

Hong Kong Offshore LNG Terminal

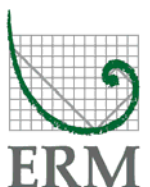
Executive Summary

June 2018

Environmental Resources Management

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ERM Document Code: 0359722_HKOLNG EIA_Exec Summ_Rev 3

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Client: CLP Power Hong Kong Limited		Project No: 0359722			
Summary: This document presents the Executive Summary for the Hong Kong Offshore LNG Terminal Project.		Date: June 2018			
		Approved by: 			
		Dr Robin Kennish Project Director			
3	Public Inspection	Var	JN	RK	06/18
2	Formal Submission	Var	JN	RK	05/18
Revision	Description	By	Checked	Approved	Date
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CLP Power Hong Kong Limited (CLP) and The Hongkong Electric Company, Limited (HK Electric) are both responsible for providing a safe, highly reliable and clean supply of electricity to Hong Kong's population at reasonable cost.

CLP operates three power stations that supply electricity to the population in Kowloon, the New Territories and most of the outlying islands, namely the Castle Peak Power Station (CPPS), the Black Point Power Station (BPPS) and the Penny's Bay Power Station (PBPS) which are owned by the Castle Peak Power Company Limited (CAPCO), a joint venture between CLP and China Southern Power Grid International (HK) Co., Limited, of which CLP holds a 70% interest.

HK Electric operates the Lamma Power Station (LPS) that supplies electricity to the population on Hong Kong and Lamma Island.

Hong Kong has no indigenous energy resources and all energy for Hong Kong needs to be imported. Dependable fuel sources are critical to maintaining reliable power supply for the Hong Kong population, while providing environmental benefits. The Hong Kong Special Administrative Region (HKSAR) Government plans to increase the percentage of natural gas used for power generation to around 50% by 2020 to meet its pledged environmental targets.

The Hong Kong Climate Action Plan 2030+ Report states that the HKSAR Government will work closely with CLP and HK Electric; to ensure they can secure adequate supplies of natural gas and put the required infrastructure in place in the coming decade to handle the larger quantities of natural gas that will be required to be imported into Hong Kong in order to meet these HKSAR Government emissions targets.

To support the HKSAR Government in the increased use of natural gas in Hong Kong to reduce carbon intensity from 2020 onwards, CLP and HK Electric have identified that the development of an offshore Liquefied Natural Gas (LNG) receiving terminal in Hong Kong based on Floating Storage and Regasification Unit (FSRU) technology presents an additional gas supply option that will provide long-term energy security for Hong Kong, as well as access to competitive gas supplies from world markets.

The purpose of CLP and HK Electric's current proposal is to consider the development of an offshore LNG receiving terminal (LNG Terminal) in Hong Kong based on FSRU technology that is located in HKSAR waters to serve as a gas supply source to meet Hong Kong's future power generation fuel supply needs (hereinafter referred to as the '**Hong Kong Offshore LNG Terminal**' or the '**Project**'). The Project will increase CLP and HK Electric's options regarding the sourcing of future gas supplies for Hong Kong, and provide the flexibility to directly access competitively priced gas from the global LNG market, including its associated spot market, therefore improving the Hong

Kong LNG buyers' future negotiating position, and diversity of gas supply sources. The Project is planned to be a 'shared-use' import facility that has the capability to receive and store LNG and then deliver regasified LNG (natural gas) by subsea pipeline to the BPPS and the LPS. The LNG Terminal can also supply other potential current or future users with natural gas, or other potential uses of LNG in Hong Kong such as for marine transportation.

The implementation of this Project is therefore a critical step for ensuring a gas supply source is made available to meet Hong Kong's future power generation fuel supply needs and supporting air quality improvements and environmental performance in Hong Kong.

CLP is leading the development of the Project, acting for and on behalf of CAPCO and HK Electric, and hence for the EIA Study purposes, CLP is the *Project Proponent*. However, the submission of, and content described in this Environmental Impact Assessment (EIA) Report, does not amount to a commitment by or on behalf of CLP/CAPCO or HK Electric to proceed with the Project.

1.2 *PURPOSE & NATURE OF PROJECT*

The scope of the Project involves the construction and operation of the following key infrastructure facilities:

- an FSRU vessel equipped with LNG storage tanks and regasification equipment;
- a double berth jetty with mooring facilities for the FSRU vessel and LNG carriers;
- two subsea gas pipelines connecting the FSRU facility with the BPPS and the LPS respectively; and
- Gas Receiving Stations (GRSs) located entirely within the BPPS and LPS respectively.

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

- Construction of a storage, transfer and trans-shipment facility of liquefied natural gas with a storage capacity of not less than 200 tonnes (*Item L.2 of Part I of Schedule 2 of EIAO*);
- Dredging operations for the construction and maintenance of the LNG Terminal Jetty, the construction of the BPPS Pipeline and the LPS Pipeline that exceeds 500,000m³ or are less than 500m from the nearest boundary of an existing or planned marine park (*Item C.12 of Part I of Schedule 2 of EIAO*); and

- Construction of the submarine gas BPPS Pipeline and LPS Pipeline connecting the LNG Terminal with the GRS at the BPPS and the GRS at the LPS (*Item H.2 of Part I of Schedule 2 of EIAO*).

1.3

PURPOSE AND OBJECTIVES OF THE EIA STUDY

This *EIA Report* has been prepared by ERM-Hong Kong, Ltd (ERM) for CLP in accordance with the *EIA Study Brief No. ESB-292/2016* (“the *EIA Study Brief*”), issued in June 2016, and the *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)*.

The purpose and objective of this EIA Study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and associated works that will take place concurrently in accordance with the requirements described in the *EIA Study Brief*. This information will contribute to decisions by the Director of Environmental Protection on:

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

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

2.1 OBJECTIVES AND BENEFITS OF THE PROJECT

The objectives and benefits of the Project have been considered in detail in *Section 2.1* of the EIA Report and are summarised as follows:

- *Supporting HKSAR Government's Objective of Improving Air Quality:* The HKSAR Government caps the emissions of power plants to reduce emissions and improve air quality. In support of this, the HKSAR Government has set out a policy to achieve a fuel mix target of around 50% natural gas-fired power generation by 2020. In addition, the gradual replacement of coal-fired units with gas-fired units (and non-fossil fuel sources) will help to further lower emissions from power generation activities in the long-term. Consequently, in order to ensure an efficient, secure and stable electricity supply and meet the long-term demand growth in the electricity market, sufficient local gas-fired power generation capacity and natural gas supplies are required to replace Hong Kong's reducing coal-fired power generation capacity. This Project is proposed to provide a viable additional gas supply option that will provide long-term energy security for Hong Kong through access to competitive gas supplies from world markets.
- *Securing Competitive Gas Supply Options:* Natural gas is currently imported into the BPPS and the LPS via three subsea gas pipelines from the Mainland. Maintaining a cost-effective, diverse, reliable and adequate supply of fuel remains a priority for CLP and HK Electric. The Project would increase CLP and HK Electric's optionality regarding the sourcing of future gas supplies for Hong Kong, and provide the flexibility to directly access competitively priced gas from the global LNG market, enabling CLP and HK Electric to achieve the best possible combination of pricing and terms which would be to the benefit of electricity consumers in Hong Kong.
- *Ensuring Electricity Reliability:* Hong Kong has no indigenous energy resources and most of the fuel for Hong Kong needs to be imported. Given the future electricity demand, the CLP and HK Electric gas supply capacity will not be able to satisfy electricity demand; potentially resulting in increased emissions beyond existing levels and targets (due to the continued use of coal-fired units) and may lead to possible power cuts, or rationing. Hong Kong needs (i) certainty of gas supply and timely availability; (ii) supply security (i.e. increased number of gas supply options beyond the existing pipelines to minimise the impact of any pipeline disruptions); and (iii) adequate volume and flexibility to augment existing gas supplies and provide the flexibility to meet the future gas demand growth and match seasonal demand.

CLP and HK Electric have identified the Project as the critical enabling infrastructure that will make a significant contribution to achieving the HKSAR

Government's commitment to improving air quality and reducing carbon emissions.

2.2 *CONSIDERATION OF AN ONSHORE VERSUS OFFSHORE LNG TERMINAL*

The requirements for an onshore, land-based LNG terminal and an offshore LNG terminal for the Project have been explored. With Hong Kong's rising demand for land availability being a significant development constraint, coupled with the advantages of a remote offshore location for the LNG terminal in HKSAR waters, it was concluded that the Hong Kong Offshore LNG Terminal based on FSRU technology, together with its quicker construction time, lower capital cost and reduced environmental impact, is the preferred choice for the Project, rather than an onshore, land-based LNG import terminal.

2.3 *CONSIDERATION OF SITING AND LAYOUT OPTIONS AND CONSTRUCTION METHODS*

Sections 2.3 to 2.6 of the EIA Report discuss the benefits and dis-benefits of the infrastructure that is required for the Project, namely:

- Site for the LNG Terminal Jetty and its preferred orientation;
- BPPS and LPS Pipeline alignments; and
- Siting of the GRSs at the BPPS and the LPS.

A variety of factors, including environmental, marine, engineering, construction, operational (e.g. accessibility and operability), physical and risk constraints, were considered during the review of the siting and layout options for the LNG Terminal and its associated infrastructure. Considering all of the above factors, and the relative distance to sensitive receivers, the preferred Site for the LNG Terminal, the alignments of the BPPS Pipeline and LPS Pipeline and the locations of the GRSs at the BPPS and the LPS were developed, and described in *Section 3* of the EIA Report.

In addition, the construction methods options and work sequences for the LNG Terminal Jetty, the BPPS Pipeline and LPS Pipeline and the GRSs at the BPPS and the LPS were also considered in order to optimise the facilities that are required for the Project, see *Sections 2.7 to 2.8*.

2.4 *SCENARIOS WITH AND WITHOUT THE PROJECT*

With the Project in place, CLP and HK Electric will be able to support the HKSAR Government's policy to diversify the fuel mix for power generation and achieve the 2020 target of around 50% of power generation being from natural gas-fired units. The Project will also help to support further reductions in the air pollutant emissions from the CLP and HK Electric's power generation facilities, and further improve air quality and reduce carbon intensity.

Currently, CLP has to be reliant on its two existing pipeline gas sources, whereas HK Electric has to be reliant on its single existing pipeline gas source. If the Project does not proceed, CLP and HK Electric's reliability and security of electricity supply could be at risk should one of these pipelines suffer a disruption. This impacts CLP and HK Electric in meeting the HKSAR Government's fuel mix and environmental targets. Securing adequate competitive gas supply capacity to CLP and HK Electric's power generation system to support the need for additional gas supply and continued growth in electricity demand would also be affected.

In addition, the supply capacity of the CLP and HK Electric power generation system is anticipated to be more gas driven as a result of the progressive retirement of coal-fired generating units. Replacement gas-fired generating capacity and its required gas supply needs to be secured in time, otherwise CLP and HK Electric's reliability of electricity supply and ability to meeting HKSAR Government's environmental targets could be at risk. The long-term plan for the gradual replacement of power generated by coal-fired units with gas-fired units thus helping to further lower emissions from power generation, could also be impacted.

3 PROJECT OVERVIEW

3.1 SITE LOCATION AND HISTORY

3.1.1 LNG Terminal

The proposed Site for the LNG Terminal Jetty, which is located offshore Hong Kong in open waters about 4km east of Tau Lo Chau (the closest land mass), near the Soko Islands, was selected following an extensive site selection study and also engineering and marine/met-ocean studies. The water depth at the Site is at least 15m. To the northwest of the LNG Terminal Site there is the proposed South Lantau Marine Park (SLMP). To the south of the Site there is open water for approximately 500m, until the boundary of the HKSAR waters is reached, and thereafter the South China Sea. To the east of the Site there is the Sediment Disposal Area, which is operational and used for the disposal of uncontaminated sediment.

3.1.2 BPPS Pipeline Route

The proposed BPPS Pipeline that will connect the LNG Terminal with the GRS at the BPPS is approximately 45km in length. It is located entirely within HKSAR waters. The BPPS Pipeline departs the LNG Terminal and heads west running to the south of the Soko Islands towards the southwest Lantau cable corridor. Then it continues to run westwards parallel to the southern boundary of the proposed SLMP. It then turns northwards and unavoidably crosses the Southwest of Fan Lau and part of the Lantau Channel Traffic Separation Scheme (LCTSS), then continues northwards and runs parallel to, but outside of, the LCTSS. The route continues northwards passing to the west of the proposed Southwest Lantau Marine Park, and unavoidably crosses under the Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road to the west of the Airport's restricted area. The BPPS Pipeline route then continues to run northwards, parallel and within the western boundary of the proposed marine park related to the HKIA Three Runway System project (to be designated after the construction of the BPPS Pipeline), then passes to the west of the Sha Chau and Lung Kwu Chau Marine Park. In order to approach the BPPS, the pipeline turns eastwards and unavoidably crosses the Urmston Road marine shipping channel before reaching landfall at the BPPS seawall in the vicinity of the existing GRSs.

3.1.3 LPS Pipeline Route

The proposed LPS Pipeline that will connect the LNG Terminal with the GRS at the LPS is approximately 18km in length. It is also located entirely within HKSAR waters. The LPS Pipeline route departs the LNG Terminal and heads north passing between the eastern boundary of the proposed SLMP, and the western boundary of the Sediment Disposal Area. Thereafter, the LPS Pipeline route turns eastwards and runs between the southern boundary of the South Cheung Chau Traffic Separation Scheme and the northern boundary of the Sediment Disposal Area. The LPS Pipeline then continues to run

eastwards and, en route, crosses two existing subsea cables to the north of the HK Electric proposed offshore wind farm in southwest Lamma. It is proposed that the LPS Pipeline will tie-in to an existing pipeline located approximately 1 km from the LPS landfall point adjacent to the existing Dapeng Pipeline.

3.1.4 Gas Receiving Station at the Black Point Power Station

The proposed location for the new GRS at the BPPS is within the existing boundary of the BPPS on vacant land between the two existing GRS facilities.

3.1.5 Gas Receiving Station at the Lamma Power Station

The proposed location for the new GRS at the LPS is within the existing boundary of the LPS southern platform extension site, where there are no other facilities or utilities within this land area.

The proposed location of the Project is illustrated in *Figures 3.1, 3.2 and 3.3*.

3.2 PROJECT COMPONENTS

The Project is comprised of the following key components which are discussed in detail in *Section 3.3* of the EIA Report:

- Offshore LNG Terminal where LNG is delivered by a visiting LNG carrier (LNGC) and loaded on to the FSRU Vessel where it is stored and then regasified and sent-out as natural gas through the BPPS Pipeline and the LPS Pipeline:
 - a) Jetty is approximately 500m long by 50m wide (i.e. approximately 2.5ha), with mooring facilities to accommodate the simultaneous mooring of an FSRU Vessel and a visiting LNGC. The Jetty comprises of a substructure with a platform that includes topsides LNG/gas equipment, piping and support facilities, mooring dolphins, with connecting walkways / pipe racks and a vent stack;
 - b) FSRU Vessel of up to approximately 270,000m³ LNG storage capacity, consisting of LNG storage tanks, regasification units, seawater intake and outfall system, freshwater generator, sewage treatment unit and associated operation facilities. The FSRU Vessel will be either an existing or a 'new build' vessel.

The Project Site area also includes the provision of a Safety Zone surrounding the LNG Terminal in which vessels are not allowed to enter without authorization. The implementation will be further reviewed and determined with the relevant authorities under separate exercise outside the EIA Study process.

- Two subsea pipelines, to supply natural gas from the LNG Terminal to the GRSs at the BPPS and LPS, that will be buried beneath the seabed with various levels of pipeline protection trench designs and rock armour,

dependent on the potential risks to the pipelines during operations (e.g. anchor drop and drag risks):

- a) BPPS Pipeline – approximately 30” diameter and 45km in length.
 - b) LPS Pipeline - approximately 20” diameter and 18km in length.
- GRS facilities at the BPPS and the LPS to receive natural gas from the LNG Terminal via the BPPS Pipeline and the LPS Pipeline, respectively. The GRS facilities are similar and comprise of metering and regulating units to reduce the pressure of the gas so that it can be sent out to supply the gas-fired generation units at the BPPS and the LPS.

The Project will be designed, constructed, and operated in accordance with relevant international and local standards.

The EIA Study identified a number of committed or planned projects in the vicinity of the LNG Terminal, the BPPS Pipeline and the LPS Pipeline, and GRSs at the BPPS and the LPS which may potentially interface with the construction and operation of this Project. The cumulative impacts from these projects, if any, are addressed in the technical assessments in this EIA Study if these projects are located within the Study Area for the respective technical aspects.

4 LEGISLATIVE REQUIREMENTS, EVALUATION CRITERIA AND SENSITIVE RECEIVERS

4.1 AIR QUALITY

This EIA Study has examined the construction and operation phase impacts to air quality. The impacts have been identified and analysed for compliance with the prevailing Air Quality Objectives (AQOs) stipulated under the *Air Pollution Control Ordinance (APCO)* and the criteria and guidelines stated in the *EIAO-TM Annexes 4 and 12* respectively.

The Study Area is defined as an area within 500m from the boundary of the Project. No existing or planned Air Sensitive Receiver (ASR) was identified within the Study Area. The LNG Terminal is located in the southern HKSAR waters. The local air quality in the vicinity of the GRSs at the BPPS and the LPS are primarily influenced by emissions from the BPPS and the LPS respectively. No ASRs are located within approximately 4km from the LNG Terminal. A total of seven representative ASRs beyond the Study Area for the GRS at the BPPS and the LPS (at least 1.3km away) have been identified. The potential impacts arising from the construction and operation phases of this Project have been evaluated.

4.2 HAZARD TO LIFE

The potential hazards arising from the construction and operation phases of the Project have been evaluated for compliance with Section 2 of *Annex 4* of *EIAO-TM* which specifies the individual risk guidelines and societal risk guidelines. The LNG Terminal, the BPPS Pipeline and the LPS Pipeline and the locations of the GRSs at the BPPS and the LPS are generally in remote locations with no or very low population densities in the vicinity. All surrounding population, including land, road traffic and marine vessel population was considered in this assessment.

4.3 NOISE

The potential impacts of noise caused by construction and operation activities of the Project have been assessed in this EIA Report. The impacts have been identified and analysed for compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 5 and 13* respectively and the applicable criteria stipulated under the *Noise Control Ordinance (NCO)*.

The Assessment Area includes areas within 300m of the boundary of the Project. No existing or planned Noise Sensitive Receiver (NSR) was identified within the Assessment Area. The LNG Terminal is located in open HKSAR waters. The nearest NSRs are approximately 1.3km away from the sites of the GRS at the BPPS and the GRS at the LPS; approximately 2km away from the LPS Pipeline during construction, and approximately 4.7km from the LNG Terminal during construction and operation. These NSRs are generally

screened by natural terrain and existing structures which will further reduce any noise impact. A representative, unscreened, rural NSR beyond the Assessment Area for the GRS at the LPS (at least 1.6km away) has been identified and assessed. The potential impacts arising from the construction and operation phases of this Project have been evaluated.

4.4 WATER QUALITY

The EIA Study has described the potential impacts associated with the construction and operation of the Project on water quality that have been identified and analysed for compliance with the prevailing Water Quality Objectives (WQOs) stipulated under the *Water Pollution Control Ordinance (WPCO)* and the *Technical Memorandum Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-ICW)*, and the criteria and guidelines stated in the *EIAO-TM Annexes 6 and 14* respectively.

The Study Area for the water quality assessment covers the Deep Bay, North Western, North Western Supplementary, Second Southern Supplementary, and Southern Water Control Zones (WCZs). Baseline conditions within the Study Area are influenced by discharges from the Pearl River and some local discharges and surface run-off, with total inorganic nitrogen (TIN) levels consistently exceeding the WQOs. A total of 86 Water Quality Sensitive Receivers (WSRs) were identified in the Study Area, including (see *Section 7* for further details):

- *Fisheries Resources*: An oyster production area, spawning grounds of commercial fisheries resources, artificial reef deployment area, and fish culture zones;
- *Marine Ecological Resources*: Existing, proposed and potential Marine Parks, intertidal mudflats / mangroves / horseshoe crab nursery grounds, and coral colonies;
- *Beaches*: Gazette beaches, and non-gazetted beaches;
- Secondary contact recreation subzones and potential water sports activities; and
- Seawater intakes.

The potential impacts arising from the construction and operation phases of this Project to these WSRs have been evaluated.

4.5 WASTE MANAGEMENT

The potential waste management implications caused by construction and operational activities of this Project have been assessed in this EIA Report. The impacts have been identified and analysed for compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 7 and 15* respectively.

A review of previous sediment sampling and testing from existing studies was carried out, and further sediment sampling and testing was conducted under this EIA Study to identify the level of sediment contamination within the marine construction works areas for the LNG Terminal Jetty and along the BPPS Pipeline and the LPS Pipeline routes. The sediment testing results were compared against the relevant sediment quality criteria specified in *ADV-21 Management Framework for Disposal of Dredged/Excavated Sediment*. The marine sediments to be dredged (i) near the Jetty, (ii) southwest of Lantau, (iii) near the LPS and (iv) near the BPPS were found to be uncontaminated. Marine sediment to be dredged along the BPPS Pipeline from southwest of Lantau to the BPPS were found to be category M contaminated sediments. This is consistent with the results of the nearby EPD sediment quality monitoring data and the previous sediment quality information along the BPPS Pipeline and the LPS Pipeline.

4.6

ECOLOGY

The potential impacts of the construction and operation activities of this Project on terrestrial and marine ecology have been assessed in this EIA Report. The impacts have been identified and analysed for compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 8 and 16* respectively.

The Assessment Area for terrestrial ecology covered a distance within 500m from the boundary of the Project, and no terrestrial ecological sensitive receivers were identified within this Assessment Area. The Assessment Area and sensitive receivers for marine ecology are the same as those identified in *Section 4.4* above and also extends to cover the Deep Bay WCZ (Outer Subzone) and Western Buffer WCZ. Known ecological important habitats and species in the vicinity of the Project within the Assessment Areas include existing, planned and potential marine parks, horseshoe crab breeding and nursery grounds, mangroves, coral communities, marine benthos of conservation interest, and ecological important species including Chinese White Dolphins (CWDs), Finless Porpoises (FPs), Green Turtles, Whale Sharks, Amphioxus, Horseshoe Crabs, White-bellied Sea Eagle, seabirds and migratory birds.

A series of detailed field surveys, which include intertidal, subtidal (benthic and coral), marine mammal and avifauna surveys, were conducted during the dry and wet seasons of 2016 and 2017 to update the baseline conditions of the terrestrial and marine habitats and assemblages within and around the Project's footprint. Findings from the field surveys confirmed the findings of the literature review, and are presented below:

- Recognized Sites of Conservation Importance - These include a number of existing, proposed and potential marine parks (Sha Chau and Lung Kwu Chau Marine Park (SCLKCMP), The Brothers Marine Park (BMP), the proposed Southwest Lantau Marine Park (SWLMP), South Lantau Marine Park (SLMP) and the marine park for the Expansion of Hong Kong International Airport into a Three-Runway System (3RSMP), and the potential South Lamma Marine Park, as well as Sites of Special Scientific

Interest (SSSI) (including San Tau Beach SSSI, Sham Wan SSSI and Lung Kwu Chau, Tree Island and Sha Chau SSSI) and the Sham Wan Restricted Area.

- Marine Mammals - both of Hong Kong's resident marine mammal species, the Finless Porpoise *Neophocaena phocaenoides* and the Chinese White Dolphin *Sousa chinensis* are present in the Assessment Area, although only the habitat use by the Finless Porpoise overlaps with waters around the LNG Terminal site. Finless Porpoise are present in South Lantau waters year-round and their occurrence is greater and more widespread in these waters in the dry season (December to May). Finless Porpoise use a broad swathe of South Lantau waters, particularly extending across the waters between the Soko Islands and Shek Kwu Chau with the LNG Terminal site appearing to be located at the southern periphery of areas used by these animals. Data from the Passive Acoustic Monitoring (PAM) surveys have also demonstrated the tendency for more Finless Porpoise activity in late night hours and very early hours at the surveyed locations compared to daylight hours. The overlap of Finless Porpoise habitat usage is limited to the BPPS Pipeline route from the LNG Terminal site to the south of the Soko Islands, and the LPS Pipeline route to the southwest of Shek Kwu Chau extending toward the LNG Terminal site. Chinese White Dolphin do not use the marine waters at the LNG Terminal or the LPS Pipeline route, however their major habitats in West Lantau overlap with the waters of the BPPS Pipeline route.
- Horseshoe Crab, and its Breeding and Nursery Grounds - two species of horseshoe crab have previously been recorded around Hong Kong waters. Confirmed nursery sites and key nursery grounds are located far away from the proposed works area (at least 2km) and are considered to be too remote to be affected by the Project works. Horseshoe crabs were not recorded during the baseline intertidal surveys conducted in LPS, Pak Chau and Tau Lo Chau.
- Mangroves - mangroves are found along the coastline at Sheung Pak Nai, Ha Pak Nai, Tung Chung Bay, San Tau, Sham Wat, Tai O, Yi O, Shui Hau, Pui O Wan. These sites are located far away from the proposed works area (at least 2km) and are considered to be too remote to be affected by the Project works.
- Coral Communities - the field survey results indicated that only isolated colonies of hard coral, cup corals, and octocorals in very low percentage cover (< 5%) were recorded in the Assessment Area, except at Pak Chau which is at some distance from the BPPS Pipeline route, where low to moderate coral cover (~6 - 30%) contributed by the octocoral *Guaiaigorgia* sp. was recorded.
- Amphioxus - desktop data indicated a low number of amphioxus were reported in Tung Wan on the east coast of South Soko Island and at north Chek Lap Kok waters. These sites are located far away from the proposed works area (at least 2km) and are considered to be too remote to be affected

by the Project works. Amphioxus was not recorded in the baseline subtidal benthos surveys along the proposed LNG Terminal and the pipelines.

- Other Intertidal and Subtidal Assemblages - other intertidal and subtidal benthos species reported from the field surveys and literature review in the Assessment Area for the Project are common and widespread in Hong Kong with no species of conservation importance. A total of 15 marine fish species of conservation importance (excluding Whale Shark described below) were reported from the literature review and field surveys. None of these species is unique to a particular location of the Assessment Area, and many of these species were also reported elsewhere in Hong Kong waters.
- Whale Shark and Sea Turtle - the literature review suggested the presence of species of conservation importance such as Green Turtle *Chelonia mydas* and Whale Shark *Rhincodon typus* in the Assessment Area. Very occasional records of a few animals were reported previously and no opportunistic sightings of both species occurred during field surveys. The major nesting site for Green Turtle in Hong Kong is at Sham Wan, southern Lamma Island, which is more than 4km from the proposed route of the LPS Pipeline.
- Terrestrial Ecology (including Avifauna) - in terms of terrestrial ecology, three habitat types, namely grassland/ shrubland, plantation and urbanised/ disturbed area, were recorded in the Assessment Area at the BPPS. The GRS at the BPPS is located within urbanised/ disturbed area, with no flora or fauna species of conservation importance recorded. The proposed LNG Terminal is located in open waters about 4km away from the nearest shoreline at the Soko Islands. The literature review suggested that the area could be within the flying route of migratory birds and breeding individuals of Black-naped Terns and Roseate Terns were recorded at Soko Islands within the Avifauna Assessment Area. Nesting locations of White-bellied Sea Eagle were also recorded in Shek Kwu Chau, Lung Kwu Chau, Chi Ma Wan Peninsular near Ha So Pai, Mo Tat Wan of Lamma Island and Sunshine Island while an egretty was recorded in Sha Chau from literature review. The majority of the species recorded in the Avifauna Assessment Area during the boat-based avifauna survey are common and widespread in Hong Kong, and a relatively low diversity and density of birds was recorded in the vicinity of the LNG Terminal compared to elsewhere in the Avifauna Assessment Area during the boat-based avifauna survey. Twenty four species of conservation interest were recorded including White-bellied Sea Eagle, Black Kite, Common Buzzard, Peregrine Falcon, Crested Goshawk, Crested Serpent Eagle, Common Kestrel, Pacific Reef Egret, Great Egret, Little Egret, Cattle Egret, Black-headed Gull, Black-naped Tern, Black-tailed Gull, Bridled Tern, Aleutian Tern, Little Tern, Yellow-legged Gull, Roseate Tern, House Swift, Grey-tailed Tattler, Whimbrel, Pied Kingfisher and Northern Pintail. Four of these species of conservation interest (Black-headed Gull, Black-

tailed Gull, Bridled Tern and Aleutian Tern) were observed within 500m of the proposed LNG Terminal Project Site including the Safety Zone during the surveys.

Based on the gathered monitoring and survey data, the ecological importance of waters at the LNG Terminal is considered moderate. In areas along the BPPS Pipeline route the ecological importance is considered to range between low and moderate to high. Existing and proposed Marine Parks and SSSIs are generally considered to be of high ecological importance. In areas along the LPS Pipeline, the ecological importance is considered to be low to moderate. Other marine habitats (e.g. intertidal, subtidal hard bottom, subtidal soft bottom) at the Project Site and its vicinity are considered as of low to moderate ecological importance.

Terrestrial habitats in the Project Site and its vicinity are considered to be of negligible to moderate ecological importance, with the LNG Terminal and vicinity being of low importance for avifauna. The potential impacts arising from the construction and operation phases of this Project to these sensitive receivers have been evaluated.

4.7

FISHERIES

The potential impacts to fisheries caused by the construction and operational activities of this Project have been assessed in this EIA Report. The impacts have been identified and analysed for compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 9 and 17* respectively.

The Assessment Area and sensitive receivers for fisheries are the same as those identified in *Section 4.4* above. A review of baseline information on commercial fisheries resources, habitats and fishing operations surrounding the waters of the Project from available literature and field surveys has been undertaken. Results from the review indicate that, within the Assessment Area, although some fishing grounds near the Sha Chau and Lung Kwu Chau Marine Park, Tai O, Soko Islands, Cheung Chau and south of Lamma Island are considered to have moderate to high commercial value, the fishing grounds within the LNG Terminal site are considered to be of low commercial value. The small extent of the LNG Terminal site and low commercial value of the catches characterise the waters of LNG Terminal to be of low importance to the Hong Kong fishing industry. The Project is located in the vicinity of the recognised northern Lantau spawning ground and southern Lantau spawning ground and nursery area. It is, however, important to note that the level of ichthyoplankton and fish post-larvae resources of the Assessment Area was low in general with mainly low value commercial species, which indicates that the potential for the Assessment Area to function as important spawning grounds and nursery area is relatively low. Also, at Pak Tso Wan of Tai A Chau (South Soko) which was previously reported as a nearshore juvenile fish habitat, fry production was not recorded. The potential impacts arising from the construction and operation phases of this Project to these sensitive receivers have been evaluated.

VISUAL

The EIA Study has described the visual impacts associated with the construction and operation of this Project. The purpose of the assessment was to evaluate the predicted impacts to Visual Sensitive Receivers (VSRs) as per *EIAO GN 8/2010* and the criteria and guidelines stated in the *EIAO-TM Annexes 10 and 18* respectively.

The EIA Study has identified seventeen VSRs for the LNG Terminal and the GRSs at the BPPS and the LPS, including recreational, residential, occupational and travelling users. The quality of most existing views towards these components of the Project are generally fair and good, with a high degree of visibility to natural views.

The potential visual impacts and glare effect from the construction and operation phases of this Project to these sensitive receivers have been evaluated.

CULTURAL HERITAGE

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

A Marine Archaeological Investigation has been undertaken and it confirmed that the Project Site has no marine sites of cultural heritage / archaeological value present and has no archaeological potential. The potential impacts on cultural heritage arising from the construction and operation phases of this Project have been evaluated.

5.1 PROJECT DESCRIPTION

The scope of the Project involves the construction and operation of an offshore LNG Terminal (comprising of Jetty and FSRU Vessel moored alongside), two subsea pipelines (from the LNG Terminal Jetty to the BPPS and the LPS) and two GRSs at the BPPS and the LPS. The proposed location of the above project components is illustrated in *Figures 3.1, 3.2 and 3.3*.

5.1.1 Construction & Operational Activities

No major earthworks or site formation works will be required during the construction of the Project. Marine dredging and jetting works are required for the construction of specific sections of the BPPS Pipeline and the LPS Pipeline routes. Key activities for the construction and operation of the Project are summarised in *Table 5.1*.

Table 5.1 Summary of Key Project Details

Item	Detail
LNG Terminal	
Project Component Scope	<ul style="list-style-type: none"> Construction of Jetty, 500m long by 50m wide (i.e. approximately 2.5ha), with its associated topsides equipment, piping and support facilities, and mooring dolphins, walkways / pipe racks and vent stack. FSRU Vessel of approximately 270,000m³ LNG storage capacity will be an existing or a 'new build' vessel. The Project Site area also includes the provision of a Safety Zone surrounding the LNG Terminal.
Construction Activities	<ul style="list-style-type: none"> Construction of the Jetty structure will involve installation of piled jacket substructure followed by construction of the Jetty Platform, and the Mooring Dolphins, Walkways, Vent Stack structures. Installation of the various topsides equipment would follow when the substructure is completed. The FSRU Vessel will be constructed and pre-commissioned outside of Hong Kong.
Operational Activities	<ul style="list-style-type: none"> LNG Terminal (Jetty and FSRU Vessel) will normally operate on a 24-hour, all year round continuously, except in adverse weather conditions. Discharge of treated sewage effluent. Discharge of cooling water (from regasification). Discharge of concentrated seawater (from freshwater generator). Maintenance dredging of marine access (about every five years, timing and volume subject to actual site conditions).

Item	Detail
Subsea Pipelines	
Project Component Scope	<ul style="list-style-type: none"> • Construction of BPPS Pipeline approximately 30" diameter and 45km long, buried beneath the seabed with various levels of pipeline protection trench designs along its length. • Construction of LPS Pipeline approximately 20" diameter and 18km long, buried beneath the seabed with various levels of pipeline protection trench designs along its length.
Construction Activities	<ul style="list-style-type: none"> • BPPS Pipeline (offshore marine works): <ul style="list-style-type: none"> – Dredging (by grab dredger, or Trailing Suction Hopper Dredger (TSHD)) of approximately 9km. – Jetting of approximately 36km. – Laying of pipeline. – Rock armour material to be placed on top of installed pipeline. • LPS Pipeline (offshore marine works): <ul style="list-style-type: none"> – Dredging (by grab dredger) of approximately 1km (the alternative LPS Pipeline tie-in, if necessary). – Jetting of approximately 17km. – Laying of pipeline. – Rock armour material to be placed on top of installed pipeline. – Deburial of, and tie-in to, pre-installed pipeline • At the Pipeline Landfalls at the BPPS (and the alternative LPS Pipeline tie-in, if necessary) - seawall cofferdam construction, dredging, laying of pipeline, temporary seawall removal and reinstatement. • Pipeline hydrotesting.
Operational Activities	<ul style="list-style-type: none"> • Subsea pipelines will normally operate on a 24-hour, all year round continuously. • Maintenance dredging is not expected for the subsea pipelines.
Gas Receiving Stations (GRSs) at the BPPS and the LPS	
Project Component Scope	<ul style="list-style-type: none"> • Limited clearance activities within the Project Site • Civil works and electrical / mechanical works for installation of new pipe racks, GRS facilities (e.g. heating station, metering station, filtering station, pressure reduction facility and pig receiving station), and fencing, as well as for modifications and necessary works to existing pipe racks and vent stacks etc. to enable tie-in of new GRS piping and facilities.
Construction Activities	<ul style="list-style-type: none"> • Site construction, excavation, trenching, and equipment installation.
Operational Activities	<ul style="list-style-type: none"> • GRSs will normally operate on a 24-hour, all year round continuously.

5.1.2

Tentative Implementation Programme

Subject to obtaining HKSAR Government approval of the Project and a final investment decision on the Project being taken, the construction works of the Project would commence in 2019, dependent on timely receipt of various

regulatory approvals and statutory permits. The overall construction duration is anticipated to be approximately 21 months. It is expected that construction of the LNG Terminal, pipelines and GRSs will be constructed concurrently. An indicative construction programme is shown in *Figure 5.1*.

Figure 5.1 Preliminary Construction Programme of the Project

	Months																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Submission of Marine Traffic Impact Assessment	▼																							
Jetty Construction																								
Pipeline Construction																								
Pre-trenching by Dredging																								
Pipelaying																								
Post-trenching by Jetting																								
Rock Armour Placement																								
Commissioning																								
GRS Construction																								

Based on the preliminary construction programme as shown above, the start of commercial operation of the Project is estimated at the earliest the end of 2020.

5.2 AIR QUALITY

5.2.1 Construction Phase

For the LNG Terminal, the FSRU Vessel will be constructed outside of Hong Kong. The Jetty marine based construction works are not expected to be dust generating, and topsides construction works is expected to have very limited fugitive dust. Due to the large separation distance between the LNG Terminal worksite and the nearest ASR (~ 4km), adverse dust impact arising from the construction activities of the Project is not anticipated for the LNG Terminal.

For the subsea pipelines, these marine based works are not dust generating.

For the GRSs at the BPPS and the LPS, the construction sites are small, with insignificant quantities of construction and demolition materials and excavated materials generated from construction activities, and very limited number of truck trip per day. The potential air quality impact due to vehicular emissions from additional trucks during construction is minimal. As there is no ASR within 500m of the Project Site, no adverse dust impact is anticipated during construction. Dust control measures and good site practices will be implemented and regularly monitored through environmental site inspections.

5.2.2 Operation Phase

At the LNG Terminal, during normal operation, the FSRU Vessel and the Jetty will be fueled by natural gas. A diesel-fired generator will also be provided at the Jetty for backup power. The visiting LNGCs will be operated using boil off gas or low sulphur marine fuel. In addition, while berthed at the LNG Terminal, the LNGCs shall use fuel with sulphur content of not exceeding 0.5%.

Given the above, and due to the large separation distance between the LNG Terminal, LNGC marine transit route and the nearest ASRs (~ 4km), adverse air quality impact arising from the operation of the Project is not anticipated for the LNG Terminal. Further mitigation measures and monitoring are therefore not required during operation.

For the GRSs at the BPPS and the LPS, cumulative nitrogen dioxide (NO₂) impacts on the identified ASRs in the vicinity of the GRSs have been assessed, taking into account emissions from the proposed new GRSs, other emissions in the vicinity of the Project, vehicular emissions, as well as PATH-2016 predicted background NO₂ concentrations in 2020. The assessment results predict cumulative 1-hour average (118.6 to 153.7 µg m⁻³) and annual average NO₂ concentrations (18.2 to 37.7 µg m⁻³) at the identified ASRs comply with the relevant AQO criteria of 200 µg m⁻³ and 40 µg m⁻³, respectively. Adverse air quality impact due to the operation of the GRS at the BPPS and the GRS at the LPS is not anticipated, therefore mitigation measures and monitoring are therefore not required.

5.3 HAZARD TO LIFE

5.3.1 Construction Phase

For the LNG Terminal and subsea pipelines construction, LNG, natural gas and other dangerous goods will not be present, other than for commissioning purposes, therefore, construction phase associated risk has not been assessed.

For the GRSs at the BPPS and the LPS, the individual risk and societal risks posed by the Project and the existing BPPS and LPS facilities for the construction phase have been found to be acceptable and in compliance with the risk criteria in Section 2 of *Annex 4 of EIAO-TM*. No unacceptable risks are foreseen as a result of the construction of the proposed Project with safety management measures put in place to further manage and minimise the external hazards from constructions activities.

5.3.2 Operation Phase

The individual risk and societal risks posed by the Project during operation, including: marine transits of LNGCs and FSRU Vessel to the LNG Terminal; LNG Terminal, including the FSRU Vessel, the Jetty and LNGC unloading operations; the subsea pipelines; and the GRSs at the BPPS and the LPS were assessed.

For marine transits of LNGCs and the FSRU Vessel, subsea pipelines, the LNG Terminal and the GRSs at the BPPS and the LPS (with safety management systems in place, including safety inspection and audits), the individual risk has been found to be in compliance with the risk criteria in Section 2 of *Annex 4 of the EIAO-TM*.

In terms of societal risk, the F-N curves for all Project components lie within the Acceptable Region; hence all are in compliance with the risk criteria stipulated in Section 2 of *Annex 4* of the *EIAO-TM*.

5.4 NOISE

5.4.1 Construction Phase

Since no existing or planned NSRs have been identified within the Assessment Area for all the Project Sites, no unacceptable noise impact associated with the construction of the Project is anticipated. Mitigation measures and monitoring are therefore not required during construction.

5.4.2 Operation Phase

Results of the quantitative noise assessment due to operation of the GRS at the LPS indicate that the predicted noise levels are 44 dB(A) for daytime and night-time at the nearest NSR, and complies with both daytime and night-time noise criteria which are 54 dB(A) and 45 dB(A) respectively. In view of the insignificant noise impact arising from the operation of the Project and the large separation distance to the nearest NSRs (> 1.3km away), no unacceptable noise impact associated with the operation of the Project is anticipated. Mitigation measures and monitoring are therefore not required during operation.

No unacceptable residual noise impact is expected during the construction and operation phases of the Project.

5.5 WATER QUALITY

5.5.1 Construction Phase

Computational modelling has been conducted to predict various potential water quality impacts from the proposed marine dredging and jetting operations under this Project, and relevant concurrent projects, including suspended solids (SS) elevation, sedimentation flux, dissolved oxygen (DO) depletion, release of nutrient, heavy metal and trace organic contaminants.

Full compliance is predicted at all identified WSRs for all parameters in both seasons with the implementation of proposed mitigation measures. Key results are outlined below:

- Under the mitigated scenarios, the maximum SS elevation of 5.1 mg L⁻¹ in dry season and 5.7 mg L⁻¹ in wet season was predicted at observation point MPA-2 at the northwest corner of the SCLKCMP. The corresponding Water Quality Objectives (WQO) criteria for SS were 6.6 mg L⁻¹ and 6.0 mg L⁻¹ respectively in dry and wet seasons, and are hence complied with.
- The maximum DO depletion predicted based on conservative assumptions using maximum SS elevation was 0.2 mg L⁻¹, which is the

same as the corresponding WQO criterion for DO depletion, and is in compliance with the WQO.

- Worst case sedimentation flux among all mitigated scenarios was predicted at coral location CR1 at the BPPS seawall, where a maximum of 118.6 g m⁻² day⁻¹ and 108.8 g m⁻² day⁻¹ were predicted in dry and wet seasons respectively, which is well below the corresponding assessment criterion of 200 g m⁻² day⁻¹, and hence comply with the WQO.
- Results of water quality modelling also indicated the predicted release of sediment-bounded contaminants as well as nutrients would be limited at the identified WSRs and are below the corresponding assessment criteria.

Potential water quality impacts from other construction works as well as hydrotesting were also addressed, no exceedance of WQO criterion is expected. Appropriate precautionary and mitigation measures are recommended to minimise the potential water quality impact from these construction works. No unacceptable residual water quality impact is expected.

To ensure environmental compliance, marine water monitoring for the marine construction works is recommended to ensure the proper implementation of these measures.

5.5.2

Operation Phase

The potential change in water quality due to various discharges, including cooled seawater and total residual chlorine (TRC) from regasification unit, concentrated seawater from freshwater generator, and treated sewage effluent from sewage treatment unit, have been assessed alongside relevant concurrent projects. No exceedance of WQO criterion is expected from these discharges, and no unacceptable water quality impact has been predicted.

Potential water quality impact from maintenance dredging at the Jetty (if needed) is also assessed by computational model and no unacceptable water quality impact has been predicted with the implementation of proposed mitigation measures.

Furthermore, computational simulation has been conducted to predict the movement and extent of oil patches in case of a hypothetical oil spill event from LNGC in the absence of spill response. No unacceptable water quality impact is expected with the implementation of spill contingency plan.

Marine water quality monitoring at representative location is recommended for first year of operation of the LNG Terminal, and during any maintenance dredging. No unacceptable residual water quality impact is expected.

5.6 WASTE MANAGEMENT

5.6.1 Construction Phase

The key potential impacts during the construction of the Project are related to dredged marine sediment from the BPPS Pipeline and the LPS Pipeline. As dredged marine sediments are not suitable for re-use onsite, approximately 0.35Mm³ (in situ volume) will require off-site disposal. The estimated dredged quantities of approximately 0.03Mm³ (in situ volume) uncontaminated sediment (Category L sediment) could be considered to be disposed of at Type 1 open sea disposal sites (i.e. South of Cheung Chau or East of Ninepin). At present the East of Sha Chau Mud Pits are designated for confined marine sediment disposal of contaminated sediment. The current capacity of these pits is around 4.6Mm³ for contaminated sediment and these pits could be considered as the disposal site for the Category M contaminated marine sediments (approximately 0.32Mm³ (in situ volume)) generated from this Project. In accordance with *PNAP ADV-21*, the project proponent will liaise with Marine Fill Committee (MFC) and EPD at an early stage of the project, as to the allocation arrangement for sediment disposal. Marine sediment sampling, testing and reporting in accordance with the requirement stated in *PNAP ADV-21* for EPD approval as required under the *Dumping at Sea Ordinance* is recommended prior to the commencement of dredging and sediment disposal. The Project Proponent will continue to liaise with the relevant authorities to ensure compliance with *PNAP ADV-21*.

Generation of other wastes, including Construction & Demolition (C&D) materials, chemical waste, and general refuse including floating refuse are anticipated to be small. With the implementation of the mitigation measures recommended, no unacceptable environmental impacts arising from storage, handling, collection, transport and disposal of these wastes are expected.

Site audits at both land and marine-based work sites will be undertaken to determine if wastes are being managed appropriately.

5.6.2 Operation Phase

The operation of the GRSs at the BPPS and the LPS, and the LNG Terminal will generate minimal quantities of waste, and with the implementation of standard waste management practices no adverse environmental impacts are anticipated from the storage, handling, collection, transport and disposal of wastes are expected. Waste monitoring and auditing during the operation phase of the Project is not required.

No unacceptable residual waste management impact is envisaged during the construction and operation phases of the Project.

5.7 ECOLOGY

Following a site selection study, the preferred locations for the LNG Terminal and the BPPS Pipeline and LPS Pipeline routes have been selected that avoid,

to the extent practical, adverse impacts to habitats or species of high ecological value (e.g. existing and proposed marine parks).

Marine Ecological Resources

A review of baseline information on marine ecological resources surrounding the waters of the proposed Project from available literature and field surveys has been undertaken, covering the intertidal, sub-tidal soft bottom and hard bottom habitats and marine waters. Results from the review and the field surveys indicate that although both Chinese White Dolphin and Finless Porpoise are present in the Assessment Area, their habitats that are of some ecological importance only overlap with the Project infrastructure in some locations, e.g. the waters in the vicinity of Lung Kwu Chau and Sha Chau, West Lantau and the waters between Soko Islands and Shek Kwu Chau. Marine ecological resources in close proximity to the Project are generally regarded as of low ecological values (apart from high ecological values for the proposed South Lantau Marine Park which is located in the close vicinity), whereas further afield habitats and sensitive receivers of ecological values such as the corals at Pak Chau and the existing and proposed marine parks (Sha Chau and Lung Kwu Chau Marine Park, proposed Southwest Lantau Marine Park and proposed 3RS Marine Park) can be found. The presence of species of conservation importance such as green turtle and whale shark in the Assessment Area is considered to be very occasional.

Terrestrial Ecological Resources

The review of terrestrial ecological resources indicated that no terrestrial ecological sensitive receivers were identified within a 500m Assessment Area from the Project footprint including in offshore and onshore environments. However, breeding terns on Soko Islands, egretty at Sha Chau and WBSE nesting sites at Shek Kwu Chau, Lung Kwu Chau, Chi Ma Wan Peninsular near Ha So Pai, Mo Tat Wan of Lamma Island and Sunshine Island were reported outside the 500m Assessment Area from the Project footprint. Further baseline field surveys reported a relatively low diversity and density of avifauna in the marine waters of the LNG Terminal and its vicinity, and only four bird of species of conservation importance, Black-headed Gull, Black-tailed Gull, Bridled Tern and Aleutian Tern, of which Black-headed Gull, Black-tailed Gull and Bridled Tern are common and widespread in Hong Kong, was observed within 500m of the proposed LNG Terminal during the field surveys.

The GRS at the BPPS and the GRS at the LPS are located in urbanised/ disturbed areas within the boundaries of the BPPS and the LPS. The habitat is of negligible ecological importance and no species of conservation importance was recorded.

5.7.1 Construction Phase

The loss and disturbance of subtidal habitats and intertidal habitats due to the construction of the Jetty, the BPPS Pipeline and the LPS Pipeline is considered as environmentally acceptable to marine ecology since the areas affected are

relatively small in the context of the extent of similar habitat available in the vicinity and the comparatively low ecological value of the affected assemblages. Recolonisation by organisms in these habitats is expected to occur.

Marine mammals are expected to temporarily avoid active marine construction areas, and would return upon cessation of such activities. With the implementation of mitigation measures including briefing to Project vessel operators, the use of predefined and regular routes, optimized piling method with ramp-up procedures, marine mammal exclusion zone, restriction of percussive piling works during night-time and peak season of FP and control of dredging / jetting rates, thus no unacceptable impacts are anticipated considering also the short duration of works at specific locations during the phased construction activities.

Underwater percussive piling for Jetty construction has the potential to cause impacts to marine ecological resources especially marine mammals through underwater sound generation. With the adoption of recommended mitigation measures, including the use of hydraulic hammering with noise reduction system, use of bubble curtain, avoidance of marine percussive piling during the peak season of FP (December to May), avoidance of night-time working, adopting ramp-up procedures and strictly controlled marine mammal exclusion zones, no unacceptable impacts on these species are expected. Underwater sound and increase marine traffic generated from other marine construction activities are also not expected to result in unacceptable impacts to marine ecological resources especially marine mammals, considering the relatively small number of works vessels and trips involved slow-moving nature of these vessels and the habituation of similar sounds by the species in the current underwater soundscape.

As impacts of short-term changes in water quality arising from the construction of the Jetty, BPPS pipeline and LPS Pipeline are predicted to be largely confined to the specific works areas and with the implementation of mitigation measures the predicted elevations of suspended sediment due to the Project are not predicted to cause exceedances of the WQO outside of the mixing zones, unacceptable adverse impacts to water quality, and hence marine ecological resources, green turtles, whale sharks, marine mammals, existing and proposed marine parks are not anticipated. The assessment of water quality impacts demonstrated that marine ecological sensitive receivers, including existing and proposed marine parks, would not be unacceptably affected as defined by the relevant assessment criteria.

The mitigation measures designed to reduce impacts to water quality to acceptable levels and complying with WQOs during Project construction are also expected to mitigate impacts to marine ecological resources, marine mammals and marine parks. Precautionary measures designed to reduce impacts to marine mammals that use the Project's marine construction works areas include restrictions on vessel speed and use of predefined and regular routes. Specific mitigation measures have been identified for marine works and these include use of hydraulic hammers, bubble curtain and ramp-up procedures for underwater percussive piling, exclusion zone monitoring

during underwater percussive piling and marine dredging and jetting works, and scheduling measures for these construction activities to avoid periods of higher level of marine mammal activities. Cumulative impacts on marine mammals with other projects are not expected to occur.

As all land-based construction phase activities will be confined within the BPPS and the LPS, potential impacts on terrestrial ecological resources during construction of the Project are considered to be negligible, and no adverse residual impacts are expected.

Unacceptable impacts on avifauna due to noise and light emissions from construction activities are also not expected.

5.7.2 *Operational Phase*

The loss of about 2.5ha of Finless Porpoise habitats within the footprint of the Jetty is considered to be acceptable to marine and terrestrial ecology (including Finless Porpoise (FP) and offshore avifauna) as the habitat is very small in size in the context of the surrounding available habitat for the key species. Taking account of the sizable movement ranges and mobility of affected animals, it is expected that the loss would not give rise to significant adverse impacts on individuals or the populations as a whole. Additionally, the habitat which would be lost is not considered to be unique or critical habitat in terms of habitat utilization by the species. Recolonisation by organisms in the new artificial habitats provided by the subsea Jetty infrastructure is expected to occur. Similarly, these waters are not key habitats for horseshoe crabs, marine turtle and whale shark and impacts to these species would be negligible.

Unacceptable adverse impacts to marine ecological resources, marine mammals and marine parks, associated with cooled seawater discharge, impingement and entrainment of planktonic eggs and larvae, mooring for LNG transfer, increased marine traffic and underwater sound from project vessels, and maintenance dredging that maybe required, are not expected to occur during the operation of the Project. Potential incidents (e.g. during typhoon) may result in additional vessel movements during such emergency conditions, however, considering the slow speed of these vessels, it is not expected there would be a significant risk of vessel strike due to these vessel movements. Unacceptable adverse impacts of increased marine traffic due to potential incidents (e.g. during typhoon) on marine mammals are not anticipated. Accidental spill events at a scale that may impact marine ecology and marine parks are extremely unlikely to occur, and a contingency plan will be in place to reduce potential impacts. No marine ecology-specific mitigation measures are required during operation. The implementation of a Safety Zone around the LNG Terminal has negligible impact on marine park as the Safety Zone is outside the proposed SLMP.

The physical presence of the LNG Terminal in these waters, which are evaluated as of low ecological importance to offshore avifauna including White-bellied Sea Eagle, seabirds and migratory birds, is not expected to result in unacceptable impacts to avifauna considering the size of available marine areas

in the range of these birds. Unacceptable impacts on avifauna due to noise and light emissions from operational activities are also not expected.

As all land-based operation phase activities will be confined within the BPPS and the LPS, potential impacts on terrestrial ecological resources during operation of the Project are considered to be negligible, and no adverse residual impacts are expected.

Enhancement measures in the form of an independent funding have been recommended in supporting enhancement initiatives that contribute to enhance the marine environment of southern Lantau for the benefit of its biodiversity and the community.

5.8 *FISHERIES*

5.8.1 *Construction Phase*

During construction of the Project, direct impacts arising from the proposed marine construction works include temporary disturbance to fisheries habitats and loss of access to potential fishing ground within an area of approximately 18ha within the Jetty works areas. Given the small size of the affected areas which is of low fisheries importance and temporary nature of the disturbance, no unacceptable impacts are expected to occur.

During subsea pipeline construction, the entire lengths of the two pipeline routes would not be disturbed at any one time because pipeline construction activities would be undertaken in sequence and at discrete work fronts only. Considering the temporary nature of the disturbance and with the management of work fronts/ sequence, unacceptable impacts on fisheries resources, habitats (including spawning or nursery grounds) and fishing activities are hence not expected. Potential impacts of elevated levels of underwater sound as a result of construction activities are not expected to be unacceptable. Indirect impacts to fisheries resources related to perturbations to key water quality parameters, from both marine and land-based activities, are also expected to be insignificant as the predicted changes in water quality are short term, localised to immediate vicinity of the works areas and in compliance with the corresponding WQOs and assessment criteria. Marine construction works have been designed to reduce potential impacts on water quality which will, in turn, reduce impacts on fisheries resources. No unacceptable construction phase impacts to fisheries resources, habitats and fishing operations are expected to occur and no fisheries-specific mitigation measures are required during construction.

5.8.2 *Operation Phase*

No unacceptable impacts are expected to occur during the operation of the subsea pipelines. There will be a permanent loss of about 0.8ha of seabed habitats due to the presence of Jetty piles during operation of the Project. Given the very small size and low fisheries importance of the affected seabed habitats, the impacts to fisheries are considered to be of minor significance. The Jetty piles will provide hard substrates that could be colonised by a variety

of marine organisms. Colonisation of these structures could attract fish and marine invertebrates into the area. The loss of about 20ha of potential fishing ground access within the Safety Zone of the LNG Terminal, which is of low fisheries importance, is considered to be minor in the context of similar fishing grounds elsewhere in Hong Kong, and the effect on fisheries resources by the Jetty structure may have potential positive effect on fisheries resources. With the absence of significant ichthyoplankton and fish larvae resources in the LNG Terminal site, impingement and entrainment of fisheries resources is not anticipated to be unacceptable. Indirect impacts to fisheries as a result of the discharge of cooled seawater with residual chlorine, concentrated seawater from the freshwater generator, and treated sewage from the FSRU Vessel, and maintenance dredging are not expected to occur. Potential obstruction to fishing activities due to maintenance dredging works is not anticipated as it will be limited to the vicinity of the LNG Terminal only. Potential impacts of elevated levels of underwater sound generated from the FSRU Vessel and LNGC transits are not expected to be unacceptable. Accidental spill events at a scale that may impact fisheries are extremely unlikely to occur, and contingency plan will be in place to reduce potential impacts on fisheries. No unacceptable operational phase impacts to fisheries resources, habitats and fishing operations are expected to occur and no fisheries-specific mitigation measures are required during operation.

Enhancement measures in the form of an independent funding have been recommended in supporting enhancement initiatives that contribute to enhance the marine environment of southern Lantau for the benefit of its biodiversity and the community. It is expected that such initiatives can also enhance fisheries resources of southern Lantau and also support the sustainable development of the fishing industry.

5.9

VISUAL

The GRSs at the BPPS and the LPS are considered to integrate well with the existing power station facilities, and visual impacts during construction are acceptable. During operation, the GRSs will blend into their existing landscape and their visual impacts are considered negligible.

The construction and operation of the LNG Terminal is distant to most VSRs. There are existing large vessels traversing and anchored in or near these Hong Kong southwest marine waters and therefore the LNG Terminal, partly fits with the existing seascape. Overall the LNG Terminal construction, and operation including berthed FSRU Vessel and a visiting LNGC, is considered acceptable prior to mitigation. Some level of night time lighting is anticipated from the normal operation of the LNG Terminal but the impact is not anticipated to be significant. Nonetheless, measures including the use of sensitive architectural design of new facilities and reinstatement of temporary construction areas are recommended to further enhance the visual elements associated with the Project. No unacceptable residual impacts are anticipated.

Overall, it is considered that the Project will not cause unacceptable visual impacts.

5.10 *CULTURAL HERITAGE*

The Marine Archaeological Investigation (MAI) concluded that there are no potential archaeological materials within the impact area, therefore no marine archaeological impact is expected to occur during the Project construction and operation. No mitigation measures are considered necessary.

There are no planned projects that could have cumulative cultural heritage impacts with the Project.

5.11 *ENVIRONMENTAL MONITORING AND AUDIT*

A summary of the environmental impacts is presented in *Table 5.2*. The EIA Study of the Project has been demonstrated to comply with the *EIAO-TM* requirements. Actual impacts during the construction works will be monitored through a detailed EM&A programme. Full details of the programme are presented in the EM&A Manual associated with the EIA Report. This programme will provide management actions and supplemental mitigation measures to be employed should any impacts arise, thereby ensuring the environmental acceptability of the construction and operation of this Project.

5.11.1 *Construction Phase*

During construction, regular site inspections and audits will be conducted to confirm the effective and timely implementation of the recommended mitigation measures.

Marine water quality monitoring at selected WSRs will be necessary to assess the effectiveness of measures implemented to mitigate potential construction impacts for marine dredging and jetting works for the pipelines.

Monitoring of an exclusion zone for the presence of marine mammals around the dredging and jetting works areas is recommended as a precautionary measure, as well as baseline, impact and post-construction monitoring of marine mammals using vessel-based line transect surveys and passive acoustic monitoring (PAM).

Monthly waste audits will be conducted to determine if wastes are being managed in accordance with the recommended good site practices and the Waste Management Plan.

5.11.2 *Operation Phase*

During operation of the Project, regular monitoring of marine water quality monitoring at representative location of the LNG Terminal during the first year of operation of the Project are recommended. Marine water quality

monitoring would also be required for maintenance dredging at the LNG Terminal, if required.

Table 5.2 Summary of Environmental Impacts

Sensitive Receivers/ Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions	Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
Air Quality						
Air Sensitive Receivers (ASRs) within 500m from the Study Area.	<ul style="list-style-type: none"> Annex 4 of EIAO-TM Air Pollution Control Ordinance AQO 	Construction Phase: <ul style="list-style-type: none"> No unacceptable dust impact is anticipated. 	No	<ul style="list-style-type: none"> Project site located in remote locations avoiding impacts to ASRs 	Construction Phase: <ul style="list-style-type: none"> GRSs at the BPPS and the LPS - Relevant dust control measures in <i>Air Pollution Control (Construction Dust) Regulation</i> and good site practices. 	<ul style="list-style-type: none"> No unacceptable residual impacts are anticipated.
		Operation Phase: <ul style="list-style-type: none"> LNG Terminal - No unacceptable air quality impact is anticipated. GRSs at the BPPS and the LPS - No unacceptable air quality impact is anticipated. 	No		Operational Phase: <ul style="list-style-type: none"> Visiting LNGCs - Will comply with the fuel restriction requirement under <i>the Air Pollution Control (Ocean Going Vessels) (Fuel at berth) Regulation</i>. GRSs at the BPPS and the LPS - Emissions will be kept within their design parameters. 	
Hazard to Life						
Land and marine populations in the vicinity of the various project elements.	<ul style="list-style-type: none"> Annex 4 of EIAO-TM Hong Kong Risk Guidelines 	Construction Phase: <ul style="list-style-type: none"> No unacceptable risks are anticipated. 	No	<ul style="list-style-type: none"> Project site located in remote locations avoiding impacts to populations 	Construction Phase: <ul style="list-style-type: none"> Although mitigation measure is not required, safety management measures would be implemented. 	<ul style="list-style-type: none"> No unacceptable residual impacts are anticipated.
		Operation Phase: <ul style="list-style-type: none"> For LNG Terminal, marine transits of LNGCs and FSRU Vessel, subsea pipelines, and the GRSs at the BPPS and the LPS - No unacceptable risks are anticipated. 	No		Operational Phase: <ul style="list-style-type: none"> Although mitigation measure is not required, safety management system would be implemented, including safety inspection and audit. 	
Noise						
Noise Sensitive Receivers (NSRs) within 300m from the Assessment Area.	<ul style="list-style-type: none"> Annexes 5 and 13 of EIAO-TM Noise Control Ordinance Technical Memorandum on Noise from Construction Work other than Percussive Piling Technical Memorandum on Noise From Places Other than Domestic Premises, Public Places or Construction Sites (IND-TM) 	Construction Phase: <ul style="list-style-type: none"> No unacceptable construction noise impact is anticipated. 	No	<ul style="list-style-type: none"> Project site located in remote locations avoiding impacts to NSRs 	NA	<ul style="list-style-type: none"> No unacceptable residual impacts are anticipated.
		Operational Phase: <ul style="list-style-type: none"> No unacceptable noise impact associated is anticipated. 	No			
Water Quality						
Water Sensitive Receivers (WSRs) within: <ul style="list-style-type: none"> Southern WCZ Second Southern Supplementary WCZ North Western WCZ 	<ul style="list-style-type: none"> Annexes 6 and 14 of EIAO-TM Water Pollution Control Ordinance Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters WQOs for: 	Construction Phase: <p>With implementation of mitigation measures:</p> <ul style="list-style-type: none"> Changes in Water Quality due to Marine Construction Activities - Suspended Solids (SS) Dispersion and Sedimentation; Dissolved Oxygen (DO) Depletion; Release of Sediment-bounded 	No	<ul style="list-style-type: none"> Location of the LNG Terminal and the associated pipeline routes are selected to avoid the existing, proposed and potential marine parks as far as practicable. Use of appropriate chemical for pipeline hydrotesting. 	Construction Phase: <ul style="list-style-type: none"> Adoption of appropriate dredging and jetting rates, plant numbers and silt curtains at the plant and WSRs, where appropriate. 	<ul style="list-style-type: none"> No unacceptable residual impacts are anticipated.

Sensitive Receivers/ Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions	Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
<ul style="list-style-type: none"> North Western Supplementary WCZ Deep Bay WCZ (Outer Subzone) Western Buffer WCZ 	<ul style="list-style-type: none"> Southern WCZ Second Southern Supplementary WCZ North Western WCZ North Western Supplementary WCZ Deep Bay WCZ (Outer Subzone) Western Buffer WCZ 	Contaminants; Release of Sediment-bounded Nutrients - No unacceptable impacts <ul style="list-style-type: none"> Marine Vessel Discharges - No unacceptable impacts Subsea Pipeline Hydrotesting - No unacceptable impacts Runoff from Land-based Work Sites - No unacceptable impacts Sewage Discharges - No unacceptable impacts 			<ul style="list-style-type: none"> Grab dredging can be conducted concurrently with one Trailer Suction Hopper Dredger (TSHD). One jetting machine can be working on each pipeline. Cofferdam construction and removal within silt curtain and not conducted concurrently with the nearby pipeline dredging. Standard measures and good site practices. Develop a detailed hydrotesting procedure. 	
		Operational Phase: <ul style="list-style-type: none"> Discharge of Cooled Seawater with total residual chlorine (TRC) from the FSRU Vessel - No unacceptable impacts Discharge of Concentrated Seawater and Treated Effluent from the FSRU Vessel - No unacceptable impacts Other Effluent Discharges from the FSRU Vessel and LNGC - No unacceptable impacts Accidental Spill Events, with implementation of mitigation measures - No unacceptable impacts Maintenance Dredging at the LNG Terminal (if needed), with implementation of mitigation measures - No unacceptable impacts 	No	<ul style="list-style-type: none"> Location of the LNG Terminal and the associated pipeline routes are selected to avoid the existing, proposed and potential marine parks as far as practicable. 	Operational Phase: <ul style="list-style-type: none"> For accidental fuel spill: <ul style="list-style-type: none"> Design features such as shutdown valves and leak detectors. A spill contingency plan. For maintenance dredging: <ul style="list-style-type: none"> Controlled dredging rate, plant number as well as silt curtain. 	
Waste						
Project area	<ul style="list-style-type: none"> Annexes 7 and 15 of the EIAO-TM. Waste Disposal Ordinance (WDO); Waste Disposal (Chemical Waste) (General) Regulation Buildings Ordinance Land (Miscellaneous Provisions) Ordinance Public Health and Municipal Services Ordinance - Public Cleansing and Prevention of Nuisances Regulation Dumping at Sea Ordinance Merchant Shipping (Prevention and Control of Pollution) Ordinance 	Construction Phase: <ul style="list-style-type: none"> Marine Sediments - total about 0.35Mm³ (in situ volume): <ul style="list-style-type: none"> Category L sediment: about 0.03Mm³ Category Mpass sediment which passed the biological screening test: about 0.32Mm³ C&D materials: - total about 45,000m³ Chemical waste - about few hundred litres per month General refuse - about 390kg per day 	No	<ul style="list-style-type: none"> Use of pre-fabricated Jacket substructure reduces number of piles and waste generation Use of non-dredge method for Jetty and pipeline construction avoids bulk removal and disposal of any dredged materials 	<ul style="list-style-type: none"> Standard measures and good site practices. A Waste Management Plan. 	<ul style="list-style-type: none"> No unacceptable residual impacts are anticipated.
		Operational Phase: <ul style="list-style-type: none"> Industrial waste - Insignificant quantity Marine sediment from maintenance dredging - Subjected to site conditions Chemical waste - Insignificant quantity General refuse - about 32.5kg per day 	No	<ul style="list-style-type: none"> The Jetty design enables constant flushing which avoids trapping of floating refuse 		
Ecology						
Terrestrial Ecological Sensitive Receivers within 500m distance from the	<ul style="list-style-type: none"> Annexes 8 and 16 of the EIAO-TM 	Construction Phase: <ul style="list-style-type: none"> Marine Ecological Impacts (excluding Marine Mammals) 	No	<ul style="list-style-type: none"> Adoption of floating technology avoids the need for coastal reclamation and larger loss of seabed, and avoids 	General Measures for Marine Ecological Resources: <ul style="list-style-type: none"> Vessel operators to control effluent. 	<ul style="list-style-type: none"> Loss of about 0.8ha of subtidal soft bottom habitat and water

Sensitive Receivers/ Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions	Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
<p>boundary of the Project and any other areas likely to be impacted by the Project.</p> <p>Marine Ecological Sensitive Receivers within:</p> <ul style="list-style-type: none"> Southern WCZ Second Southern Supplementary WCZ North Western WCZ North Western Supplementary WCZ Deep Bay WCZ (Outer Subzone) Western Buffer WCZ 	<ul style="list-style-type: none"> EIAO Guidance Notes No. 6/2010, 7/2010, 10/2010 and 11/2010 Marine Parks Ordinance Wild Animals Protection Ordinance Protection of Endangered Species of Animals and Plants Ordinance Country Parks Ordinance Forests and Countryside Ordinance Town Planning Ordinance Hong Kong Planning Standards and Guidelines Chapter 10 (HKPSG) United Nations Convention on Biodiversity (1992) Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention) 	<ul style="list-style-type: none"> Temporary habitat loss and disturbance - Minor significance Underwater sound - Minor significance Short-term changes in water quality (marine construction activities and discharges and runoff from land-based and jetty topside construction activities, and pipeline hydrotesting) - Minor significance Accidental spillage and leakage of fuel/chemicals - Negligible significance Ecological Impacts to Marine Mammals <ul style="list-style-type: none"> Temporary habitat loss and disturbance Construction of Jetty, Construction of BPPS Pipeline and LPS Pipeline - Minor to Moderate significance Underwater sound from Jetty pile installation works - Moderate significance Increased marine traffic from marine construction activities - Minor significance Short-term changes in water quality - Minor significance Underwater sound from marine construction activities - Minor significance Accidental spillage/leakage of fuels/ chemicals - Negligible significance Ecological Impacts to Marine Parks <ul style="list-style-type: none"> Underwater sound from Jetty pile installation works - Moderate significance Increased marine traffic from marine construction activities - Minor to Moderate significance Short-term changes in water quality - Minor to Moderate significance Underwater sound from marine construction activities - Minor significance Accidental spillage/leakage of fuels/ chemicals - Negligible significance Ecological Impacts to Offshore Avifauna <ul style="list-style-type: none"> Permanent habitat loss - Minor significance Habitat Disturbance - Minor significance Terrestrial Ecological Impacts (excluding Offshore Avifauna) <ul style="list-style-type: none"> Habitat loss, fragmentation and isolation - Negligible significance Habitat disturbance - Negligible significance <p>Operation Phase:</p> <ul style="list-style-type: none"> Marine Ecological Impacts (excluding Marine Mammals) <ul style="list-style-type: none"> