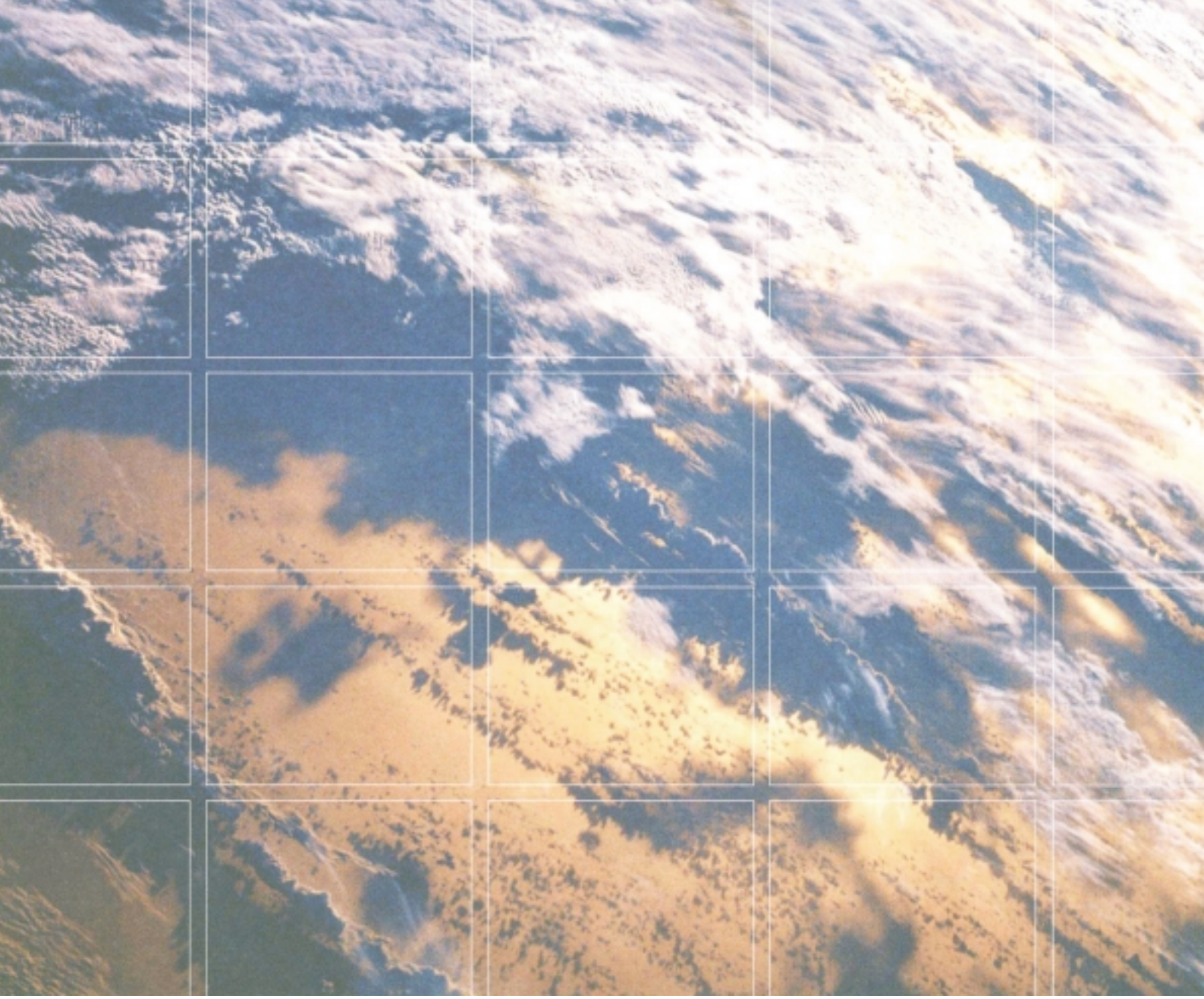

中華電力

CLP Power

ExxonMobil

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

Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities

Project Profile

May 2005

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PROJECT PROFILE

CAPCO

Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities

May 2005

Reference 0018180 (C2662)

For and on behalf of
Environmental Resources Management

Approved by: Dr Andrew P Jackson

Signed:

Position: Managing Director

Date: 13th May 2005

CONTENTS

1 INTRODUCTION AND BACKGROUND

Castle Peak Power Company Limited (CAPCO), a joint venture between CLP Power Hong Kong Limited (CLP) and ExxonMobil Energy Limited (EMEL), is considering the development of a Liquefied Natural Gas (LNG) Terminal in the Hong Kong SAR. CLP is the operator of CAPCO. The facility will provide the infrastructure for a sustainable supply of natural gas primarily to fuel CAPCO's power plant at Black Point.

1.1 THE NEED FOR LNG

1.1.1 Introduction

Since 1996 with the start-up of the Black Point Power Station, natural gas has been an important component of CAPCO's fuel supply. Natural gas has delivered environmental benefits as well as added diversity to the mix of fuels used for electricity generation, thereby enhancing the security of electricity production.

The current source of CAPCO's gas supply, the Yacheng field off Hainan Island in the South China Sea, is estimated to be depleted early in the next decade, depending upon the rate of offtake and actual reserve levels. Other South China gas reserves appear insufficient to supplement or replace the Yacheng field. The importation of LNG through a Hong Kong LNG terminal is considered to be the most appropriate means of securing a long-term reliable replacement natural gas source. The development of a Hong Kong LNG terminal will entail coordination with stakeholders, and it is estimated that up to six years will be required to complete the process.

1.1.2 Fuel Diversity – Balancing Reliability, Cost and Environmental Benefits

Over the past decade, the fuel used for electricity generation has evolved from being primarily coal to a diverse mix that is roughly 30% gas, 30% nuclear, and 40% coal [1].

Due partly to the introduction of nuclear power and natural gas into the fuel mix, air emissions have significantly improved, with NO_x down 80%, SO_x down 35% and particulates down 68% over the period between 1990 and 2004 [2]. Fuel diversity has enabled these improvements to be achieved while maintaining competitive tariffs and world-class electricity supply reliability. Often taken for granted, these factors are key contributors to Hong Kong's quality of life, competitiveness on the global stage, and ability to attract investment. Businesses ranging from large multi-national companies who choose Hong Kong as a regional hub and financial resources centre, to small

(1) Estimate for 2004 – 2006.

(2) CLP Group (2005) Social and Environmental Report 2004.

local shops are all dependent on a cost-competitive and uninterrupted supply of electricity.

Benefits of Natural Gas as a Fuel

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 at the combined cycle gas turbines (CCGT) at Black Point Power Station using some of the most advanced technology yet developed in the power industry in terms of equipment and operating systems. Acknowledged as a safe, clean, efficient form of power generation, a CCGT plant produces electricity through the use of gas turbines. CCGTs have lower environmental impact and higher thermal efficiency than conventional fossil fuel fired power stations with the same generating capacity.

Adequate Reserves Available: It is widely acknowledged that there is an abundance of natural gas reserves worldwide. The increasingly wider use of LNG indicates that more of the world's gas reserves are available to consumers in locations remote from existing sources. In 2004 there were 12 countries producing LNG and 14 importing LNG, with total consumption of 131 MTA (million tonnes per annum). According to the International Energy Agency (IEA), worldwide LNG production capability is expected to grow from 145 MTA in 2004 to approximately 500 MTA in 2020. This represents an 8% annual growth rate, with much of the growth to come from the Middle East [1].

Environmental Benefits: Natural gas is one of the cleaner and more efficient forms of energy available. Natural gas from LNG is clean burning, producing virtually no particulates and less NO_x and CO_2 than other fossil fuels. Since sulphur is almost entirely removed in the liquefaction process, combustion of regasified LNG emits negligible amounts of SO_2.

Government's stated environmental policy includes the control of emissions from the existing power stations in Hong Kong and central to this effort, is the requirement to maximise the use of natural gas. The recognition of the role of natural gas was affirmed by the Government in this year's Policy Address [2]:

> *"**49.** To control air pollution, the Government will impose caps on the total emissions of the power companies. We will also make it a policy to require them to maximise the use of natural gas in power generation….."*

(1) International Group of Liquefied Natural Gas Importers (GIIGNL) and IEA Natural Gas Information (2004 Edition)

(2) http://www.policyaddress.gov.hk/2005/eng/p47.htm

As a consequence, natural gas is positioned to play an increasingly important role in the generation mix. Maintaining a cost-effective, diverse and adequate supply of fuel will continue to be a priority.

1.1.3 Yacheng Gas Reserves

In the early 1990s as part of the work in examining potential sources of gas for Hong Kong, the feasibility of developing a LNG Terminal was studied by private interests and the Government. Although feasible sites were identified for a LNG Terminal, an alternative method which sourced gas for Hong Kong via a submarine pipeline from the Yacheng 13-1 gas field in the South China Sea was also identified. The Yacheng field was eventually developed to supply the Black Point Power Station and was expected to provide sufficient gas for 20 years. With the identification and use of this option the need for a LNG terminal in Hong Kong was deferred.

Under the contract for the supply of gas to CAPCO, the entire Yacheng 13-1 resource is dedicated to CAPCO, except for a small volume which is delivered to neighbouring Hainan. Gas delivery began in 1996 and was expected to last until 2015.

Given the geological and technical uncertainties of gas production, reserves are periodically re-determined. The latest estimates indicate that the Yacheng field could be depleted early in the next decade depending on the gas offtake rate and the actual level of reserves.

A map illustrating the location of the Yacheng 13-1 field and the pipeline connecting to Black Point Power Station is presented in *Figure 1.1a*.

Figure 1.1a Yacheng 13-1 Gas Field and Export Pipeline to Hong Kong

1.1.4 LNG is Critical for Hong Kong and Requires Long Term Planning

A new source of natural gas will be required early in the next decade for CAPCO. If gas fields are sufficiently close to the markets, gas can be transported via pipelines. A point is eventually reached, though, where transportation by pipeline becomes uneconomic due to long distances. In those cases, where there is access to a deepwater port, the most cost-effective solution is LNG. To date, there are insufficient reserves discovered in South China to meet CAPCO's mid to long-term needs. LNG is therefore the only viable alternative for the continuation of natural gas power generation by CAPCO. A LNG terminal in Hong Kong opens up a secure, long-term access to many natural gas resources worldwide.

The LNG supply chain (comprising upstream production and liquefaction facilities, specialized carriers, and a LNG receiving terminal) requires significant resources and financial commitment from both the supplier and buyer of LNG. Consequently, the LNG industry requires long lead-time from initial planning to completion of the supply chain infrastructure. Each element of the chain has to be carefully planned and coordinated along with all other elements.

1.1.5 Why Does Hong Kong Need a LNG Terminal?

A LNG terminal located in Hong Kong would enjoy the following benefits:

1. **Fuel security and reliable supply of electricity:** Dependable fuel sources are critical to maintain world-class power supply to our customers while providing environmental benefits. Having a LNG receiving terminal in Hong Kong allows CAPCO to secure sufficient and dependable supplies of this clean fuel to meet future needs. The terminal, once commissioned, would be operated and maintained to world-class standards, with seamless delivery of gas from the terminal to the power plants.

2. **Environmental benefits:** A receiving terminal in Hong Kong offers CAPCO the flexibility of sourcing LNG from gas fields around the world. With sufficient natural gas supplies, CAPCO will be able to significantly increase its use of this clean fuel. As LNG emits virtually no particulates and negligible SO_2, as well as less NO_x and CO_2 than other fossil fuels, it will contribute to further improvements in the air quality in Hong Kong.

3. **Project development schedule:** A LNG terminal located within Hong Kong enables defined project development under one single jurisdiction with clear policy and regulations applicable to infrastructure built in Hong Kong. This means that the environmental benefits can be brought about earlier.

4. **Economic Benefits and Job Creation:** Constructing a LNG terminal in Hong Kong would comprise a major investment in Hong Kong and would, additionally, provide a significant number of construction and engineering jobs for Hong Kong.

1.2 WHAT IS LNG?

Liquefied Natural Gas (LNG) is the liquid form of natural gas, the main component of which is methane.

In the liquefied form, at atmospheric pressure, LNG occupies only 1/600th of its volume at gaseous state under normal temperature and atmospheric pressure and, is therefore more economical to store and transport over long distances.

LNG is produced by cooling natural gas to -162 °C (-260 °F) through a liquefaction process. Prior to cooling and condensing the natural gas into LNG, impurities such as carbon dioxide, water and sulphur are removed. The end result of this process is an odourless, colourless product consisting mostly of methane (approximate range 85% to 99%) with small amounts of ethane, propane, butane and pentane.

LNG gas is one of the cleaner and more efficient transportation forms for energy available. There are a number of environmental and safety benefits to using LNG:

- Regasified LNG is clean burning, producing virtually no particulates and less NO_x and CO_2 than other fossil fuels. Since sulphur is almost entirely removed in the liquefaction process, combustion of regasified LNG emits negligible amounts of sulphur dioxide.

- LNG is stored at near atmospheric pressure, reducing the storage hazard compared with pressurized fuels (e.g. Liquefied Petroleum Gas - LPG). In the unlikely event of an unconfined release of LNG vapour to the atmosphere, the vapour is not explosive in nature.

- LNG, when released to the atmosphere, will evaporate at normal temperatures and disperse quickly, leaving no residue behind and therefore requiring no environmental cleanup.

- By warming LNG it vaporizes to become lighter than air and therefore rises when released.

- LNG is non-corrosive and non-toxic.

- LNG cannot ignite without first being vaporised, mixed with the right amount of air to result in a mixture of 5 to 15 % methane in air, and provided with an ignition source.

1.3 GENERIC DESCRIPTION OF A LNG RECEIVING TERMINAL AND CARRIER

1.3.1 Introduction to the LNG Supply Chain

The LNG Supply Chain is illustrated in *Figure1.3a*. The process of LNG production involves the transport of the natural gas from the production fields via pipeline to a liquefaction plant. Prior to liquefaction the gas is first treated to remove contaminants, such as carbon dioxide, water and sulphur to avoid them freezing and damaging equipment when the gas is cooled to -162°C. The liquefaction plant is similar to a large refrigerator with compressors, condensers, pressure expansion valves and evaporators. The LNG produced from the refrigeration process is piped to storage tanks. Both are insulated to maintain the low temperature. LNG tanks are designed and constructed using special materials to contain the cryogenic liquid. LNG is then drawn from the storage tanks, loaded to specially equipped LNG carriers and transported to the receiving terminal where it is stored, to be regasified and piped to the end-user such as a power plant when needed.

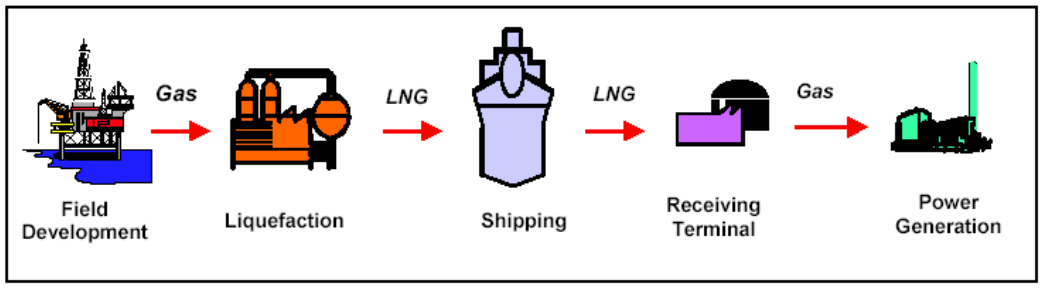

Figure 1.3a LNG Supply Chain

1.3.2 LNG Receiving Terminal

Near the end of the supply chain is the receiving terminal. The key components of the proposed LNG terminal, including marine jetty facilities for unloading LNG, special tanks for LNG storage, process equipment for the regasification of LNG, utilities and other infrastructure, are depicted in the process overview (*Figure 1.3b*).

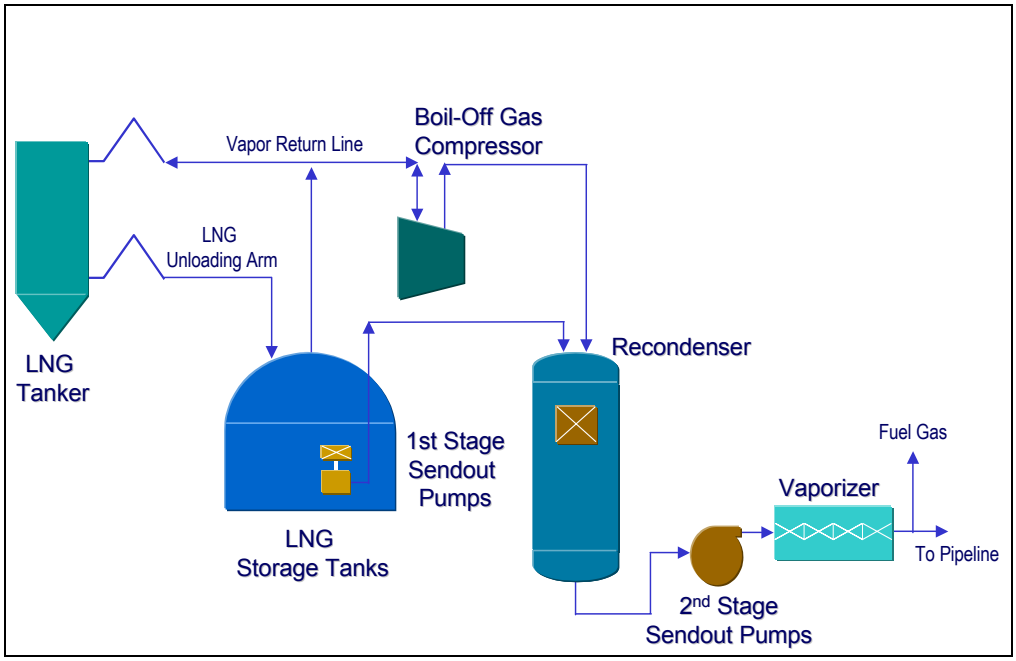

Figure 1.3b LNG Terminal Key Components and Process Overview

Receiving Facilities and Storage

A LNG carrier delivers LNG to a receiving terminal. Following berthing, the LNG is pumped ashore via the carrier's pumps through unloading arms to a cryogenic pipeline to the storage tanks. The length of the jetty where the loading arms are located is defined by specific site conditions, water depth and the overall length of the LNG carrier that have been selected to provide the maximum flexibility for the transportation requirements. In addition to the jetty, a turning circle will also be required to facilitate turning of the LNG carrier either on arrival or on departure.

The LNG will be stored at atmospheric pressure in specially designed cryogenic LNG storage tanks. Several types of tank design are available. In a full containment design, the following features will be inherent in the design to ensure that the storage tanks are secure:

- The internal tank, providing primary containment, will be fabricated of a 'cryogenic material' such as 9% nickel steel;
- There will be approximately 1m of loose insulation material (such as perlite) surrounding the sides, floor and roof of the inner nickel steel tank;
- The outer tank, providing secondary containment, will be reinforced, pre-stressed concrete and designed to independently store the LNG in the unlikely event of the inner wall failing; and,
- The domed roof will be reinforced, pre-stressed concrete.

