This EIA Report has been prepared in full compliance with the requirements of the Study Brief and the EIAO Technical Memorandum. In accordance with the EIAO, CAPCO considers that this EIA provides a suitable basis for the Director of Environmental Protection to consider granting the Environmental Permit to allow the construction and operation of this Project.