An illustration of a typical full containment tank with the above features is presented in *Figure 1.3c*.

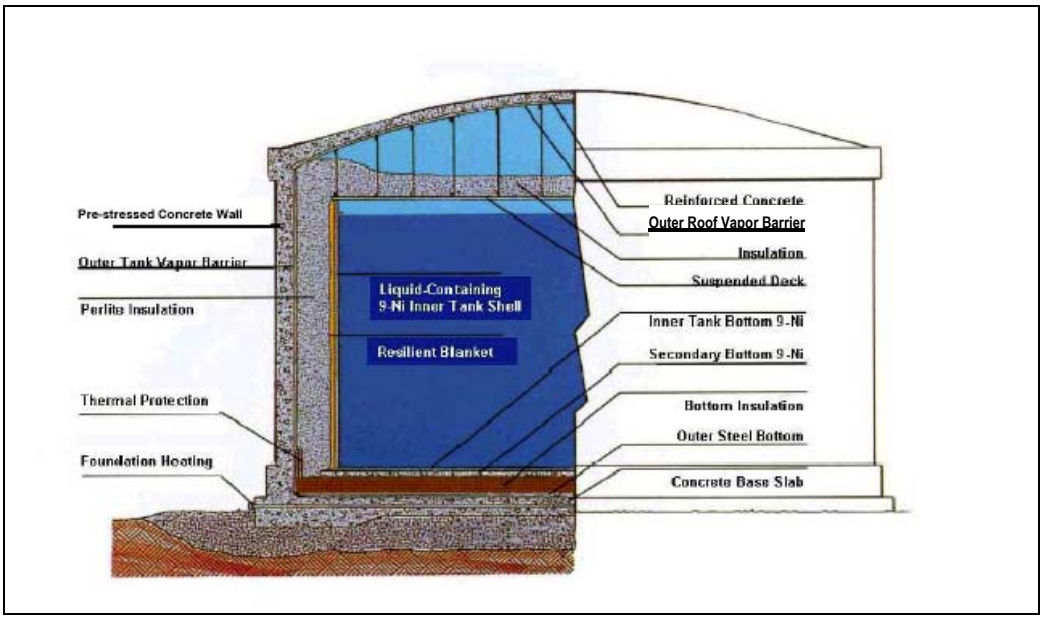

Figure 1.3c Schematic of a Full Containment LNG Storage Tank

Regasification Process

The stored LNG is sent via immersed pumps within each tank to the regasification unit where it is warmed and converted back to natural gas. Regasification is a simple heat exchange process. Common types of vaporizers include the Open Rack Vaporizer, which uses seawater for warming the LNG, and the Submerged Combustion Vaporizer, which warms LNG in a hot water bath heated by gas.

Safety Features

LNG receiving terminals have an outstanding safety record over the last 40 years by applying advanced technologies and stringent operating practices. Safety of receiving terminals is ensured by four elements that provide multiple layers of protection both for the safety of the LNG industry workers (on-site population) and the safety of the community (off-site population) [1]. While these safety elements apply to receiving terminals, some are also applicable to LNG shipping.

- **Primary Containment:** This is the first and most important requirement for containing the LNG product. This first layer of protection involves the use of appropriate materials as well as the proper engineering design of storage tanks onshore and on LNG carriers.

- **Secondary Containment:** This applies to on-shore facilities and ensures that if leaks or spills occur beyond primary containment the LNG can be fully contained and isolated.

[1] University of Houston, Institute of Energy, Law & Enterprise, Report titled 'LNG Safety and Security', Page 11. Reproduced with permission.

- **Safeguard Systems:** The goal of these systems is to minimise the frequency and size of LNG releases either from onshore facilities or from LNG carriers and prevent harm from potential associated hazards, such as fire. Typically this will involve the use of technologies such as high level alarms and multiple back-up safety systems, which include Emergency Shutdown (ESD) Systems. All LNG facilities have set operating procedures, training, emergency response and regular maintenance to protect people, property and the environment.

- **Separation Distances:** Accepted codes such as the European Standard give guidelines for the design, construction and operation of all onshore stationary liquefied natural gas (LNG) installations, including those for the liquefaction, storage, vaporization, transfer and handling of LNG.

1.3.3 LNG Carrier

LNG carriers have insulated cargo tanks and are of double-hull design to provide optimum protection for the integrity of the cargo tank containment in the event of collision or grounding. There are two traditional designs for LNG containment: the Spherical (MOSS) design and the Membrane design [1] (*Figure 1.3d*).

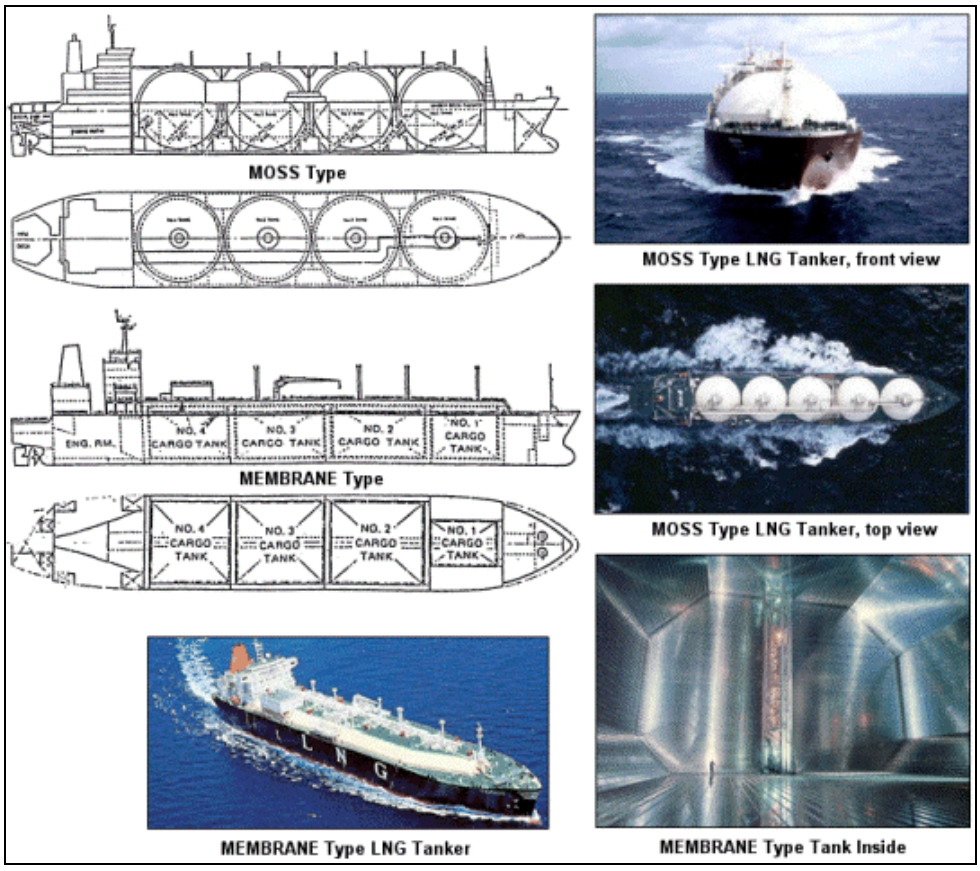

Figure 1.3d MOSS and Membrane LNG Carriers

[1] There is a third type referred to as the structural prismatic design which is used by approx 5% of LNG carriers.

On the carrier the LNG is stored in the tanks at atmospheric pressure and the boil-off gas can be used to supplement liquid fuels for propulsion or is re-liquefied and sent back to the tanks. As illustrated, for MOSS carriers, four or five spherical tanks are contained in the hull, with a substantial proportion of each tank above the weather deck. A membrane design can also have four or five tanks, but the larger proportion of each tank is below the weather deck.

Safety Features and Records

LNG shipping also has an outstanding safety record. LNG has been safely transported across the world's oceans over the last 40 years. In that time there have been over 40,000 LNG carrier voyages covering more than 90 million miles without any loss of life in port or while at sea. There are no records of collisions, fire, and explosion or hull failures resulting in breach of containment and no LNG carrier has been lost at sea. At the end of 2004, there were approximately 176 LNG carriers in the world fleet, with an additional 112 on order.

LNG carriers frequently visit areas and ports that have high traffic densities, such as in Tokyo Bay and Osaka Bay in Japan. On average, a LNG carrier enters Tokyo Bay every 20 hours, safely and without incident [1]. The favourable safety record of LNG carriers is largely due to their double-hull design and multiple levels of protection associated with cargo operations, as well as the industry's focus on safety in operations, maintenance and crew training.

1.4 ALTERNATIVES ANALYSIS PROCESS

1.4.1 Overview of the Site Selection Studies

In 2003 CAPCO commenced work on the identification of potential locations within Hong Kong that could accommodate a LNG terminal and its associated infrastructure. The following sections detail the processes by which the site selection work was conducted.

The broad approach to selecting suitable locations for the terminal is illustrated in *Figure 1.4a* and has been based on other site search studies conducted in Hong Kong [2] [3] [4]. The approach has been organised into two main phases, the first focussed mainly on excluding incompatible areas and the second, conducted in three stages, in narrowing a longlist down to the most preferred/suitable location(s). The three stages are discussed in further detail below.

[1] University of Houston, Institute of Energy, Law & Enterprise, Report titled 'Introduction to LNG', Page 23.

[2] ERM-Hong Kong, Ltd (2005) Detailed Site Selection Study for a Proposed Contaminated Mud Disposal Facility within the Airport East/East of Sha Chau Area. *Final Report*. For the Civil Engineering Department, Hong Kong SAR Government.

[3] ERM - Hong Kong, Ltd (2000) Strategic Assessment and Site Selection Study for Contaminated Mud Disposal. *Strategy Selection Report*. For the Civil Engineering Department, HKSARG.

[4] ERM - Hong Kong, Ltd (1997) Site Search for a New Power Station. *Final Report*. For Hongkong Electric Co. Ltd.

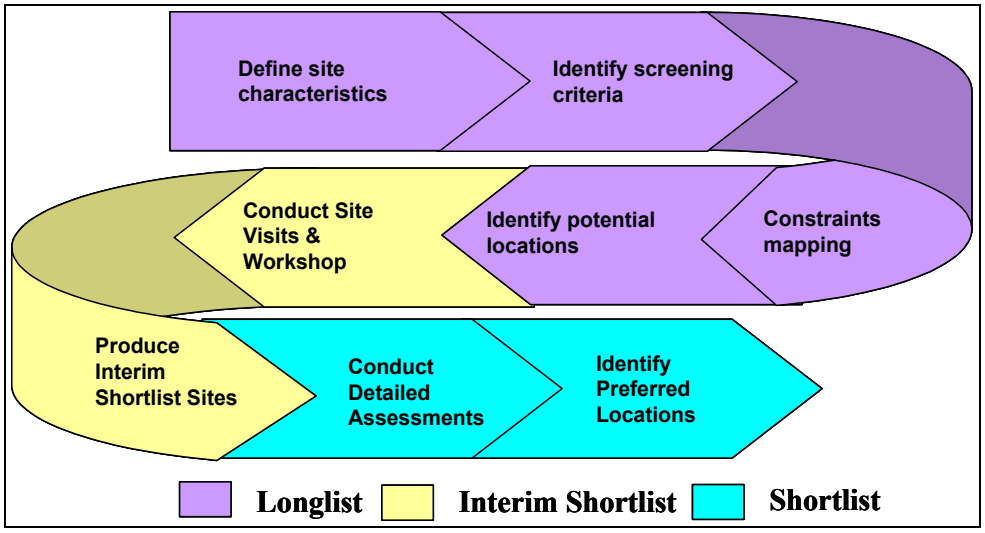

Figure 1.4a Broad Approach Adopted in the Site Selection Process

Overview of the Longlisting Study

The main objective of the longlisting phase of the study was to identify the environmental, physical and planning/social constraints associated with siting the LNG terminal so that incompatible areas could be screened out and a longlist of suitable locations derived. The approach for this phase of the study was centred around four key tasks:

Task 1 **Definition of Necessary Characteristics/Features of the Required Site.** In order to guide the site selection process, the general site requirements for the LNG terminal were defined (see *Section 1.3* for details of the typical arrangements for a LNG receiving terminal).

Task 2 **Identification of Screening Criteria.** A series of environmental, physical, planning and social criteria were identified that were considered to be relevant to the siting and operation of a LNG terminal.

Task 3 **Constraint Mapping.** Using a constraint mapping technique based around a Geographic Information System (GIS), the criteria identified in *Task 2* were compiled onto digital base maps to assist in screening out incompatible areas based on environmental issues (*Figure 1.4b*) and based on marine traffic considerations (*Figure 1.4c*). The remaining areas became, in essence, the regions of study for the identification of potential locations for the LNG terminal.

Task 4 **Identification of Potential Locations.** The unconstrained areas identified in *Task 3* were further scrutinised to determine the long list of potential locations for the LNG terminal.

Identification of the longlist of areas where a LNG terminal could be sited involved taking the site requirements and applying them to the composite constraints maps prepared following the tasks described above. Where very large areas were mapped as being free of constraints they were divided

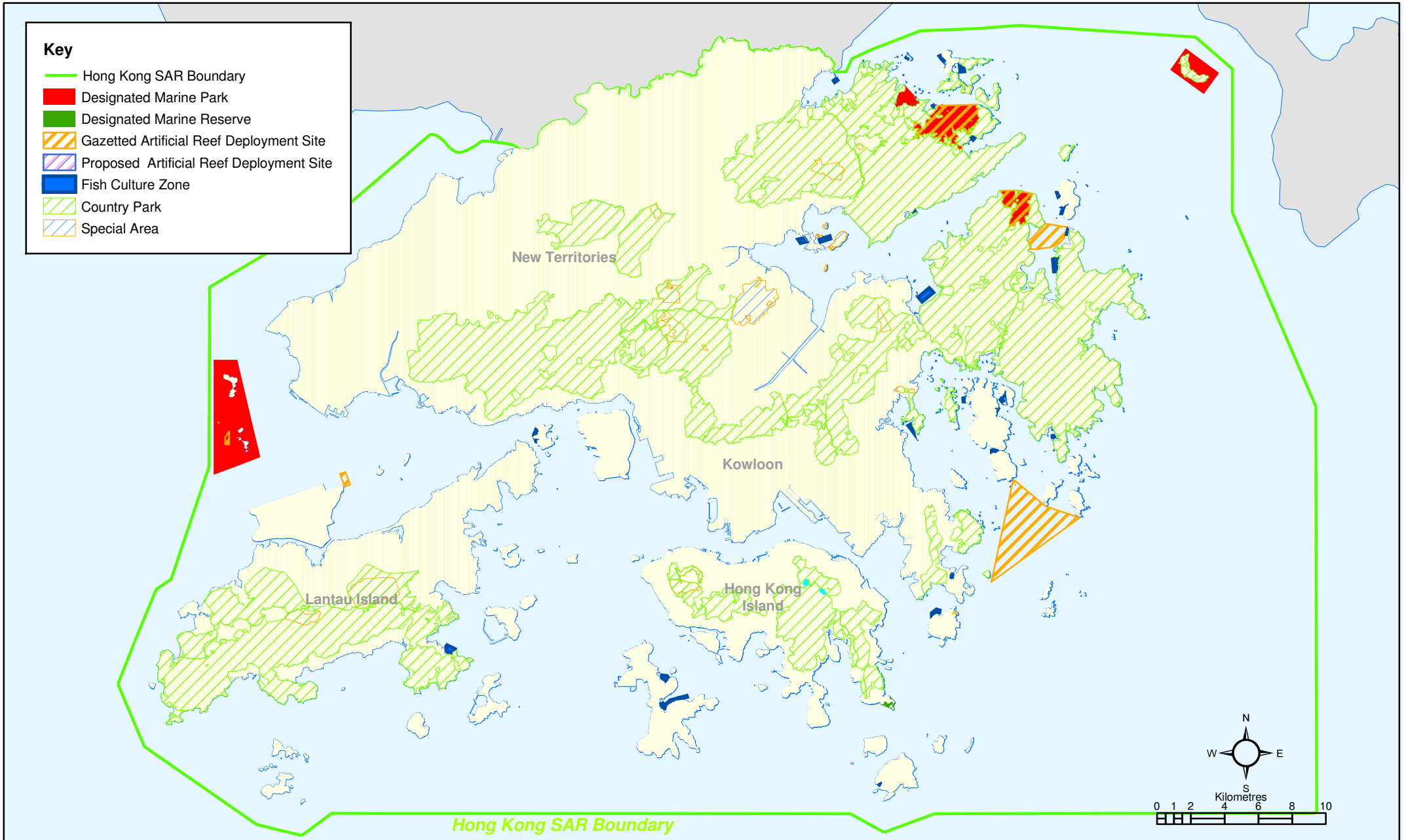

Figure 1.4b

Environmental Constraints to the Siting of a LNG Terminal

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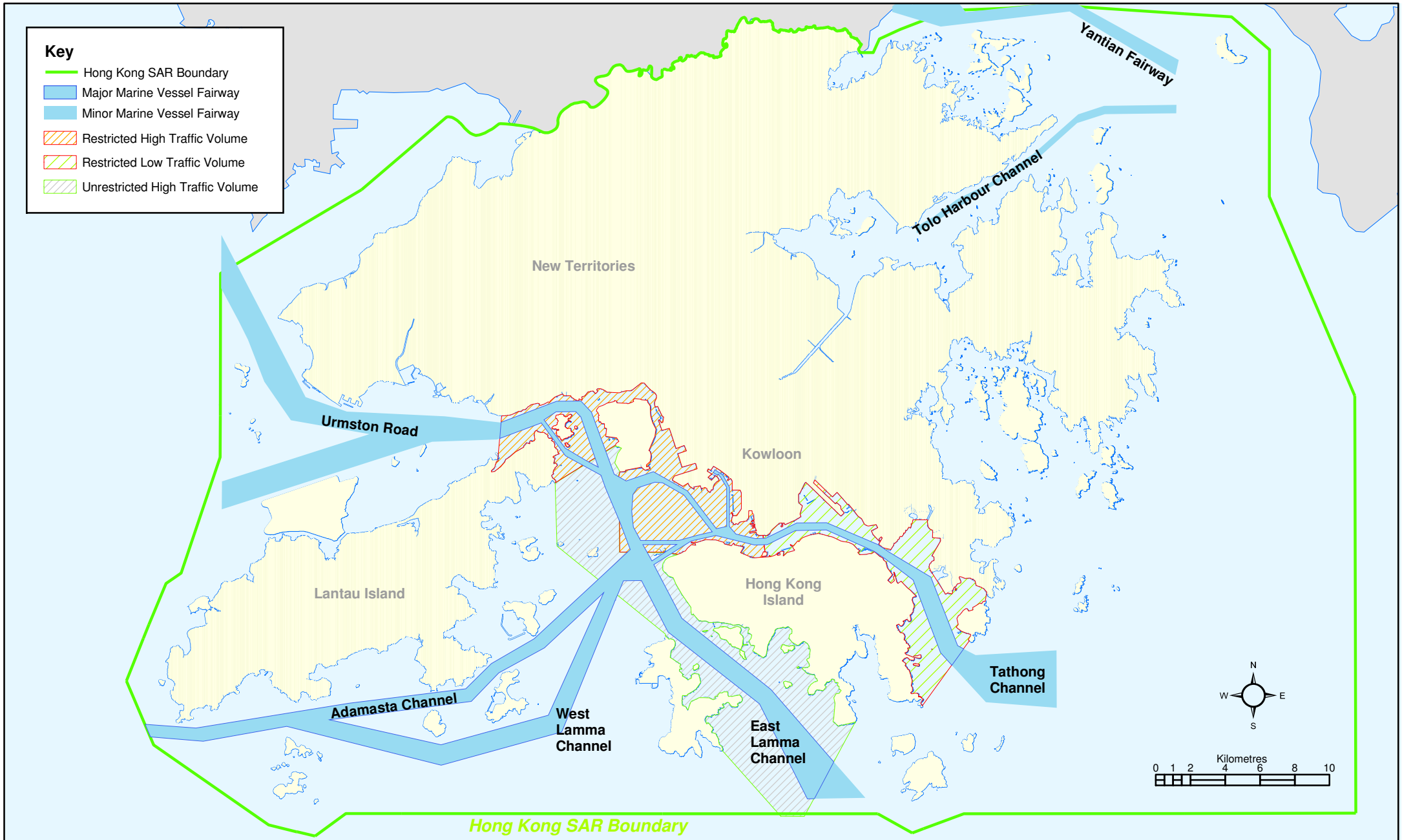

Figure 1.4c

Marine Traffic Constraints to the Siting of a LNG Terminal

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according to geographical boundaries, into areas, which could be reasonably assumed to have similar characteristics with regard to existing uses and environmental conditions. The longlisted locations identified by this process are presented in *Table 1.4a* and *Figure 1.4d*.

Table 1.4a Longlisted Locations for Siting a LNG terminal

Number	Name	Number	Name
Site 1	*Black Point*	Site 16	*Sunshine Island*
Site 2	*Lung Kwu Sheung Tan*	Site 17	*Man Kok Peninsula*
Site 3	*Castle Peak North*	Site 18	*Tsing Yi*
Site 4	*West Brothers*	Site 19	*Beaufort Island*
Site 5	*Yam Tsai*	Site 20	*Po Toi Island*
Site 6	*Brothers Point*	Site 21	*Sung Kong*
Site 7	*Sham Wat Wan*	Site 22	*Waglan Island*
Site 8	*North Tai O*	Site 23	*Stanley Peninsula*
Site 9	*Yi O*	Site 24	*Cape Collinson*
Site 10	*Peaked Hill Island*	Site 25	*Tung Lung Chau*
Site 11	*Fan Lau West*	Site 26	*Area 137*
Site 12	*Fan Lau East*	Site 27	*Wang Chau*
Site 13	*North Soko*	Site 28	*Town Island*
Site 14	*South Soko*	Site 29	*Tap Mun*
Site 15	*Shek Kwu Chau*		

Overview of the Shortlisting Study

The long-listed locations were taken forward for more detailed consideration. The main objective of this phase was to establish a short-list of sites for further analysis. Initially, the long-list of sites was reduced to an interim shortlist. Through an assessment of each long-listed site against a range of criteria, five sites were identified as potentially suitable for the LNG terminal (*Figure 1.4d*). The interim shortlisted sites were as follows:

- Site 1 Black Point
- Site 2 Lung Kwu Sheung Tan
- Site 10 Peaked Hill Island
- Site 13 North Soko Island
- Site 14 South Soko Island

Each of these sites was taken forward to a more detailed evaluation, the objective of which was to identify which sites could be considered to be the most suitable for the development of a LNG terminal. Preliminary, indicative layouts were then developed for each site, followed by further evaluation and a ranking assessment to determine the order of preference.

Evaluations of each site were conducted against a series of criteria, based on the consideration of Environment, Cost, Planning/Statutory Review, Marine Traffic and Navigation and Preliminary Hazard. The outcome of the

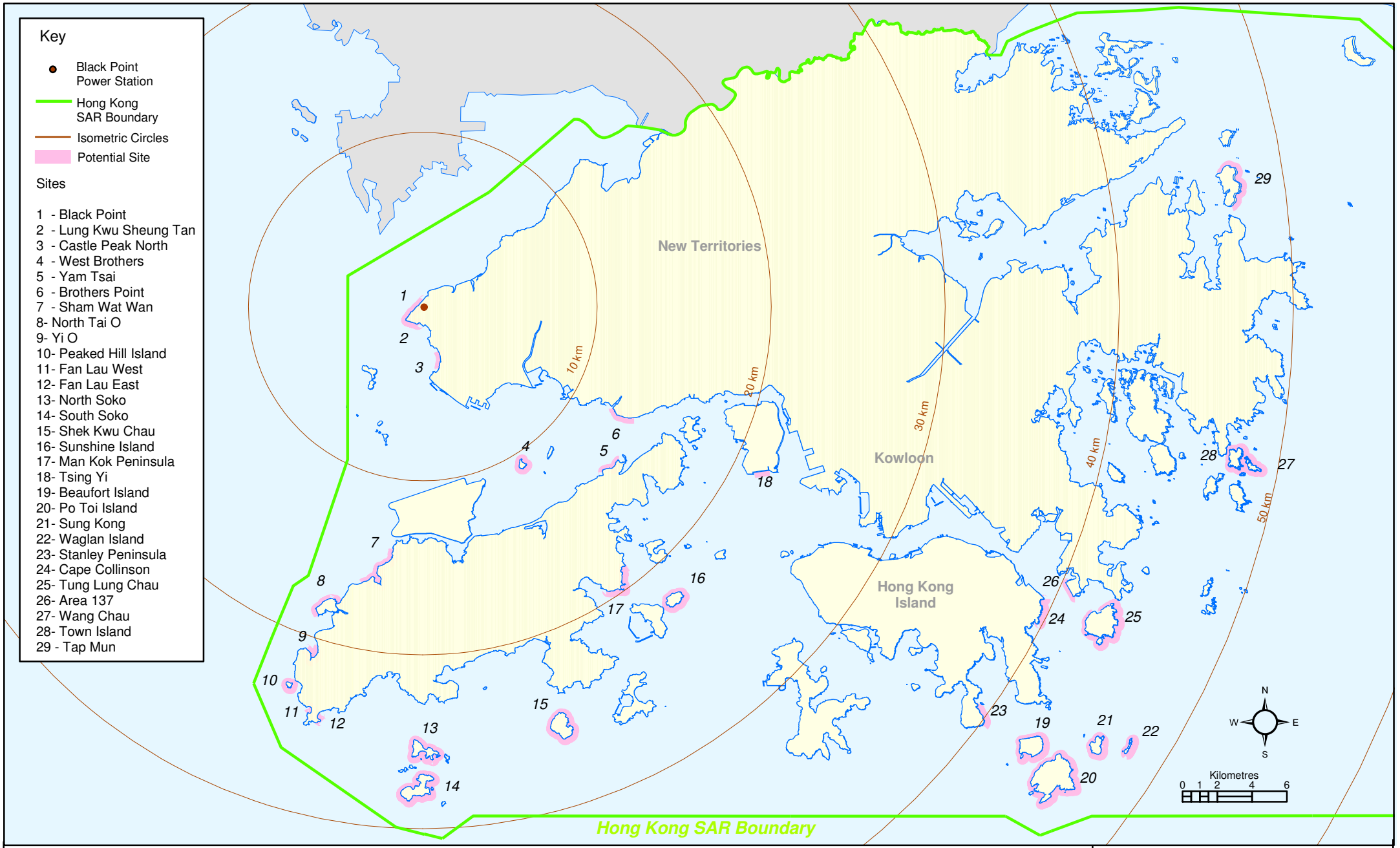

FIGURE 1.4d

Longlisted Locations for Siting a LNG Terminal

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evaluations was the identification of two sites considered most suitable for the LNG terminal. The sites were at Black Point (adjacent to the existing Black Point Power Station) and at the South Soko Island (at the site of a former detention centre).

1.4.2 ESMG Process

CAPCO commenced discussions with the members of the Environmental Study Management Group (ESMG) in September 2004 to explain the site selection process and outline a way forward. The ESMG was represented by a range of Government departments with the respective authorities to advise CAPCO on environmental, conservation, gas and fire safety, planning, marine and land issues.

ESMG members requested further examination of four sites that were not on the interim shortlist. The nominated sites were as follows:

- Site 15 Shek Kwu Chau
- Site 16 Sunshine Island
- Site 18 Tsing Yi
- Site 26 Area 137 (Tseung Kwan O).

Further Examination of Alternative Sites

On the basis of general site characteristics and historical land-use, the additional sites were separated into those that were considered to be essentially greenfield sites and those that were brownfield, or industrial, sites.

A comparative analysis of three greenfield sites located South and East of Lantau (South Soko Island, Shek Kwu Chau and Sunshine Island) and three brownfield/industrial sites (Black Point, Tsing Yi and Area 137 Tseung Kwan O) was undertaken. The analysis examined issues associated with the Environmental, Risk, Planning, Social, Engineering and Marine Traffic suitability of each location. The findings of the analysis are summarised below.

Greenfield Sites: South Soko has significant advantages over both Sunshine Island and Shek Kwu Chau. Sunshine Island has significantly larger volumes of dredging required for access to the site, the longer and more complex pipeline route and marine traffic concerns. Shek Kwu Chau has drawbacks with regard to terrestrial ecology, landscape and visual issues and comparatively closer population centres.

Brownfield / Industrial Sites: Tsing Yi has disadvantages when compared to Black Point as there is insufficient space for siting the LNG terminal. A reclamation at Tsing Yi is not considered desirable due to potential interference with the existing berthing operations at Tsing Yi and intrusion into the shipping channels in the western harbour that serve the container

terminal to the East. Connecting a gas pipeline to the Black Point Power Station from Tsing Yi is particularly challenging and is unlikely to be feasible due to the required route and the nature and number of submarine utility crossings. The proximity of large land-based populations on Tsing Yi was also considered to be a less favourable characteristic.

Although sufficient space is available at Area 137 (Tseung Kwan O), the terminal would require the use of all 38 ha of PHI and PHI-related land, thereby restricting other developments. A LNG terminal of the type planned for Hong Kong would typically require approximately 25 – 30 ha; however, there are berthing constraints at the Area 137 (Tseung Kwan O) site which dictate that the LNG carriers would have to berth at the seawall. The design code for the terminal indicates that adequate setback distances must be maintained between the berthed LNG carrier and the remainder of the terminal's infrastructure. The consequence of the setback distances is that the terminal requires more land area and therefore all of the available 38 ha would be required at Area 137 (Tseung Kwan O).

There are known to be a number of competing uses for this site, for example the potential relocation of the Towngas Ma Tau Kok gas works, extension of the SENT Landfill and Waste-to-energy facility at Tit Cham Chau. The proximity of large populations also renders this site less preferable than Black Point.

Artificial Island

In addition to the sites discussed above, construction of an artificial island for locating a LNG terminal at South West Lamma was also investigated. Whilst an artificial island was considered to be technically feasible, it has two major constraints in comparison to other sites, which are time and cost. In terms of timing there is insufficient time for a construction schedule to meet the timeline for gas requirements, by 2011. Even assuming the most optimistic set of circumstances for the development, the terminal would not be ready to supply gas until after 2015, 4 years behind CAPCO's requirement for gas.

1.4.3 Preferred Sites

Two sites identified in the site search exercise were considered worthy of further analysis. The two preferred sites are **South Soko Island**, at the location of the former detention centre, and **Black Point**, on the headland adjacent to the existing power station. The key advantages for these two sites are presented in *Tables 1.4b* and *1.4c*.

Table 1.4b Advantages of the South Soko Island location for a LNG Terminal

Parameter	South Soko Island
Environmental, Risk, Planning & Social Considerations	1. Island was formerly a detention centre for Vietnamese Illegal Immigrants and the site area has already been substantially disturbed 2. No residential populations present within approximately 5 km of site 3. Presence of two Recognised Villages but dwellings abandoned or resumed for former detention centre 4. No graves present within the expected terminal footprint 5. Shortest pipeline route (approximately 40 km) 6. No visual sensitive receivers within 5 km of the site 7. Terrestrial habitat modified and low ecological value
Technical and Engineering Considerations	1. Unconstrained, in terms of existing submarine utilities, submarine gas pipeline route to BPPS 2. Sufficient available land, including expansion 3. No wave or current restrictions, southern coast exposed but large sheltered bay available in central area 4. Platform and jetty present on centre of island which will facilitate access to site during construction and operation
Marine Traffic Considerations	1. Berth located away from the navigable channel and passing traffic 2. Adamasta Channel is to the north of the island and used by fast ferries to Pearl River Delta 3. Approach to site from the southeast of HKSAR provides adequate sea room for entering the navigable channel 4. Marine access to site avoids busy harbour areas

Table 1.4c Advantages of the Black Point location for a LNG Terminal

Parameter	Black Point
Environmental, Risk, Planning & Social Considerations	1. Minimum expected visual intrusion to Lung Kwu Sheung Tan villagers due to shielding by the hills 2. Neighbouring land uses are industrial in nature 3. Site was originally discussed with Government in 1992 as reserve for future power plant expansion 4. Remote from populations 5. No submarine gas pipeline required
Technical and Engineering Considerations	1. As the site location is right next to the BPPS, no construction of a submarine gas pipeline is required. 2. Site formation would be possible through a combination of cutting into the existing hillside and reclamation 3. Relatively deep water present in the adjacent Urmston Road reduces the total quantities of dredged materials generated by the project 4. Proximity to BPPS would allow integration of some common services.

Parameter	Black Point
Marine Traffic Considerations	1. Experience with ocean-going coal carriers has demonstrated that transit to the location can be done safely 2. No passing ship effect 3. Navigation aids and a traffic separation scheme are provided 4. Regulations are in place for traffic control in Ma Wan Channel

1.5 FURTHER STUDIES AND CONSULTATION ACTIVITIES

Since the conclusion of the site search exercise a number of assessments have been undertaken to further determine the feasibility of constructing and operating a LNG terminal at either of the two selected sites. The purpose of the assessments was to identify, in consultation with the members of the ESMG, significant environmental or risk issues.

These assessments were based on a set of conservative design assumptions and concluded that both South Soko Island and Black Point were considered feasible for locating a LNG terminal, subject to further analysis under the *Environmental Impact Assessment Ordinance (EIAO)* process.

At the same time CAPCO commenced dialogue with other key stakeholders including Non-governmental Organisations (NGOs) and District Councils to seek feedback on their proposals and factor some of the issues raised into the design plans prior to commencing the formal *EIAO* process. Some of the main issues raised and the design measures adopted by CAPCO to minimise environmental impacts are presented in *Table 1.5a*.

1.6 PROJECT PROFILE

This Project Profile includes a preliminary assessment of the potential environmental impacts associated with the construction and operation of the LNG terminal and its associated infrastructure at either the South Soko Island or Black Point. The assessment has been based on information compiled by CAPCO describing construction activities and operational details and baseline information describing the condition at the two preferred Project Sites.

Table 1.5a Issues and Mitigation Measures

Issues	Mitigation Measures
Avoidance/Minimisation of Reclamation Where Possible	**South Soko:** Various Government departments and NGOs raised the issue of whether reclamation can be avoided at South Soko so as to minimise the footprint of the project on the marine environment and avoid the loss of natural shorelines. CAPCO recognises and understands the concern and will adopt design criteria to minimise reclamation in the detailed design and constructability studies to be conducted while achieving a safe, constructible and reliable terminal design for the South Soko Island location. **Black Point:** Reclamation cannot be avoided at Black Point due to land constraints and the need to have the terminal out of direct sight of residents in Lung Kwu Tan village. This has resulted in amelioration of Landscape and Visual Impacts.
Minimisation of Landscape and Visual Impacts	**South Soko:** Although the site is remote from visual sensitive receivers on the Lantau coastline, CAPCO has examined the layout carefully so that the taller structures, such as the storage tanks, are hidden from view as much as practically possible through the use of existing landforms for screening. **Black Point:** A layout has been adopted which keeps the terminal out of direct sight of residents in Lung Kwu Tan village and resulting in amelioration of Landscape and Visual Impacts.
Minimisation of Impacts to Marine Mammals	Various Government departments and NGOs have indicated that impacts to marine mammals should be avoided and minimised where possible. In consultation with cetacean specialists, CAPCO will examine in the EIA study the adoption of mitigation measures such as: • use of bubble curtain/jacket to ameliorate underwater noise propagation; • timing of piling to avoid peaks in marine mammal abundance; • timing of piling to avoid calving season of the Indo-Pacific Humpback Dolphin (Black Point only); and • adoption of exclusion zones around the piling barge.
Minimisation of Impacts to Fish Fry from Cooled Water Discharges	**South Soko:** The discharge point for the cooled water will be designed so as to maximise dilution and dispersion of cooled waters and associated antifoulants so that concentrations at the sea surface, where fish fry are mainly present, are within tolerance thresholds in order to minimise impacts. **Black Point:** CAPCO will explore proven methods for utilising the terminal's cold energy. This measure may reduce the need for a specific discharge from the terminal and instead the water could be used in combination with the BPPS cooling water system.

2 BASIC INFORMATION

2.1 PROJECT TITLE

Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities.

2.2 PURPOSE AND NATURE OF THE PROJECT

The Project will involve the construction and operation of a LNG receiving terminal and its associated facilities at either the South Soko Island or Black Point. The receiving terminal will provide a facility for the storage of LNG and the supply of regasified natural gas to the Black Point Power Station (BPPS). For the South Soko option, the natural gas will be sent via a submarine gas pipeline to a Gas Receiving Station (GRS) at BPPS. For the Black Point option the connection to BPPS will be via a short onshore pipeline within the boundaries of the terminal and the power station. For both site locations, the principal natural gas user would be BPPS. Both the South Soko and Black Point options will require a power supply during construction and operation. For Black Point, power will be obtained from BPPS, whereas the South Soko option may necessitate the installation of a submarine electricity circuit.

2.3 NAME OF PROJECT PROPONENT

Castle Peak Power Company Limited (CAPCO).

2.4 LOCATION AND SCALE OF THE PROJECT AND HISTORY OF THE SITE

2.4.1 South Soko Island

Location

South Soko Island is at least 4.5 km south of Lantau Island, as shown in *Figure 2.4a*. The LNG terminal itself is expected to occupy an area of approximately 30 ha and provide storage of LNG in two cryogenic tanks, each with a capacity of approximately 160,000 – 180,000 m^3. A third tank may be required in the future subject to demand and would be accommodated within the 30 ha.

The land area at the South Soko Island includes an existing concrete platform which was developed, along with some reclamation works and a jetty on the North West side of the island, as part of a refugee detention centre (now disused and demolished). CAPCO is very much aware of the concern of many stakeholders regarding the extent of reclamation, especially at the South Soko site. CAPCO believes that the South Soko site offers an opportunity for significant reductions in the extent of reclamation. While more design and constructability studies are required on this issue the design intention now adopted by CAPCO is that minimal practicable reclamation will be proposed

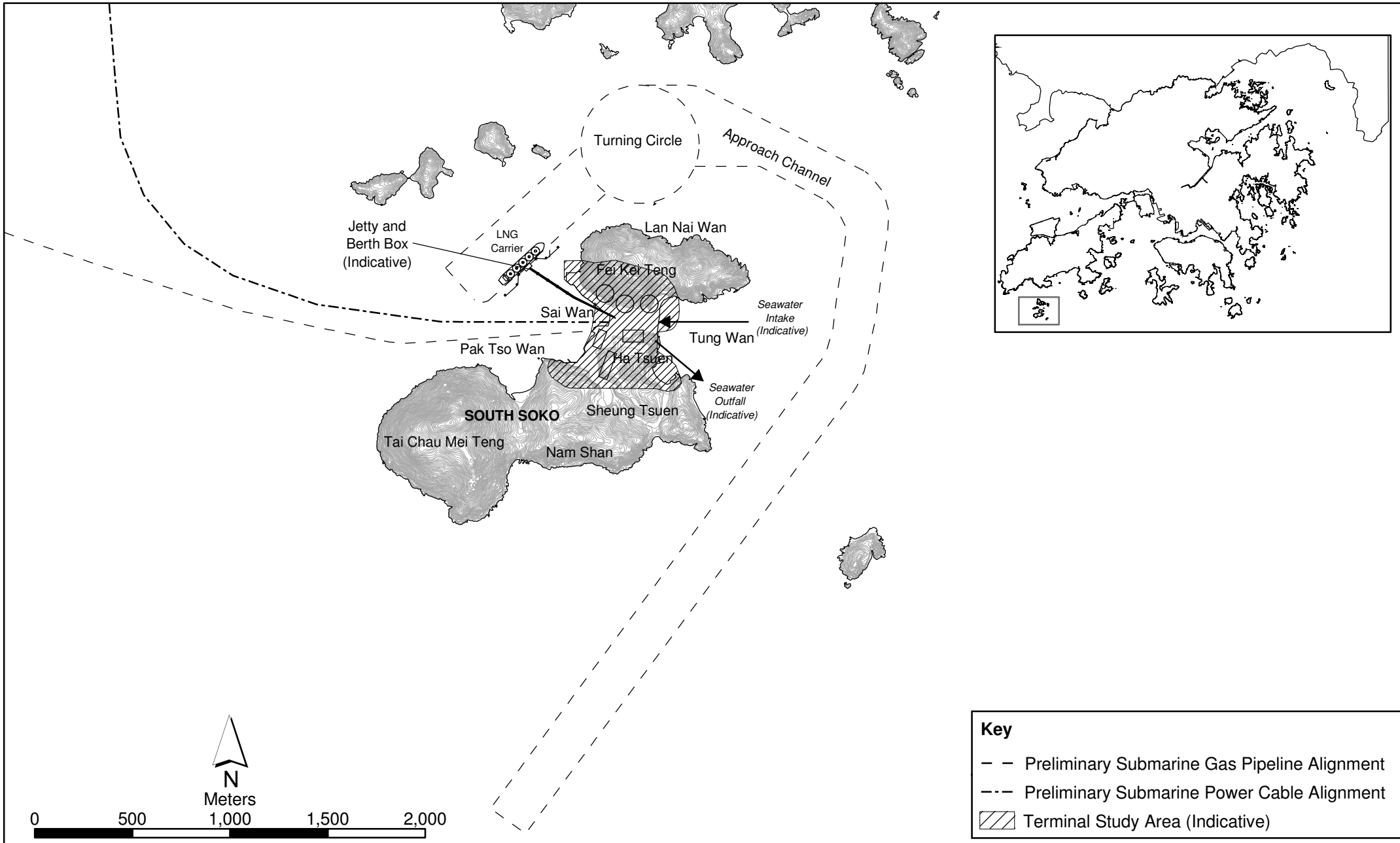

FIGURE 2.4a

Preliminary Conceptual Layout of South Soko LNG Terminal

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at the South Soko Island to accommodate the terminal facilities. Dredging work will be involved to provide the necessary navigation channel and turning circle for the LNG carriers.

In order to deliver the regasified natural gas from the terminal to the BPPS, a 40 km long submarine gas pipeline (provisional alignment as shown in *Figure 2.4b*) will be constructed. In addition, a submarine power cable may be required to connect the South Soko Island with CLP's substation at Shek Pik to supply electricity to the LNG terminal (provisional alignment as shown in *Figure 2.4b*). The exact alignments of the submarine gas pipeline and submarine power cable will be determined during the engineering design and EIA studies.

General Setting

Aerial photographs from the early 1960's (*Figure 2.4c*) indicate that settlements were concentrated in Ha Tsuen and Sheung Tsuen, with approximately 50 dwellings. During this period, terrace cultivation was evident and extensive on South Soko so that most of the lowland areas and some of the hill sides have been modified extensively by human development and agriculture.

In 1989 the construction of a detention centre commenced on the Island and these extensive works were completed in 1991 (aerial photograph 1989, *Figure 2.4c*). Before the construction of the detention centre, the Government resumed land within its footprint and no inhabitants remained on the island. The detention centre occupied the flat land in between Tung Wan and Sai Wan and required the reclamation of the shorelines of both bays. A cemented roadway was constructed to link the detention centre to the top of the hill, which was developed as a helipad. All of the constructed areas around the helipad were hydroseeded to form grassland. The reservoir was used for water storage with a plantation of trees around the fringe. The hillsides to the south of the detention centre were modified into cut slopes and all vegetation removed. The natural shoreline of Sai Wan was modified to create an artificial shore with piers constructed at the northern and southern edges of Sai Wan. The natural shoreline of Tung Wan was also modified to create an artificial shore with rocks and boulders.

Before 1997, the detention centre was cleared and all the building structures were demolished and abandoned. The island is presently uninhabited and photographs from around the platform where the terminal is proposed to be located are shown in *Figure 2.4d*.

The marine waters around the South Soko Island (and North Soko Island) have been proposed in the past for some form of conservation designation. It is noted that the Agriculture, Fisheries and Conservation Department has addressed the issue with the Legislative Council. To date though, no statutory plans have been prepared for designating the waters as a Marine Park and, the recent publication of the Lantau Concept Plan has acknowledged that there are competing uses for the South Soko Island including the LNG terminal and a spa resort.

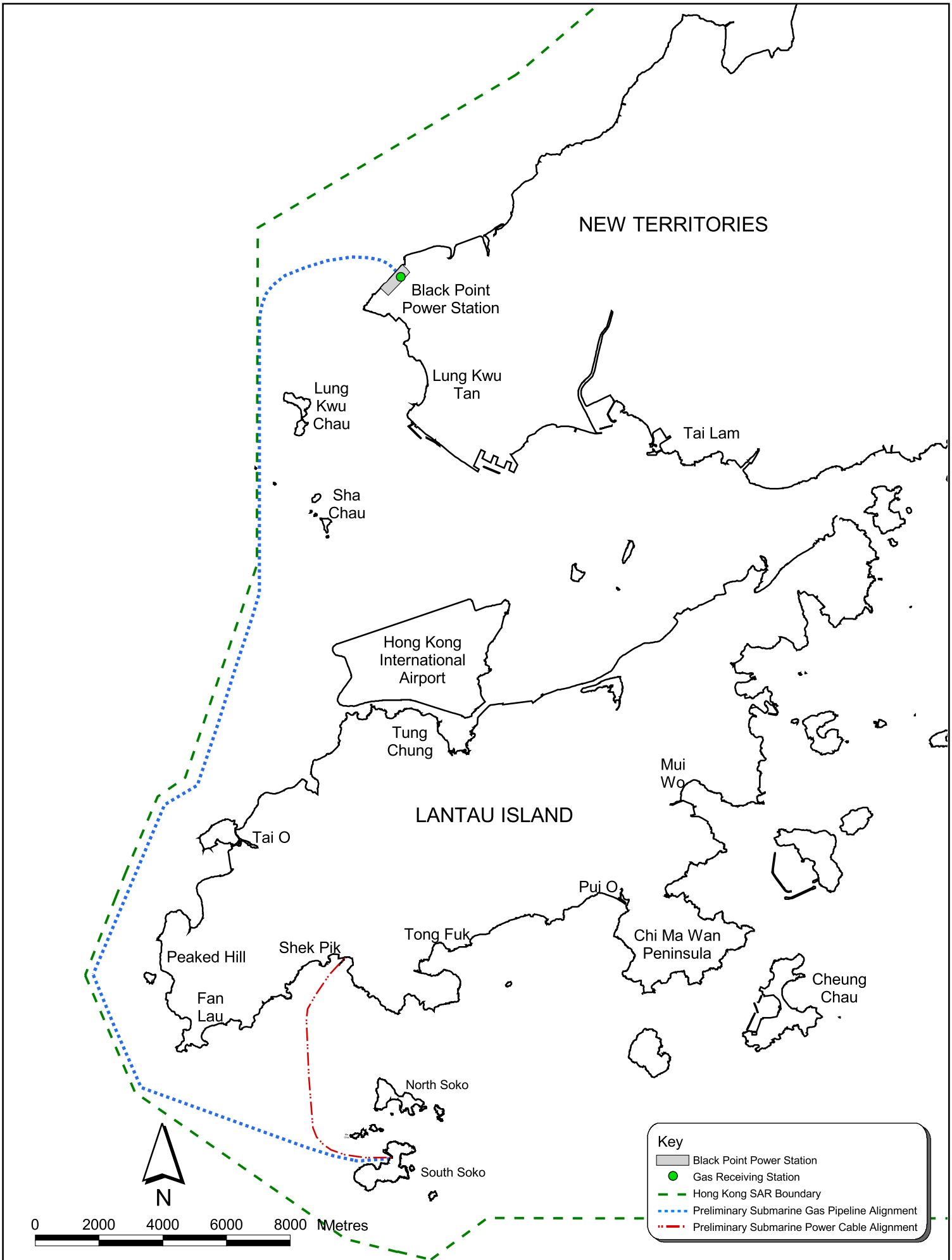

FIGURE 2.4b

Preliminary Alignments for
the Submarine Gas Pipeline and Power Cable
for the South Soko Island Option

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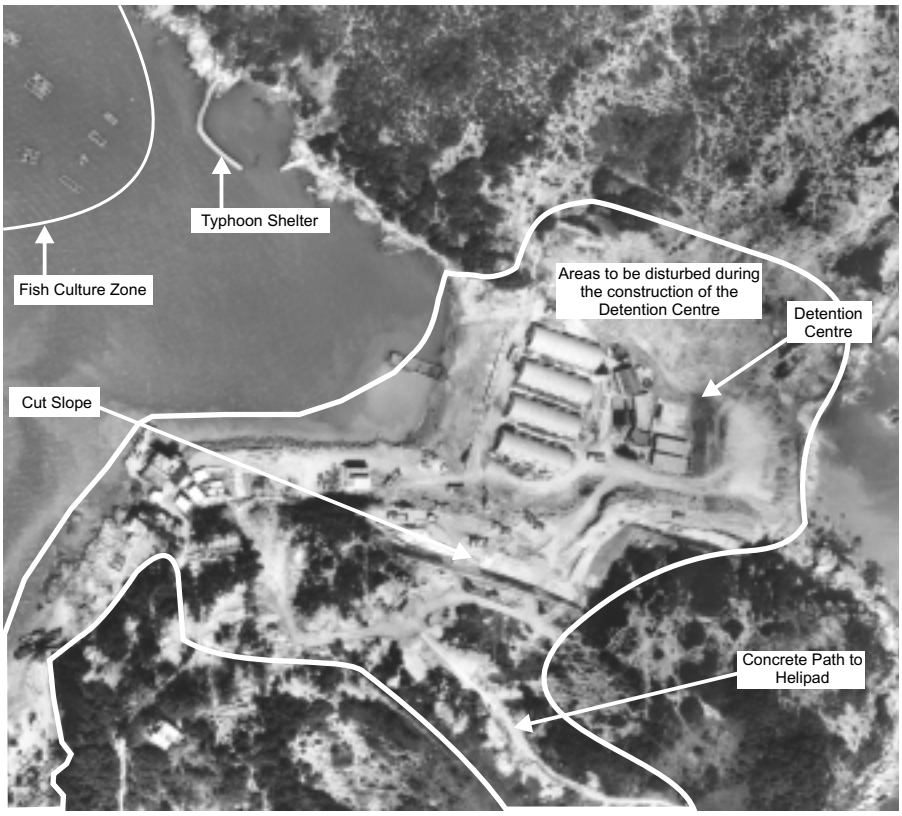
Aerial Photograph of South Soko in 1963 - A number of inhabitants were living at
South Soko and most of the lowland areas were modified as agricultural land (source : Lands Department)



Aerial Photograph of South Soko at 1989 - Detention Centre was under construction
(source : Lands Department)

Figure 2.4c

Aerial Photograph of South Soko at 1963 and 1989

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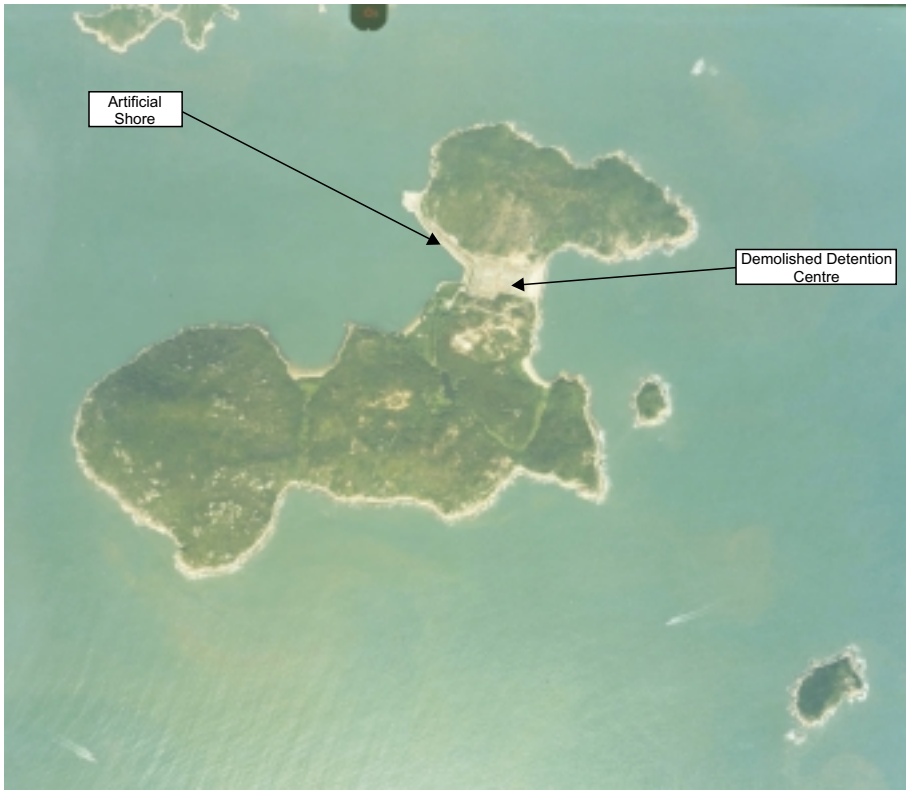

Aerial Photograph of South Soko at 2004 - This aerial photograph presents the existing condition of South Soko (source : Lands Department)

Figure 2.4d

Existing Condition of South Soko (Photographs Taken in 2004)

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2.4.2 *Black Point*

Location

The LNG terminal option at Black Point would be adjacent to the existing BPPS, as shown in *Figure 2.4e*. The LNG terminal will require a site area of approximately 30 ha and is expected to provide storage of LNG in two cryogenic tanks, each with a capacity of approximately 160,000 – 180,000 m^3. A third tank maybe required in the future subject to demand and would be accommodated within the 30 ha.

Part of the site area (approx. 15 ha) will be formed by reclamation extending out from the Black Point headland. The remaining site area will be formed by cutting the slope of the northern face of the Black Point headland. The present scheme avoids the need to intrude into the ridge line at Black Point, thereby minimising disturbance to the existing landscape and maintaining a natural barrier between the terminal and areas to the east.

Dredging work will be involved to provide the necessary approach to the jetty after leaving the fairway and for a turning circle for the LNG carrier. *Figure 2.4e* shows the preliminary layout of the proposed facilities at Black Point.

General Setting

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.

The site for the proposed LNG terminal at Black Point is in close proximity to the existing BPPS and bordering the northern reaches of the Urmston Road shipping channel. To the west of the site, across the Urmston Road shipping channel, lies the route of the Tonggu Waterway Project, which is a proposed shipping channel, intended to be ultimately dredged to a depth of –15 mPD.

2.5 *BRIEF PROJECT DESCRIPTION*

2.5.1 *Generic Description of the Project*

Approximately 30 ha of land are required to install the necessary infrastructure of the receiving terminal, which would include at least the following facilities:

- Jetty and unloading arms
- Process Area
- Up to 3 LNG Tanks

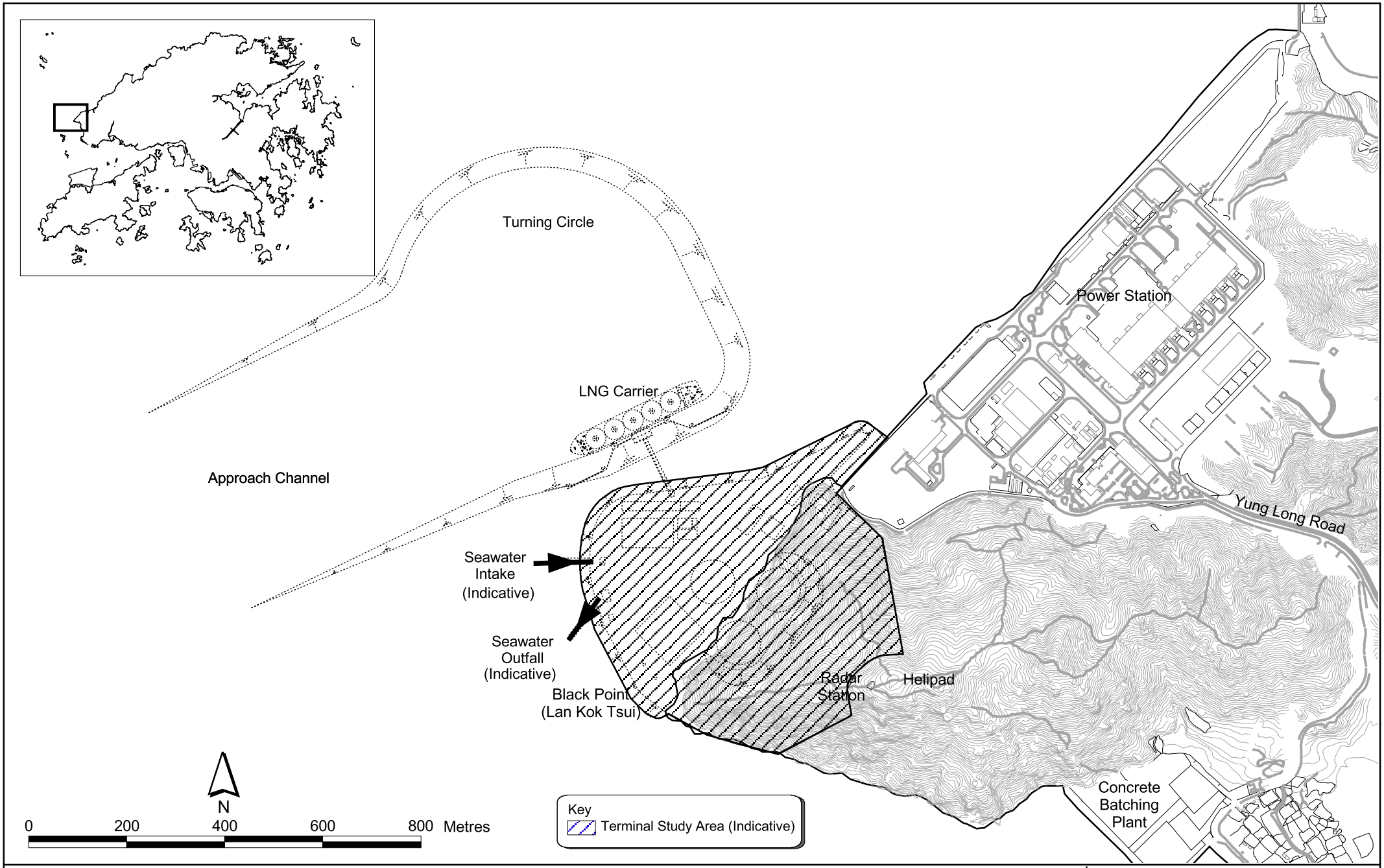

FIGURE 2.4e

Preliminary Conceptual Layout of Black Point LNG Terminal

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- Low Pressure and High Pressure pumping systems
- Vaporizers (Regasification Area)
- Vent or flare systems (low pressure and high pressure)
- Maintenance Workshop
- Administration Building
- Guard House
- Utility Area
- Control Room
- Gas Metering Station
- Emergency gas turbine power generator (for the South Soko Island Option only)
- Offshore Pipeline launching area (for South Soko option)

The LNG terminal will be designed and operated according to the *European Standard EN 1473 – Installation and Equipment for Liquefied Natural Gas - Design of Onshore Installations* (1). The tanks will be designed and constructed to BS 7777 standard (2). Other design parameters are shown in the Basis of Design (*Table 2.1*).

Table 2.1 Project Design Features

Key Parameter	Design Value / Codes
LNG Carrier Size (m^3)	145,000 – 215,000
Maximum Number of LNG Storage Tanks	3
LNG Tank Size (m^3)	160,000 – 180,000
Land Requirement (Ha)	30
	Major Design Codes
Terminal	EN1473
LNG Tanks	BS 7777 – 2 - 1993
LNG Carriers	IGC/OCIMF/SIGTTO/Class
Pipeline (South Soko Island only)	ASME B31.8, IGE/TD/1, DNV 81

Gas will be piped to the Black Point Power Station (BPPS) via a short onshore pipeline for the Black Point Option or via an approximately 40 km long submarine gas pipeline for the South Soko Option.

Presently, a typical LNG carrier measures approximately 285 m long, 43 m wide and 12 m draft, and is able to transport around 145,000 m^3 of LNG.

(1) The European Standard EN 1473 – Installation and Equipment for Liquefied Natural Gas – Design of Onshore Installations

(2) BS 7777 -2 - 1993. Flat-bottomed, vertical, cylindrical storage tanks for low temperature service. Specification for the design and construction of single, double and full containment metal tanks for the storage of liquefied gas at temperatures down to -165^0C.

LNG carriers of larger sizes, up to 215,000 m^3 have recently been ordered and these may be considered at a later stage by the Project Proponent.

In Hong Kong, the LNG carriers will require a water depth of -13.5 to -15 mPD depending on the static and dynamic allowances to be determined for the port approaches and harbour transit.

In transit to the receiving terminal, the LNG carrier will proceed through the designated fairways; turn into the approach channel towards the jetty; and then manoeuvred alongside with the assistance of tugs. Depending on the circumstances, turning the LNG carrier within the turning circle can either be on arrival or on departure.

At the berth, the carrier will be connected with the receiving terminal through the unloading arms. The LNG in the carrier will be delivered to the storage tanks using the carrier's discharge pumps. The unloading process will take approximately 12 to 18 hours. It is envisaged, based on the terminal throughput, that on average one LNG carrier will unload at the terminal every five to eight days.

Maintenance Dredging

Maintenance dredging may be required during the operational phase since the berth area, the approach channel and the turning circle will be subject to natural siltation. It is expected that maintenance dredging will be less frequent at South Soko than Black Point. The frequency and quantities of maintenance dredging will be confirmed during the EIA upon completion of a siltation study.

2.5.2 South Soko Option

Terminal Site

For the South Soko option, the preliminary terminal layout (*Figure 2.4a*) indicates that the proposed terminal and the associated facilities will be constructed near the northern section of the South Soko Island, occupying an area that was developed for the former detention centre.

The site will require levelling, preparation and excavation for the landside works. This will involve blasting to level the area of the proposed terminal, followed by grading with earth movers to ensure a suitable construction surface. Where possible the generated spoil may provide a source of backfill material for armouring of the submarine gas pipeline.

The initial phase of site formation, including site clearance and excavation of vegetation, topsoil and top fragmented layers of rock, will be excavated by machine. The remaining excavation will be conducted by drilling and blasting. Spare rock can be used for road embankments or crushed and used for road base and sub base, selected fill and blinding for buildings.

The navigation channel, turning circle and berth box will be dredged using a combination of grab and trailing suction hopper dredgers to a depth of -15 mPD to allow the safe navigation of LNG carriers.

The marine facilities for unloading LNG (jetty) will consist of a roadway trestle, a pipe trestle, an unloading platform and breasting and mooring dolphins. These structures are made of concrete decks founded on steel piles to the sea bottom. The jetty will connect to the shore by means of a rock/rip-rap footing, to which a temporary material off-loading dock (MOD) may be attached to facilitate marine construction. The roadway trestle will provide vehicle access to the LNG carrier berthing area and the pipe trestle will support a pipe rack.

Following the completion of the land works and basic infrastructure, the formed site will be handed over for permanent facilities construction. If the situation requires and if technically feasible, site development work may proceed in parallel with facilities construction to save time.

Gas Pipeline

A submarine gas pipeline of approximately 30 inch diameter (size to be confirmed during the EIA study) will be installed in order to supply natural gas from the LNG terminal at the South Soko Island to the Gas Receiving Station (GRS) at the BPPS. The pipeline would be situated below the seabed to a depth that would be dependent on the conditions and the area to be traversed. A number of alternative pipeline routes were studied. The alignment selected is entirely within HKSAR waters and does not cross any existing submarine utilities. The alignment avoids, to the largest extent possible, the restricted areas around the Hong Kong International Airport. The pipeline alignment will cross the Adamasta Channel, to the southwest of Lantau, and the Urmston Road, to the northeast of Lung Kwu Chau.

The preferred alignment avoids direct impacts to ecologically sensitive habitats within Sha Chau and Lung Kwu Chau Marine Park and the proposed Fan Lau Marine Park. The alignment is also located at a sufficient distance from marine ecological sensitive receivers, such as mud flats, seagrass beds and areas of highest density of dolphin sightings. Construction phase impacts to water quality should be temporary and minor.

The land-based construction works associated with the Black Point site would include laying the pipeline through an open trench followed by direct burial. The pipeline would, typically, be buried at about 1.1 m below ground level within a trench approximately 1 m wide. The onshore pipeline would have a protective coating and will be provided with cathodic protection.

The marine-based burial depths would generally be 3 m below the existing seabed level (in accordance with the requirements of the Marine Department). For marine areas that are considered to pose a threat to the integrity of the pipeline system through anchor drop/drag, protective measures would be required and may include rock armouring. The submarine gas pipeline

would be coated externally with an asphalt enamel coat and wrap and, would have an outer layer of steel reinforced concrete weight coating.

The submarine gas pipeline will be installed using dredging and jetting techniques. The engineering philosophy will be that the majority of the route will be jetted to avoid the need for excavation of marine sediment and subsequent off-site disposal. This will help to minimise impacts to water quality and therefore marine ecology. When dredged trenches are required, such as when the pipeline route crosses fairways, these will be dredged and backfilled with a combination of gravel and rock armour. Due to the relatively short construction time and proven installation methods, impacts to marine traffic are expected to be minimal.

Gas Receiving Station

The submarine gas pipeline from South Soko Island to the BPPS will terminate at a Gas Receiving Station (GRS). Facilities associated with the GRS are not complex and the site area requirements usually are small (60 x 60m). The GRS will be located within the BPPS site boundary. The layout can be arranged to suit the shape of the site, with due consideration being given to separation from sources of ignition, according to the relevant codes and standards.

Submarine Power Cable

Installation of a submarine power cable connecting CLP's substation at Shek Pik and the South Soko Island to supply electricity to the LNG terminal will involve: trench excavation at each landing point (approximately 35 m long and 5 m wide); cable laying using injection jetting technology (the "injector" will bury the cable in a narrow trench (0.25 m in width) to the required depth of around 5 m below the seabed); and post-lay where necessary. The length of the power cable is expected to be approximately 7.5 km and will consist of either a 132 kV (two circuits) or 11kV (six circuits) supply.

The alignment for the power cable largely follows the route of the existing water main that connects Tai A Chau with the reservoir at Shek Pik. The landing points will be selected so as to avoid/minimise disturbance to any natural shorelines. Although the landing points will be within 500m of the declared monument at Shek Pik there will be no disturbance to the monument. The alignment for the power cable does not affect any existing utilities.

Potential Submarine Water Main

There is an existing water main connecting Tai A Chau with Shek Pik that was in use during the operation of the detention centre. Since then the main has been decommissioned and its status as a potential water supply source to the Island is uncertain. Consequently, the proponent may be required to install a replacement submarine water main to the Island. It is likely that the water main would be installed using either the dredged or trenched method and this

will be subject to study during the EIA if it is confirmed that a replacement main is required.

The alignment for the water main would largely follow the route of the existing water main that connects Tai A Chau with the reservoir at Shek Pik. The landing points will be selected so as to avoid/minimise disturbance to any natural shorelines. Although the landing points will be within 500m of the declared monument at Shek Pik there will be no disturbance to the monument. The alignment for the potential water main would not affect any existing utilities.

2.5.3 Black Point Option

For the Black Point option, the preliminary terminal layout (*Figure 2.4e*) indicates that the proposed terminal and the associated facilities will be constructed to the southwest of the BPPS.

The site will require levelling, preparation and excavation for the landside works. This will involve blasting to level the area of the proposed terminal, followed by grading with earth movers to ensure a suitable construction surface. Where possible the generated spoil (earth and rock) will be used to construct seawalls, foundations and reclamation areas.

The initial phase of site formation, including site clearance and excavation of vegetation, topsoil and top fragmented layers of rock, will be excavated by machine. The remaining excavation will be conducted by drilling and blasting. The fragmented rock will be used for the reclamation of the seawall core and, secondary and primary armour layers. Spare rock can be used for road embankments or crushed and used for road base and sub base, selected fill and blinding for buildings.

The reclamation will be formed using dredged and drained methods of reclamation. Reclamation activities for the Project will include the construction of a seawall which will involve:

a. Dredging of sediments in the area below the reclamation and where the seawall will be located;

b. Placement of sand material in the dredged area for construction of the seawall;

c. Placement of rock material and concreting works to construct the seawall;

d. Infill of the area behind the seawall with marine sand fill and public filling materials (if available and required) to create the formed site;

e. Surcharge of the filled site with marine sand/public filling materials to assist settlement; and,

f. Removal of surcharge material and completion of the formed site.

A permanent seawall comprising sloping and vertical blockwork will be constructed around the seaward boundary of the reclamation to protect the reclamation site from wave and tidal action.

Dredging in the reclamation site is expected to be carried out using a combination of trailing suction hopper dredgers (TSHDs) and grab dredgers.

Dredging following similar methods will also be required for those areas within and along the turning circle and approach channel of a depth less than -15 mPD to accommodate the LNG carriers.

The marine facilities for unloading LNG (jetty) will consist of a roadway trestle, a pipe trestle, an unloading platform and breasting and mooring dolphins. These structures are made of concrete decks founded on steel piles to the sea bottom. The jetty will connect to the shore by means of a rock/rip-rap footing, to which a temporary material off-loading dock (MOD) may be attached to facilitate marine construction. The roadway trestle will provide vehicle access to the LNG carrier berthing area and the pipe trestle will support a pipe rack.

Following the completion of the land works and reclamation and basic infrastructure, the formed site will be handed over for permanent facilities construction.

2.6 *NUMBER AND TYPES OF DESIGNATED PROJECTS TO BE COVERED BY THE PROJECT PROFILE*

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

For both the South Soko Island and Black Point options:

- Construction of a storage and transfer facility of liquefied natural gas with a storage capacity of more than 200 tonnes (item *L.2* of *Part I* of *Schedule 2 of EIAO*);

- Dredging operation for the approach channel and turning circle that exceeds 500,000 m^3 (item *C.12* of *Part I* of *Schedule 2* of *EIAO*).

For the South Soko Island option only:

- Installation of a submarine gas pipeline connecting the proposed LNG terminal at the South Soko Island and the Black Point Power Station (item *H.2* of *Part I* of *Schedule 2* of *EIAO*);

- Dredging operation for the installation of a submarine power cable connecting Shek Pik with the proposed LNG terminal at South Soko which is less than 500m from the nearest boundary of an existing Site of Cultural Heritage (item *C.12(a)* of *Part I* of *Schedule 2* of *EIAO*); and,

- Potential dredging operation for the installation of a submarine water main connecting Shek Pik with the proposed LNG terminal at South Soko which is less than 500m from the nearest boundary of an existing Site of

Cultural Heritage (item *C.12(a)* of *Part I* of *Schedule 2* of *EIAO*). This item is to be confirmed.

For the Black Point option only:

- Reclamation works (including associated dredging works) of more than 5 ha in size (item *C.1* of *Part I* of *Schedule 2* of *EIAO*).

2.7 NAME, POSITION, TITLE AND TELEPHONE NUMBER OF CONTACT PERSON

Name, Position and Title	**Telephone Number**
Mr Richard Morse *Head of Environmental Strategy and Development, CLP Power*	2678-8189

3 OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

3.1 PROJECT PLANNING AND IMPLEMENTATION

The Project Proponent is **Castle Peak Power Company Limited (CAPCO)** with overall responsibility for the planning, design, construction and operation of the project. The Project Proponent has engaged Environmental Consultants to conduct an Environmental Impact Assessment (EIA) Study and Engineering Consultants to undertake the engineering design work. The Project will be implemented by Contractor(s) to be appointed by the Project Proponent at a subsequent stage.

3.2 PROJECT PROGRAMME

The source of the gas supply from the Yacheng field in mainland China could be depleted, depending on actual reserves and offtakes, early in the next decade. Construction of the LNG terminal is expected to commence in early 2007 and will deliver first gas in 2011. Indicative project milestones include the following:

- EIA Study: June 2005 – June 2006
- Award of Environmental Permit: July 2006
- Gazettal under *Foreshore and Sea-bed (Reclamations) Ordinance (Cap. 127)*, Potentially Hazardous Installation (PHI) Designation, Land Acquisition: November 2006 - September 2007
- Site Works: Commence 2007
- First Gas: 2011

After a successful commissioning programme, the LNG terminal is expected to be operational by 2011.

3.3 INTERACTIONS WITH BROADER PROGRAMME REQUIREMENTS OR OTHER PROJECTS

3.3.1 *South Soko Island*

At present there are no proposed projects that are planned to be constructed in sufficient proximity of the terminal at South Soko and the gas pipeline. The dredging works for the proposed Tonggu Waterway and the construction of the HK-Zhuhai-Macau Bridge and potential Western Port Development (CT10) are unlikely to be carried out concurrently with the construction works of the gas pipeline. This working assumption will be re-examined and confirmed at the EIA stage. The recent publication of the Lantau Concept

Plan has acknowledged that there are competing uses for the South Soko Island including the LNG terminal, a potential marine park and a spa resort.

3.3.2 Black Point

At present there are no projects that are planned to be constructed in proximity to the terminal at Black Point. The dredging works for the Tonggu Waterway are unlikely to be carried out concurrently with the construction works of the terminal. The Animal Carcass Treatment Facility, Sludge Treatment Facility and Waste-to-energy Facility have been proposed to be constructed at Nim Wan and Tsang Tsui (located at least 2 km from Black Point), but the programmes for these projects remain uncertain and are unlikely to coincide with that of the terminal. Nevertheless, the separation distance is such that cumulative impacts are unlikely to occur. This working assumption will be re-examined and confirmed at the EIA stage.

4 POSSIBLE IMPACTS ON THE ENVIRONMENT

4.1 INTRODUCTION

The following sections identify potential impacts to the environment. Technical issues are discussed in an option-specific manner, unless where specifically stated otherwise.

4.2 HAZARD TO LIFE

Safety is the principal consideration in the design, construction and operation of the LNG terminal. The design of the LNG terminal will comply with the European Standard *EN 1473 – Installation and Equipment for Liquefied Natural Gas - Design of Onshore Installations.*

The terminal will likely be classified as a Notifiable Gas Installation and hence subject to its requirements under the *Gas Safety Ordinance (Cap. 51)*. The terminal may also be classified as a Potentially Hazardous Installation (PHI) and have land use planning and control measures introduced in the vicinity of the site.

A preliminary risk assessment has been carried out during the site selection stage and found that the terminal operations are not likely to cause an unacceptable risk. As per Hong Kong regulatory requirements, a Quantitative Risk Assessment will be carried out during the EIA stage to ensure the potential risks of constructing and operating the LNG terminal and its associated facilities are considered and fall under the levels stipulated in the *Hong Kong Government Risk Guidelines (see Annex 4, Figure 1 of the EIAO-TM)*.

4.3 WATER QUALITY

4.3.1 *Construction*

Construction phase impacts of the Project are divided into the following marine work components:

For both options:

- Dredging for navigation channel, turning circle, and berthing area;

For the South Soko Option Only

- Installation of a submarine gas pipeline and electricity circuit using methods traditionally used in Hong Kong (e.g. ploughing, jetting); and
- Dredging trenches for the pipeline, which will be backfilled with gravel and rock to provide armouring protection.

For the Black Point Option Only

- Dredging seawall trenches for the terminal reclamation works;
- Filling the reclamation area with sand and suitable fill material;

The above works have the potential to affect the Water Quality Sensitive Receivers (WQSRs). The WQSRs are presented on *Figure 4.1a* and in *Table 4.3a*.

Table 4.3a Water Quality Sensitive Receivers Potentially Affected by the Project

No.	Description
Black Point Option and Submarine Gas Pipeline of the South Soko Island Option	
1	Pak Nai Site of Specific Scientific Interest (Pak Nai SSSI)
2	Seagrass bed and horseshoe crab nesting ground at Ha Pak Nai
3	Indo-Pacific Humpback Dolphin Feeding Ground (Urmston Road)
4	Cooling water intake for Black Point Power Station
5	Non-gazetted beaches at Lung Kwu Sheung Tan (Upper and Lower)
6	Sha Chau and Lung Kwu Chau Marine Park (including artificial reefs)
7	Cooling water intake for Castle Peak Power Station
8	Fisheries spawning and nursery ground NW Lantau waters
9	Indo-Pacific Hump-back Dolphin Feeding Ground (W Airport)
South Soko Island Option	
10	Horseshoe Crab Area near Sham Wat Wan
11	Indo-Pacific Humpback Dolphin Conservation Zone in Mainland waters (offshore to the southwest of Lantau Island)
12	Horseshoe Crab Area near Tai O
13	Indo-Pacific Humpback Dolphin Feeding Ground (SW Lantau)
14	Horseshoe Crab Area near Yi O
15	Non-gazetted beaches at SW Lantau
16	Fisheries spawning and nursery ground S Lantau waters
17	Winter and Spring month presence of Finless Porpoise

Terminal Site Formation at Black Point

Based on preliminary engineering information, it is envisaged that marine sediments will need to be removed for the reclamation seawalls. The dredging will be undertaken using either trailing suction hopper dredgers or grab dredgers. The primary impacts of the dredging on water quality are temporary increases in suspended sediment concentrations and potential decreases in dissolved oxygen. Such impacts may not only affect the water body within the works area but also the sensitive receivers in the vicinity.

Information on sediment quality from around Black Point indicates that all the pollutant concentrations are below the Upper Chemical Exceedance Level (UCEL), with Arsenic higher than the Lower Chemical Exceedance Level (LCEL). The impact of the dredging works on water quality will be assessed

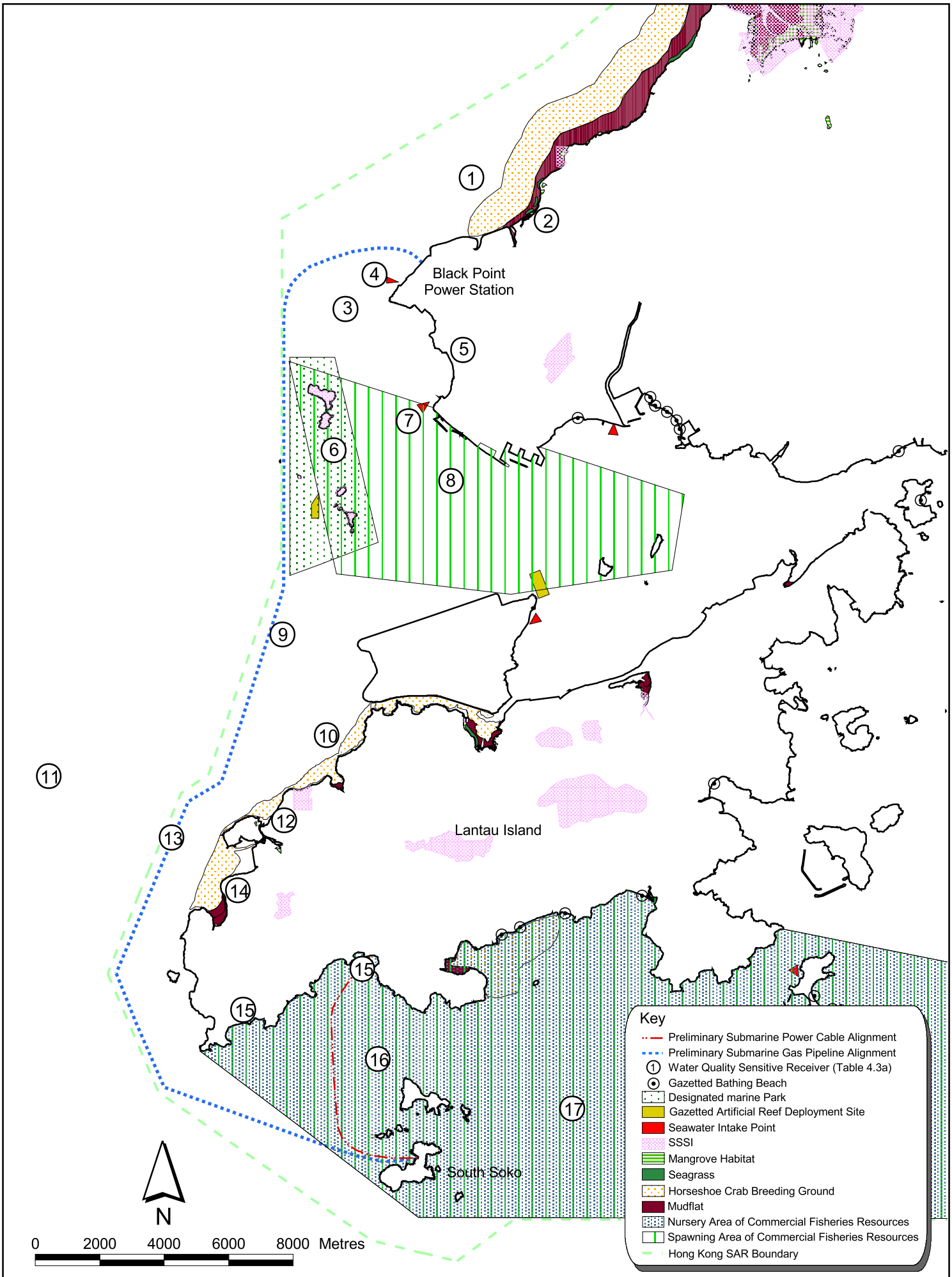

FIGURE 4.1a

Water Quality Sensitive Receivers

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in detail during the EIA Study. Mitigation measures will be proposed if found necessary to reduce any impacts to an acceptable level.

Discharges and runoff from the site during the construction phase, particularly during the filling and site formation works, will contain suspended solids. As this will potentially cause a water quality impact, mitigation measures will be implemented to ensure that any discharges resulting from the construction of the LNG terminal comply with the marine water quality standards detailed in the *Water Pollution Control Ordinance (Cap. 358)*.

Navigation Channel and Turning Circle

Based on preliminary engineering information, it is envisaged that at both sites greater than 500,000 m^3 of marine sediments have to be removed in order to allow safe transit of the LNG carrier to and from the jetty. The dredging will be undertaken using either trailing suction hopper dredgers or grab dredgers. The primary impacts of the dredging works on water quality are temporary increases in suspended sediment concentrations and potential marginal decreases in dissolved oxygen levels. Such impacts may not only affect the water body within the works area but also the sensitive receivers in the vicinity.

The impact of the dredging on water quality will be assessed in detail during the EIA Study. Mitigation measures will be proposed if found necessary.

Submarine Gas Pipeline for the South Soko Island Option Only

As discussed in *Section 2,* the jetting method will be employed for the majority of the route alignment. The jetting method will cause sediment to be suspended into the water column during burial of the pipeline, but this sediment is expected to rapidly settle onto the seabed. This indicates that sediment would not be transported beyond the immediate vicinity of the jetting machine and, as such, it is considered unlikely that there would be any adverse impacts to sensitive receivers. Along the section of the pipeline to be laid adjacent to the Sha Chau Lung Kwu Chau Marine Park, additional measures may be required to minimise the amount of suspended sediment that enters the waters of the Marine Park. Given that appropriate measures will be adopted and the short-term nature of the works, impacts to the ecological resources within the Marine Park will be limited.

The trench dredged sections along the alignment have the potential to cause impacts to water quality. In the northern section close to Black Point it is expected that the main concern will be related to the release of contaminants into the water column during dredging. Trench dredging will be undertaken at the following sections of the proposed pipeline corridor:

- Potential excavation of a total of around 150,000 m^3 at the sections of the pipeline alignment that cross the Urmston Road and the Adamasta Channel;

- Potential excavation of a total of around 80,000 m^3 at the shore approaches at Black Point and South Soko; and,

- Potential excavation of sediment at the section of the pipeline alignment that falls within the area of the proposed new Container Terminal 10 in West Lantau (should it proceed).

The estimated total volume of sediment to be dredged and disposed of for the pipeline route is not expected to exceed 500,000 m^3 (assuming a worst case option of a trench with a 1:5 slope). The exact volume will be determined during the EIA, based on the results of the site investigation works.

It is recommended that computer modelling of sediment plume dispersion and water quality be carried out as part of the EIA to simulate the impacts from jetting and dredging operations. Such modelling would determine the fate of sediments entering suspension during dredging and the resultant suspended sediment concentrations in the receiving waters and at sensitive receivers.

Submarine Power Cable for the South Soko Island Option Only

It is expected that the submarine power cable will be ploughed into the seabed along the majority of its alignment. Such works avoid the need for large scale dredging and therefore do not cause large disturbances to the seabed or water column. This technique is regularly used in Hong Kong for cable laying and is acknowledged to give rise to minimal impacts to water quality, marine ecology and fisheries resources.

Mitigation measures will be proposed if found necessary based on the findings of the above mentioned modelling studies.

4.3.2 Operation

During the operation of the LNG terminal it is expected that discharges will include cooled water, as seawater will be used for warming the LNG in the Open Rack Vaporizers. Compliance with the Water Quality Objectives (WQO) ($\Delta \pm 2^0$C from ambient) must be achieved at sensitive receivers. For operational reasons, the discharges will likely contain antifoulants and consequently their concentration in the effluent must comply with the *Water Pollution Control Ordinance Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters*.

Detailed modelling at the EIA stage will be carried out to determine the potential impact and recommend the position of the discharge point so as to minimise any potential adverse impacts. At Black Point, specifically, there may be opportunity to integrate the terminal's cold energy with the cooling water requirements of the BPPS.

Options for further mitigation will be considered in the EIA Study if found to be necessary.

4.4 MARINE ECOLOGY

4.4.1 Construction

The CAPCO team for this Project has conducted detailed reviews of literature on marine ecological resources as part of the site selection studies. CAPCO has also commissioned marine ecological surveys, which were carried out during the wet and dry seasons of 2004.

South Soko Island

The surveys examined the major habitats and species surrounding the South Soko Island, as well as along the preliminary pipeline alignment to Black Point. It was found that the marine ecological habitats and resources ranged from low to high ecological importance dependent on the location.

The survey work and literature review indicated that both of Hong Kong's marine mammals, the Indo-Pacific Humpback Dolphin *Sousa chinensis* and the Finless Porpoise *Neophocaena phocaenoides*, are present around the South Soko Island. Along the pipeline alignment only the Indo-Pacific Humpback Dolphin has been recorded. The work has identified that the waters to the West of Lantau support the highest abundance and density of humpback dolphins when compared to other areas. Sightings of both species around the South Soko Island varied according to the season with highest numbers in winter and spring.

Aside from the marine mammals no other species or habitats of high or medium ecological importance were identified around the South Soko Island or along the provisional pipeline alignment.

Impacts to ecological resources during construction will consist of the following:

- Indirect impacts to marine ecological resources around the marine works areas as a result of perturbations to water quality due to the activities described in *Section 4.4*. Soft-bottom subtidal organisms that will be disturbed during the laying of the gas pipeline, cable, navigation channel and turning circle dredging are commonly recorded elsewhere in Hong Kong waters. The minor loss of benthic organisms (directly) along the proposed pipeline and cable route, navigation channel and turning circle areas is therefore not considered to represent an unacceptable ecological impact. The rapid reinstatement of the seabed will result in prompt recolonisation by marine organisms in the potentially affected area, and hence, no permanent impacts are likely to occur. Desktop information on the seabed conditions within the proposed pipeline and cable routing corridors, navigation channel and turning circle indicates that the seabed is composed mainly of soft muds that are repeatedly reworked by the demersal trawlers that operate in the area. As a consequence, it is not expected that organisms of high ecological value will be located directly within the pipeline routing corridor. Sediment plume modelling, recommended to be conducted as part of the EIA, is necessary for a

detailed assessment of the impacts to water quality which is, in turn, essential for a thorough evaluation of indirect impacts to marine ecological resources.

- Underwater noise impacts to marine mammals as a result of piling works for the LNG unloading jetty and trestle. Mitigation measures exist for controlling the propagation of sound underwater and these have been applied effectively in Hong Kong and include the use of bubble jackets and bubble curtains. The EIA will examine this matter in detail through the conduct of an underwater noise assessment.

Black Point

The surveys examined the major habitats and species surrounding Black Point. It was found that the marine ecological habitat and resources were generally of low to medium ecological importance dependent on the location.

The survey work and literature review indicated that the Indo-Pacific Humpback Dolphin *Sousa chinensis* is present in the vicinity of Black Point. Marine waters around Black Point were regarded as of medium importance to these marine mammals in comparison to other areas in Hong Kong. Aside from the marine mammals, no other marine species or habitats of high or medium ecological importance were identified around Black Point. The majority of other marine habitats were considered to be of low ecological importance.

Impacts to ecological resources during construction will consist of the following:

- Direct loss of approximately 15 ha of marine habitats located within the reclamation area. The habitats located within the reclamation area include artificial seawalls, rocky shores and soft benthos. Recolonisation by marine organisms on the seawalls is expected to occur rapidly. Soft-bottom subtidal organisms that will be lost during the reclamation works are commonly recorded elsewhere in Hong Kong waters.

- Indirect impacts to marine ecological resources around the marine works areas (terminal) as a result of perturbations to water quality due to the activities described in *Section 4.4*. Soft-bottom subtidal organisms that will be disturbed during the navigation channel and turning circle dredging are commonly recorded elsewhere in Hong Kong waters. The minor loss of benthic organisms (directly) along the proposed navigation channel and turning circle is therefore not considered to represent an unacceptable ecological impact. The rapid reinstatement of the seabed will result in prompt recolonisation of marine organisms in the potentially affected area, and hence, no permanent impacts are likely to occur. Desktop information on the seabed conditions within the proposed navigation channel and turning circle indicates that the seabed is composed mainly of soft muds that are repeatedly reworked by the demersal trawlers that operate in the area. Sediment plume modelling, recommended to be

conducted as part of the EIA, is necessary for a detailed assessment of impacts to water quality which is, in turn, essential for a thorough evaluation of indirect impacts to marine ecological resources.

- Underwater noise impacts to humpback dolphins as a result of piling works for the LNG unloading jetty and trestle. Mitigation measures exist for controlling the propagation of sound underwater and these have been applied effectively in Hong Kong and include the use of bubble jackets and bubble curtains. The EIA will examine this matter in detail through the conduct of an underwater noise assessment.

4.4.2 Operation

The operation of the terminal is expected to involve the intake of seawater into open-rack vaporisers and the subsequent discharge of cooled water. LNG will be vaporized by exchanging heat with seawater in the open-rack vaporisers. The cooled water and associated antifoulants such as chlorine in the effluent have the potential to impact sensitive marine habitats. The engineering design studies to be conducted during the EIA will have as one of the key issues an examination of measures to minimise the effect of the discharges on marine sensitive receivers such as fisheries spawning and nursery grounds.

4.5 FISHERIES

4.5.1 Construction

South Soko Island

Reviews of existing information on commercial fisheries resources and fishing operations in the waters adjacent to the proposed South Soko LNG terminal and along the proposed submarine gas pipeline route have been undertaken. Information from a study on fishing operations in Hong Kong and the Agriculture, Fisheries and Conservation Department (AFCD) Port Survey 2001/2002 indicate that fisheries production values in the vicinity of the assessment area vary from low to high. There are no licensed fish culture activities present within 12 km of the project works.

Potential impacts to fisheries resources and fishing operations may arise from disturbances to benthic habitats on which the fisheries resources depend for food, or through changes to key water quality parameters, as a result of the dredging works and installation of the gas pipeline. As impacts arising from the proposed dredging or jetting works are expected to be largely confined to the specific works areas and of short duration, and the expected elevations of suspended sediment due to the Project are not expected to exceed environmental standards, they are not expected to cause adverse impacts to water quality, fishing grounds or species of importance to the fishery. While no special mitigation measures are required, constraints on jetting and dredging operations recommended to control impacts to water quality to

within acceptable levels are also expected to mitigate impacts to fisheries resources.

Black Point

Reviews of existing information on commercial fisheries resources and fishing operations surrounding the waters adjacent to the proposed Black Point LNG terminal have been undertaken. Information from a study on fishing operations in Hong Kong and the Agriculture, Fisheries and Conservation Department (AFCD) Port Survey 2001/2002 indicate that fisheries production values in the vicinity of the assessment area are low. There are no licensed fish culture activities present within 21 km of the project works.

Adult capture fisheries resources are unlikely to be adversely impacted by the LNG terminal as they will likely avoid the works areas. Although impacts to fish fry may occur through the permanent loss of habitat and/or elevated suspended sediment levels as a result of the proposed reclamation works, these impacts are predicted to be acceptable with the appropriate mitigation measures in place to control impacts to water quality.

Potential impacts to fisheries resources and fishing operations may arise from disturbances to benthic habitats on which the fisheries resources depend for food, or through changes to key water quality parameters, as a result of the dredging and reclamation works. As impacts arising from the proposed dredging and reclamation works are expected to be largely confined to the specific works areas and of short duration, and the expected elevations of suspended sediment due to the Project are not expected to exceed environmental standards, they are not expected to cause adverse impacts to water quality, fishing grounds or species of importance to the fishery. While no special mitigation measures are required, constraints on reclamation and dredging operations recommended to control impacts to water quality to within acceptable levels are also expected to mitigate impacts to fisheries resources.

4.5.2 Operation

The operation of the terminal is expected to involve the intake of seawater into open rack vaporisers and the discharge of cooled seawater. The volume of seawater intake and the cooled seawater and associated antifoulants in the effluent has the potential to impact juvenile fish and fish fry. The engineering design studies to be conducted during the EIA will have as one of the key issues an examination of measures to minimise impacts to marine sensitive receivers, such as fisheries spawning and nursery grounds.

4.6 TERRESTRIAL ECOLOGY

4.6.1 Construction

The CAPCO team for this Project has conducted detailed reviews of literature on terrestrial ecological resources as part of the site selection studies.

CAPCO has also commissioned terrestrial ecological surveys, which were carried out during the wet and dry seasons of 2004.

South Soko Island

The baseline ecological surveys carried out at South Soko in 2004 showed that approximately half of the land that may be used for the LNG terminal had previously been heavily disturbed during the construction and later decommissioning of the former detention centre and its associated facilities (see *Section 2.4.1*). The remaining area is dominated by disturbed shrubland and grassland of low ecological importance. Neither rare nor protected plant species were recorded during the surveys and the dominant vegetation species recorded were mainly shrubs and climbers. The wildlife surveys undertaken have indicated that faunal diversity in South Soko is low to moderate and all of the recorded species are considered to be common and widespread in Hong Kong.

Black Point

The baseline ecological surveys carried out at Black Point in 2004 showed that the terrestrial ecological resources recorded in the vicinity of the proposed project site included plantation, shrubland, shrubby grassland, stream/channel, orchard and developed areas, as well as associated wildlife. Of these habitats, shrubland located to the west and southwest of the headland has moderate ecological importance. Shrubland located at the southern part of the headland and a stream were of low to moderate ecological importance, while the remaining habitats are of low or very low ecological importance.

The construction activities for the terminal would involve cutting and excavation mainly in areas of very low and low ecological importance. The terrestrial ecological impact is expected to be minimal.

4.6.2 Operation

Adverse operational impacts to the terrestrial habitats nearby are unlikely to occur.

4.7 WASTE MANAGEMENT

4.7.1 Construction

The most significant construction waste impact for the Project will be handling and disposal of marine sediment associated with the dredging works for the activities discussed in *Section 4.4*. The management and disposal of the dredged material will follow the procedures and requirements specified in *ETWBTC 34/2002*, and a Marine Dumping Permit will be obtained under the *Dumping at Sea Ordinance (Cap. 466)*. Dependent on the final design for the site formation activities there may be a surplus of excavated material that will

require off-site disposal. Reuse of inert excavated materials will be maximised during the reclamation works, where practicable.

Other construction wastes, such as general refuse, will be generated in limited quantities and normal waste management practices will be implemented.

4.7.2 Operation

During the day-to-day operations of the LNG terminal waste will be largely limited to general refuse and normal waste management practices will be implemented.

4.8 CULTURAL HERITAGE AND ARCHAEOLOGY

4.8.1 Construction

South Soko

On South Soko Island a local temple is dedicated to the worship of Tin Hau, the Goddess of seafarers. It is not known when the temple was built but it had been renovated in 2000. The temple is not managed by the Chinese Temples Committee and may need to be relocated during the construction of the LNG terminal.

According to the Antiquities & Monuments Office (AMO) of the Leisure & Cultural Services Department (LCSD) part of the South Soko Island is listed as an archaeological site (Tai A Chau Archaeological Site). This indicates that there is a reasonable potential for both terrestrial and marine sites/artefacts of archaeological importance to be present within the construction work areas. An archaeological investigation has therefore been undertaken and reported to AMO in 2004. The results suggested that, in general, the site has been highly disturbed as a result of the construction and decommissioning of the detention centre. However, there remains at least one stable cultural layer beneath the site of the former detention centre. The cultural layer is located within the proposed footprint of the terminal and consequently there may have to be a rescue excavation during site formation. This issue will be examined in detail in the EIA.

For the submarine cable, the potential for terrestrial sites of cultural heritage to exist has been examined through a literature review which identified a declared monument (the Ancient Rock Carving at Shek Pik on Lantau Island) and an archaeological site (the Tung Wan Archaeological Site). These two locations are adjacent to the potential site of the landing point for the submarine cable at Shek Pik (~200m).

The proposed pipeline and submarine cable routing corridors have marine archaeological potential due to the historical use of the Pearl River Delta areas for trade and fishing activities. Consequently, the potential exists for impacts to occur to marine archaeological materials. The procedures outlined by the AMO will be followed which consist of the following:

- Baseline review of existing information;
- Geophysical survey of the dredging areas using high resolution boomer, side scan sonar and an echo sounder;
- Establishment of archaeological potential will then be determined from Tasks 1 and 2 and a written report with charts provided to AMO.

Should a high potential for archaeological material be identified, then recommendations will be made for a watching brief to be maintained during the pipeline and cable installation operations.

Black Point

As there is no Declared Monument or Deemed Monument located within the project area, no existing sites of cultural heritage protected under the *Antiquities and Monuments Ordinance (Cap. 53)* have been identified and thus adverse construction impacts are not expected.

Two derelict building structures of low heritage value have been identified within the proposed project area. Direct loss of these two building structures is expected as a result of the proposed construction works. Given the low heritage value of the structures, the impact is considered acceptable.

A desktop review indicated that the marine area around Black Point has marine archaeological potential. Although no shipwreck record has been identified within the proposed project area, the marine archaeological potential cannot be ruled out at this stage. Further marine archaeological investigation, following Marine Archaeological Investigation (MAI) guidelines established by AMO, is recommended to collect field data for further detailed assessment during the EIA stage.

Should a high potential for archaeological material be identified, then recommendations will be made for a watching brief to be maintained during the construction.

4.8.2 Operation

No adverse cultural heritage impact is envisaged during the operation of the LNG terminal.

4.9 LANDSCAPE & VISUAL

4.9.1 Construction

South Soko Island

During the site formation work, a substantial amount of excavation will occur into the side slopes of the hills on South Soko Island. Excavation will be required and vegetation including grassland and scrub will be lost. The landscape and visual resources of the island will potentially be affected by the

construction of the LNG terminal. The landscape and Visual Sensitive Receivers to be potentially affected include the vessels passing by the South Soko Island. Due to the screening effect of the North Soko Island, it is expected that only parts of the construction area would be visible from the distant land-based receivers. These sensitive receivers include hikers in the Lantau South Country Park, and visitors to gazetted beaches. Considering that all sensitive receivers would have distant views towards the proposed LNG terminal (> 6 km) and would rely on excellent visibility conditions, the level of visual impacts is considered to be of low severity.

Black Point

The site formation at Black Point will involve the loss of the existing hillside along the southwestern boundary of the existing BPPS site. Excavation, leaving cut-slopes of up to a maximum height of 105 m, is required and approximately 6.9 ha of shrubland will be permanently lost due to the construction of the LNG terminal platform. In addition, part of the site will be formed by reclamation and the total length of coastline loss due to reclamation will be < 650 m. The change caused by the proposed LNG terminal would be consistent with the current industrial use of the area, and hence the level of landscape impacts is considered to be moderate.

4.9.2 Operation

South Soko

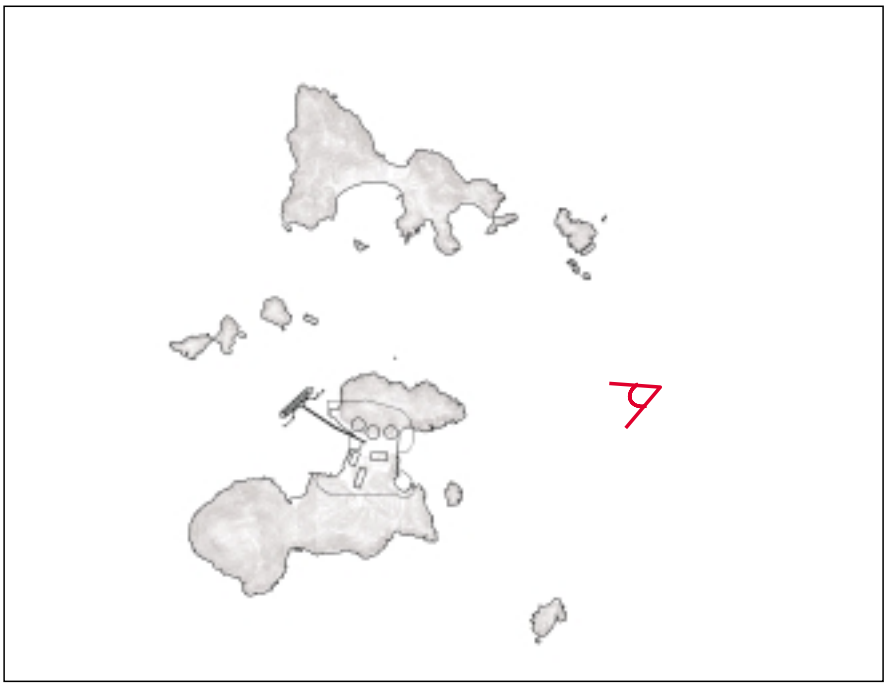
The LNG terminal at South Soko would contrast with the existing character of the island. Although part of the site is currently covered with concrete that was left in place following demolition of the decommissioned refugee detention centre, the LNG terminal would be considered to have a potential visual impact, considering the relatively undeveloped nature of the South Soko Island as a whole. The landscape and Visual Sensitive Receivers potentially affected are the vessels passing by the South Soko, hikers in the Lantau South Country Park, and visitors to gazetted beaches. With this in mind the storage tanks have been positioned so that they are partially screened to the north by the hillside of Fei Kei Teng. Considering that all sensitive receivers would have distant views towards the proposed LNG terminal (> 6 km) and would rely on excellent visibility conditions, the level of visual impacts is considered to be minimal. Views of the proposed LNG terminal from representative viewpoints are presented in *Figures 4.9a* and *4.9b.*

Black Point

The proposed LNG terminal would not be visible to the majority of the land-based Visual Sensitive Receiver (VSR) group. In particular, the more sensitive receivers including Lung Kwu Tan village, which is the nearest residential development, located approximately 3 km southeast of the site, would be screened by the Black Point headland. Other VSR groups including visitors to Lung Kwu Chau, will have restricted views of the site, as part of the site will be screened by the Black Point headland.

Existing Conditions (view from boat at sea level)

Year 1 of operation - based on preliminary conceptual layout



Viewpoint

Figure 4.9a

A Computer Simulated View of
the Proposed South Soko LNG Terminal

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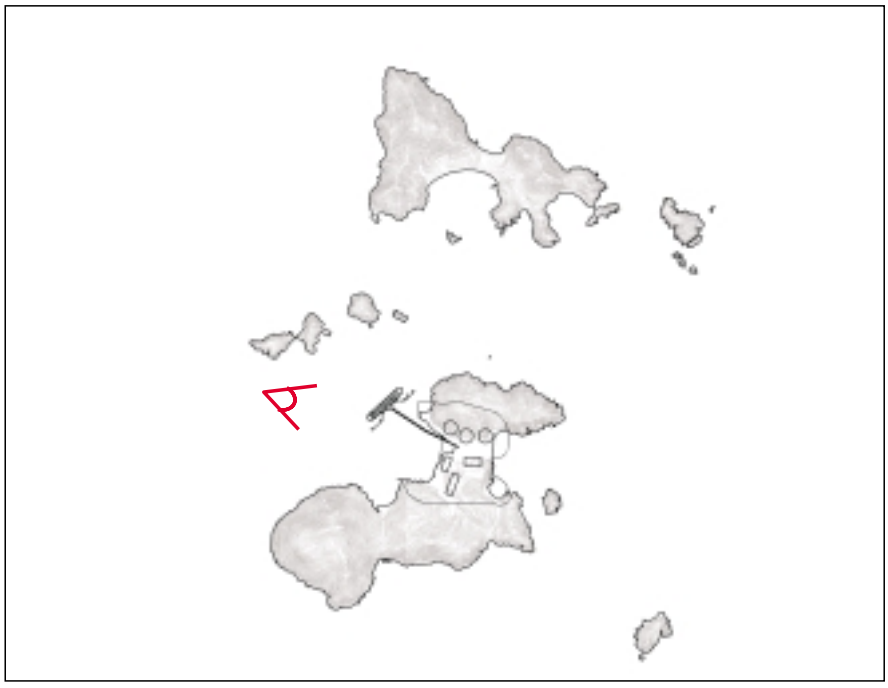
Existing Conditions (view from boat at sea level)

Year 1 of operation - based on preliminary conceptual layout



Viewpoint

Figure 4.9b

A Computer Simulated View of
the Proposed South Soko LNG Terminal

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The only group which will have a direct view of the site will be passengers on ferry routes passing by Black Point. However, in view of the transient nature of this impact, and the existing industrial character of the area, the level of visual impact is considered to be low. Views of the proposed LNG terminal at Black Point from representative viewpoints are presented in *Figures 4.9c* and *4.9d*.

4.10 AIR QUALITY

4.10.1 Construction

Dust arising from the construction works is a potential concern during the construction phase. Construction works may include site formation, reclamation, dredging and facilities construction. Blasting, excavation, filling and materials handling are the major dust generating activities. No Air Sensitive Receivers (ASRs) are identified in close proximity of either site. The nearest ASR for South Soko is identified at Shek Pik, which is at least 6 km away from the site. At Black Point the administration building of BPPS and a village house in Lung Kwu Sheung Tan are the closest ASRs and are 600 m and 1.7 km away, respectively. Due to the large separation distance and with the implementation of the dust suppression measures stipulated in the *Air Pollution Control (Construction Dust) Regulation*, the potential dust impacts would be limited and well within the relevant criteria.

Air emissions from construction plant would be expected; however, due to the large separation distances between the sites and the ASRs, the impacts would be minimal and well within the relevant standards.

No quantitative construction phase assessment is therefore required.

4.10.2 Operation

During the operation of the terminal, stack emissions from back-up submerged combustion vaporisers, emergency generator and diesel-driven firewater pumps are potential sources of air quality impacts. The separation distances between the sources and the ASRs at both locations are large and only infrequent operation is expected. Adverse air quality impacts are not envisaged. Air dispersion modelling will be carried out to confirm the scale and significance of any impacts.

4.11 NOISE

4.11.1 Construction

Construction activities including site formation, reclamation, dredging and facilities construction will involve the use of Powered Mechanical Equipment (PME). The use of PME has the potential to generate construction noise. The closest Noise Sensitive Receivers (NSR) to the LNG terminal at South Soko are village houses at Shek Pik on Lantau Island (>6 km from the

Existing Conditions (aerial view)

Year 1 of operation - based on preliminary conceptual layout

Figure 4.9c

A Computer Simulated View of the Proposed Black Point LNG Terminal

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DATE: 17/03/05

Environmental Resources Management

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Existing Conditions (view from boat at sea level)

Year 1 of operation - based on preliminary conceptual layout

View from Urmston Road, at sea level looking North

Figure 4.9d

A Computer Simulated View of the Proposed Black Point LNG Terminal

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Environmental Resources Management

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terminal) and for Black Point, a village house at Lung Kwu Sheung Tan (> 1.7 km from the terminal). These NSRs are remote and are consequently not expected to be affected by construction noise. The EIA will confirm this interim conclusion.

4.11.2 Operation

Fixed plant noise will be produced by the facilities present at the LNG terminal, which could potentially include:

- LNG submerged combustion vaporizers (as back-up);
- Blowers, compressors and generators;
- Various kinds of pumps; and
- Special equipment such as nitrogen generator and vents.

Reviews of information from other operating terminals worldwide indicate that these facilities are not considered noisy. Consequently, the remote village houses on Lantau Island (South Soko) and at Lung Kwu Cheung Tan (Black Point) are not expected to be affected by operational noise from the LNG terminal due to the large separation distances.

4.12 OTHER ISSUES

4.12.1 Night-Time Operations

Construction

Night-time construction works may be required. The use of PME during the restricted hours, i.e. 1900 to 0700 will require Construction Noise Permit (CNP). Assessments to demonstrate that the construction activities will not cause adverse noise impacts will need to be provided by the contractor to support an application for a CNP.

Operation

The LNG terminal will operate on a 24-hour basis to provide a consistent and reliable supply of natural gas to the power station in Black Point. Therefore, nighttime operation of the LNG carrier, unloading arms as well as jetty facilities are likely.

4.12.2 Traffic Generation

Construction

Marine traffic will be generated during the construction of the LNG terminal. Vessel movements for material delivery, waste transportation, dredging, pipeline, jetty and terminal construction, and ferries for transporting workers are required during the construction period.

Operation

It is envisaged, based on the terminal throughput, that on average one LNG carrier will unload at the terminal every five to eight days.

4.13 SUMMARY OF KEY ISSUES

The table below (*Table 4.13a*) presents a summary of the key issues under various technical aspects for each of the two siting options.

Table 4.13a Summary Table of Key Issues

ISSUE	- BLACK POINT -	- SOUTH SOKO -
HAZARD TO LIFE	The societal and individual risks for the Black Point site are expected to meet the Hong Kong Risk Guidelines. A study to confirm this will be conducted.	The societal and individual risks for the South Soko site are expected to meet the Hong Kong Risk Guidelines. A study to confirm this will be conducted.
WATER QUALITY	Water quality impacts as a result of the operational phase discharges are likely to be very minor and acceptable. If necessary, mitigation measures will be proposed to reduce any impacts to acceptable levels.	Water quality impacts as a result of the operational phase discharges are likely to be very minor and acceptable. If necessary, mitigation measures will be proposed to reduce any impacts to acceptable levels.
MARINE ECOLOGY	No unacceptable impacts are expected to occur to marine ecological resources with the implementation of appropriate mitigation measures.	The key sensitive receivers for this option are the two resident marine mammals in Hong Kong, Indo-pacific Humpback Dolphin and Finless Porpoise. Impacts are not expected to be unacceptable as key habitats have been avoided to the largest extent practical and standard mitigation measures will be adopted.
FISHERIES	Mitigation measures that will be designed to mitigate impacts to water quality to acceptable levels (compliance with Water Quality Objectives) are also expected to mitigate impacts to fisheries resources.	During the operation phase of the LNG terminal at South Soko adverse impacts to fisheries resources are not expected to occur. The area affected by the cooled water discharge is expected to be small and restricted to the immediate vicinity of the discharge point. Mitigation measures that will be designed to mitigate impacts to water quality to acceptable levels (compliance with Water Quality Objectives) are also expected to mitigate impacts to fisheries resources.
TERRESTRIAL ECOLOGY	No unacceptable impacts are expected to occur to terrestrial ecological resources due to the development and operation of the LNG terminal at Black Point.	No unacceptable impacts are expected to occur to terrestrial ecological resources due to the development and operation of the LNG terminal at South Soko.

WASTE MANAGEMENT	The key potential impacts during the construction phase expect to be related to the disposal of surplus public fill and dredged marine sediments. No unacceptable waste management impacts are anticipated.	The key potential impacts during the construction phase expect to be related to the disposal of surplus public fill and dredged marine sediments. No unacceptable waste management impacts are anticipated.
CULTURAL HERITAGE	No unacceptable impacts on cultural heritage are expected to occur with the implementation of any necessary and appropriate mitigation measures.	The impact on cultural heritage caused by the potential removal of the Tin Hau Temple can be mitigated by relocation of the Temple. The impact on any remaining archaeological deposits at the former detention centre within the Tai A Chau Archaeological Site could be mitigated by rescue excavation to preserve the archaeological deposit by record. With the implantation of any necessary and appropriate mitigation measures, no unacceptable impacts on cultural heritage are expected.
LANDSCAPE & VISUAL	The proposed LNG terminal would be only visible from limited viewpoints, including the small number of visitors on Lung Kwu Chau and the transient passengers on ferry routes. Owing to the current industrial character of the area, the level of landscape impact is expected to be moderate. Considering the small number of potential VSRs affected and the existing industrial character of the area, the level of visual impact would likely be of low severity.	The only visual sensitive group, which would have a direct view of the site and is less than 4km away, will be passengers on ferry routes. Other VSRs would have distant views (>6km) towards the proposed LNG terminal that would require excellent visibility conditions. Due to the relatively disturbed conditions of the island, the overall impact on the landscape quality of the island itself would be expected to be moderate/ significant. The level of visual impact is likely to be small given that the views would be based on excellent prevailing visibility conditions.
AIR QUALITY	Due to the large separation from the Air Sensitive Receivers (ASRs) at Leung Kwu Sheung Tan and with the implementation of the dust suppression measures stipulated in the *Air Pollution Control (Construction Dust) Regulation*, the construction dust impacts and operational emissions are expected to be within the Air Quality Objectives criteria.	Due to the large separation from the Air Sensitive Receivers (ASRs) at Shek Pik and with the implementation of the dust suppression measures stipulated in the *Air Pollution Control (Construction Dust) Regulation*, the construction dust impacts and operational emissions are expected to be within the Air Quality Objectives criteria.
NOISE	Due to the large separation distance between the village house at Lung Kwu Sheung Tan and the noise sources as well as the barrier effect of the Black Point Headland, the predicted noise levels are expected to be within the *Noise Control Ordinance* daytime and night time criteria.	Due to the large separation distance between the village house at Shek Pik and the noise sources, the predicted noise levels are expected to be within the *Noise Control Ordinance* daytime and night time criteria.

The land-based sections of the Project will be at South Soko Island or at Black Point (within the boundary of the existing Black Point Power Station).

5.1 SOUTH SOKO ISLAND

The South Soko Island is located approximately 4.5 km south of Lantau. The site was developed as a refugee detention centre and subsequently decommissioned, leaving a large concrete surface on the flat lowland area of the island and engineered slopes. A Tin Hau temple, a helipad and two jetties exist at the site area and may be relocated as part of the construction of the LNG terminal.

Air, noise and landscape and visual sensitive receivers are distant since the island is relatively remote. The sensitive receivers that may be affected by the construction and operation of the LNG terminal include:

- Pak Nai Site of Specific Scientific Interest (Pak Nai SSSI)
- Seagrass bed and horseshoe crab nesting ground at Ha Pak Nai
- Indo-Pacific Humpback Dolphin Feeding Ground (Urmston Road)
- Cooling water intake for Black Point Power Station
- Non-gazetted beaches at Lung Kwu Sheung Tan (Upper and Lower)
- Sha Chau and Lung Kwu Chau Marine Park (including artificial reefs)
- Cooling water intake for Castle Peak Power Station
- Fisheries spawning and nursery ground NW Lantau waters
- Indo-Pacific Hump-back Dolphin Feeding Ground (W Airport)
- Horseshoe Crab Area near Sham Wat Wan
- Indo-Pacific Humpback Dolphin Conservation Zone in Mainland waters (offshore to the southwest of Lantau Island)
- Horseshoe Crab Area near Tai O
- Indo-Pacific Humpback Dolphin Feeding Ground (SW Lantau)
- Horseshoe Crab Area near Yi O
- Non-gazetted beaches at SW Lantau
- Fisheries spawning and nursery ground S Lantau waters

- Winter and Spring month presence of Finless Porpoise
- Archaeological Remains within Tai A Chau Archaeological Site;
- Tin Hau Temple at South Soko
- Ancient Rock Carving and the Tung Wan Archaeological Site at Shek Pik

5.2 BLACK POINT

The proposed Black Point LNG terminal will be located on the north face of the Black Point headland, in close proximity to the BPPS. The natural habitats on the headland in the vicinity of the proposed Project site are mainly shrubland of moderate ecological importance. Two locally protected but common floral species, Pitcher Plant and Bamboo Orchid, have been recorded in the vicinity.

To the north of the proposed Project site is the Pak Nai Site of Specific Scientific Interest (Pak Nai SSSI) (> 4.5 km) and the seagrass bed and horseshoe crab nursery ground at Ha Pak Nai (> 3 km). The marine areas off Black Point have been identified as habitat for the Indo-Pacific Humpback Dolphin. North West Lantau waters are known to be fisheries spawning and nursery areas.

Sensitive receivers identified for hazard to life, air quality, noise and landscape and visual impacts include the village houses at Lung Kwu Sheung Tan.

The sensitive receivers that may be affected by the construction and operation of the LNG terminal include:

- Pak Nai Site of Specific Scientific Interest (Pak Nai SSSI)
- Seagrass bed and horseshoe crab nesting ground at Ha Pak Nai
- Indo-Pacific Humpback Dolphin Feeding Ground (Urmston Road)
- Cooling water intake for Black Point Power Station
- Non-gazetted beaches at Lung Kwu Sheung Tan (Upper and Lower)
- Sha Chau and Lung Kwu Chau Marine Park (including artificial reefs)
- Cooling water intake for Castle Peak Power Station
- Fisheries spawning and nursery ground NW Lantau waters
- Indo-Pacific Hump-back Dolphin Feeding Ground (W Airport)
- Village Houses at Lung Kwu Sheung Tan

5.3 EIA STUDY

The EIA Study will pay particular attention to impacts to the above sensitive receivers and if necessary, mitigation measures will be proposed in accordance with the requirements of the *EIAO*.

6 ENVIRONMENTAL PROTECTION MEASURES

6.1 HAZARD TO LIFE

As discussed in *Section 2* of this Project Profile the LNG terminal will be designed and operated according to the European Standard *EN 1473 – Installation and Equipment for Liquefied Natural Gas - Design of Onshore Installations.*

In addition to the EIA there will be several other risk-related permitting procedures that have to be completed before construction and operation of the terminal can occur. The terminal is a Potentially Hazardous Installation as well as a Notifiable Gas Installation. Consequently, emergency response plans and action plans will have to be set up and defined to the satisfaction of relevant Government departments such as Electrical and Mechanical Services Department (EMSD).

6.2 WATER QUALITY

6.2.1 *Construction*

A number of mitigation measures are expected to be required for the dredging and backfilling, both for the seawall trenches (Black Point only), navigation channel and berth box, and any pipeline trenches (South Soko only). The measures would serve to control the potential impacts to within acceptable levels. The mitigation measures are divided into two facets, general operating procedures and specific measures to reduce the quantities of sediment lost to suspension during dredging. The general mitigation measures relate to the use of closed, watertight grabs, the speed of lowering of the grab, the loading of barges and the operating conditions of the barges. Specific mitigation measures may include:

- optimisation of the rate of dredging; and
- the use of silt curtains.

The need for these mitigation measures would be established through the use of computer modelling to determine sediment plume dispersion impacts to water quality during the EIA.

Although it is expected that unacceptable impacts to water quality will not be caused by jetting for the submarine gas pipeline (South Soko only) based on past experience in Hong Kong, mitigation measures could be implemented if exceedances are detected during the monitoring of the construction works.

- A reduction in the speed of the jetting machine;
- A reduction in the pressure of the water jets; and

- The use of silt curtains in sensitive areas of the route (eg adjacent to the Sha Chau Lung Kwu Chau Marine Park).

It is expected that an Environmental Monitoring and Audit (EM&A) programme will be required to monitor impacts to water quality during both dredging, backfilling and jetting. This monitoring programme would be able to confirm that the necessary mitigation measures are being implemented and that impacts are within acceptable levels. Should unacceptable impacts be detected, the EM&A programme would serve to trigger additional measures.

6.2.2 Operation

The main discharge during the operational phase will be seawater used to warm the LNG. This water will be discharged at a lower than ambient temperature and will contain antifoulants such as chlorine. Measures will be prepared during the EIA to ensure that the effluents comply with the *Water Pollution Control Ordinance Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters*.

For the Black Point option, CAPCO will explore proven methods for utilising the terminal's cold energy. This measure may minimise the need for water discharge from the terminal as the water could be used in combination with the BPPS cooling water system.

6.3 MARINE ECOLOGY & FISHERIES

6.3.1 Construction

Practical measures should be taken to minimise impacts to water quality during dredging/jetting so as to prevent subsequent impacts to marine ecological and fisheries resources. It is acknowledged that measures recommended to control water quality impacts to within acceptable levels are also expected to control impacts to ecological and fisheries resources. Measures that may be adopted to prevent unacceptable impacts from underwater noise during piling from affecting marine mammal species include:

- use of bubble curtain/jacket to ameliorate underwater noise propagation;
- timing of piling to avoid peaks in marine mammal abundance;
- timing of piling to avoid calving season of the humpback dolphin (Black Point only)
- adoption of exclusion zones around the piling barge.

It is expected that an Environmental Monitoring and Audit (EM&A) programme will be required to monitor impacts to marine mammals during the marine works. This monitoring programme would be able to confirm that the necessary mitigation measures are being implemented and that

impacts are within acceptable levels. Should unacceptable impacts be detected, the EM&A programme would serve to trigger additional mitigation measures.

6.3.2 Operation

It is acknowledged that measures recommended to control water quality impacts to within acceptable levels are also expected to control impacts to ecological and fisheries resources.

6.4 TERRESTRIAL ECOLOGY

Site clearance areas should be clearly demarcated to avoid unnecessary damage to habitats outside of the project area. Compensatory tree planting should be implemented for any trees that are felled during the construction works.

At Black Point the transplantation of the Pitcher Plants and Bamboo Orchids identified within the project area is recommended.

6.5 WASTE

6.5.1 Construction

Typical measures that may be adopted during the construction phase include:

- Public fill and general refuse should be segregated and stored separately for disposal.
- Waste should be properly stored at site and windblown litter should be minimised during transportation by either covering trucks or transporting wastes in enclosed containers.
- Waste should be disposed of at licensed sites and a disposal permit shall be obtained from appropriate authorities, if required, in accordance with the *Waste Disposal Ordinance (Cap. 354)*;
- All debris and materials shall be covered or stored in a sheltered debris collection area to prevent site runoff loaded with suspended solids;
- Litter on site should be collected regularly;
- General refuse generated on site will be stored in enclosed bins or compaction units separated from construction and chemical wastes. Waste collector will be employed to remove general refuse from the site regularly;
- Implementation of the trip-ticket system to ensure the dumping/filling location is used and to prevent fly tipping.

6.5.2 *Operation*

Areas for maintenance dredging will be clearly defined to avoid unnecessary waste generation. The dredging process will be carried out carefully to minimise the leakage of dredged material back into the waters.

6.6 *CULTURAL HERITAGE & ARCHAEOLOGY*

6.6.1 *South Soko*

It is envisaged that the EIA will be able to further delineate the extent of archaeological deposits within the Tai A Chau Archaeological Site. A rescue excavation may be required to recover any potentially affected artefacts.

6.6.2 *Black Point*

It is envisaged that the EIA Study will further examine the extent of the archaeological potential at Black Point. Since the two identified derelict building structures are considered to have little heritage value, appropriate mitigation measures comprising preparation of photographic records are recommended for the purpose of preservation.

6.7 *LANDSCAPE & VISUAL*

6.7.1 *South Soko*

Adverse impacts to visual sensitive receivers are not expected to occur, as the terminal is remote from Visual Sensitive Receivers (>6km). Locations at higher elevations on Lantau Island may have a restricted view of the terminal but this will only occur during weather conditions with high visibility. The presence of the terminal will introduce a landscape and visual impact to the South Soko Island and hence measures will be required such as careful positioning and colouring of facilities to minimise the impact. Although the site is remote from visual sensitive receivers on the Lantau coastline, CAPCO has examined the layout carefully so that the taller structures, such as the storage tanks, are hidden from view as much as practically possible through the use of existing landforms for screening.

6.7.2 *Black Point*

Adverse impacts to Visual Sensitive Receivers (VSRs) are not expected to occur, as the terminal is remote and only visible from sea level in the Deep Bay and Urmston Road area to passing vessel traffic. The terminal is not visible from the Lung Kwu Tan or Tuen Mun areas.

6.8 *AIR QUALITY*

Given the relatively remote location of the two terminal locations it is not anticipated that adverse air quality impacts will occur at sensitive receivers.

Dust emissions during construction works will be subject to control. In accordance with the *Air Pollution Control (Construction Dust) Regulation*, the following control requirements will be employed at the worksite and incorporated into the Contract Specification to minimise potential dust nuisance arising from the works:

- materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport;
- water sprays should be applied to maintain the work site wet;
- all dusty materials should be covered entirely by tarpaulin sheet to avoid fugitive dust emission;
- all dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet;
- the load carried by the barge should be covered to ensure that the dusty materials do not leak out;
- the excavation working area should be sprayed with water after the operation so as to maintain the entire surface wet; and
- should the blasting be involved, the area within 30 m from the blasting area should be wetted and the blasting should not be carried out when the strong wind signal or tropical cyclone warning signal No. 3 or higher is hoisted.

With these dust suppression measures, dust emissions from the site will be minimised and adverse impacts are not expected.

During terminal operations venting operation is not normal operating procedure. Even if venting is required under exceptional circumstances it is not expected to cause unacceptable air quality impacts, particularly as the site is remote from sensitive receivers.

6.9 NOISE

Given the relatively remote location of the two terminal sites it is not anticipated that adverse noise impacts will occur during either construction or operation. Standard measures will be implemented to control on-site noise generation.

Measures to control underwater noise impacts to marine mammals are discussed in *Section 6.3*.

6.10 *POTENTIAL SEVERITY, DISTRIBUTION AND DURATION OF ENVIRONMENTAL EFFECTS*

It is anticipated that the construction work will commence in 2007 with completion targeted for early in the next decade. Water, waste, marine ecology, cultural heritage, landscape and visual, as well as fisheries impacts are potential issues during the construction period. Water quality, marine ecology, fisheries, landscape and visual, and hazard to life impacts are potential issues during the operation of the terminal.

With the implementation of appropriate mitigation measures, no unacceptable impacts are expected. This will be confirmed in the EIA study.

6.11 *BENEFICIAL EFFECTS*

Implementation of the Project will make a significant contribution to managing emissions of air pollutants. Natural gas is acknowledged widely as a comparatively clean burning fuel and its use is encouraged in the 2005 Policy Address. Without this project there will be some adverse environmental effects caused by the unavoidable need to use "less clean" fuels.

In addition, there are a number of advantages to a Hong Kong LNG terminal, which are summarized below.

1. **Fuel security and reliable supply of electricity:** Dependable fuel sources are critical to maintain world-class power supply to our customers while providing environmental benefits. Having a LNG receiving terminal in Hong Kong allows CAPCO to secure sufficient and dependable supplies of this clean fuel to meet future needs. The terminal, once commissioned, would be operated and maintained to world-class standards, with seamless delivery of gas from the terminal to the power plants.

2. **Environmental benefits:** A receiving terminal in Hong Kong offers CAPCO the flexibility of sourcing LNG from gas fields around the world. With sufficient natural gas supplies, CAPCO will be able to significantly increase its use of this clean fuel. As LNG emits virtually no particulates and negligible SO_2, as well as less NO_x and CO_2 than other fossil fuels, it will contribute to further improvements in the air quality in Hong Kong.

3. **Project development schedule:** A LNG terminal located within Hong Kong enables defined project development under one single jurisdiction with clear policy and regulations applicable to infrastructure built in Hong Kong. This means that the environmental benefits can be brought about earlier.

4. **Economic Benefits and Job Creation:** Constructing a LNG terminal in Hong Kong would comprise a major investment in Hong Kong and would, additionally, provide a significant number of construction and engineering jobs for Hong Kong.

7 USE OF PREVIOUSLY APPROVED EIA REPORTS

No previous EIA Report has been approved or submitted for this Project.

7.1 FOR THE SOUTH SOKO ISLAND OPTION

Similar projects that have been conducted under the *EIAO* include the following:

- *The Proposed Submarine Gas Pipelines from Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production Plant, Hong Kong – EIA Study.* The EIA Report for this Study was submitted to EPD in March 2003. The Study concluded that there would be no adverse long term or cumulative effects/impacts on the environment and the Environmental Permit was granted on 30th May 2003 (EP-167/2003). The relevance to this Project is that the mentioned EIA study examined the impacts to the environment from the installation of twin submarine pipelines. Relevance from the assessments may be drawn to the submarine gas pipeline component of the present EIA study.

- *Permanent Aviation Fuel Facility for Hong Kong International Airport – EIA Study.* The EIA Report for this Study was submitted to EPD in 2002. The Study concluded that there would be no adverse long term or cumulative effects/impacts to the environment as a result of installing submarine aviation fuel pipelines in the Sha Chau and Lung Kwu Chau Marine Park and the Environmental Permit was granted on 3rd May 2002 (EP-139/2002). The relevance to this Project is that the mentioned EIA study examined the impacts to the environment from the installation of twin submarine pipelines. Relevance from the assessments may be drawn to the submarine gas pipeline component of the present EIA study. Additionally the installation works took place in a similar area of northwest Lantau to the proposed submarine gas pipeline component of the present project.

- *Environmental Impact Assessment of a 1,800MW Gas-Fired Power Station at Lamma Extension.* The EIA Report for this Study, which included installation of an 89km submarine natural gas pipeline, was submitted to EPD in February 1999. The Study concluded that there would be no adverse long term or cumulative effects/impacts on the environment and the Environmental Permit was granted on 8th August 2000 (EP-071/2000/A). The relevance to this Project is that the mentioned EIA study examined the impacts to the environment from the installation of a submarine gas pipeline. Relevance from the assessments may be drawn to the submarine gas pipeline component of the present EIA study.

The following project has relevance due to its location and the presence of a jetty. The project was conducted before the *EIAO* came into operation:

- *Low-Level Radioactive Waste Storage Facility Consultancy Study - Environmental Impact and Safety Assessment Report (EISA).* The EIA Report for this Study was submitted to and approved by EPD before the *EIAO* comes into operation on 1st April 1998 (EIA-064/BC). The Study concluded that there would be no adverse long term or cumulative effects/impacts on the environment.

The following project has relevance due to its location and the inclusion of a submarine power cable component in the EIA.

- *132 KV Supply Circuit from Pui O via Chi Ma Wan Peninsula via Sea Crossing towards Cheung Chau – EIA Study.* The EIA Report for this Study was submitted to EPD in 2002. The Study concluded that there would be no adverse long term or cumulative effects/impacts to the environment as a result of installing a submarine power cable that connected Pui O to Cheung Chau and the Environmental Permit was granted on 2nd April 2002 (EP-126/2002). The relevance to this Project is that the mentioned EIA study examined the impacts to the environment from the installation of a submarine power cable. Relevance from the assessments may be drawn to the submarine power cable component of the present EIA study. Additionally the installation works took place in a similar area of southern Lantau to the proposed submarine cable component of the present project.

7.2 FOR THE BLACK POINT OPTION

Similar projects that have been conducted under the *EIAO* include the following:

- *Permanent Aviation Fuel Facility for Hong Kong International Airport – EIA Study.* The EIA Report for this Study was submitted to EPD in 2002. The Study concluded that there would be no adverse long term or cumulative effects/impacts on the environment as a result of installing submarine aviation fuel pipelines in the Sha Chau and Lung Kwu Chau Marine Park and the Environmental Permit was granted on 3rd May 2002 (EP-139/2002). The relevance to this Project is that the mentioned EIA study examined impacts to the marine environment from dredging works in the northwest Lantau area, a similar area of northwest Lantau to the proposed dredging works for the navigation channel. Relevance from the assessments may be drawn to the present EIA study.

The following projects have relevance due to their location. The project was conducted before the *EIAO* came into operation:

- *EIA of the Proposed 6,000 MW Thermal Power Station at Black Point.* The EIA Report for this Study was submitted to and approved by EPD before the *EIAO* came into operation on 1st April 1998 (EIA-015/BC). The Study concluded that there would be no adverse long term or cumulative effects/impacts on the environment.

This project profile has presented information concerning the intention of CAPCO to site, build and operate a LNG terminal in the Hong Kong SAR. Implementation of the Project will make a significant contribution to managing emissions of air pollutants. Natural gas is acknowledged widely as a comparatively clean burning fuel and its use is encouraged in the 2005 Policy Address.

Two sites are under consideration, Black Point and South Soko Island. The EIA Study will pay particular attention to impacts to the sensitive receivers identified in this project profile and where necessary, mitigation measures will be proposed in accordance with the requirements of the *EIAO*.

The English version of this Project Profile shall prevail wherever there is a discrepancy between the English version and the Chinese version.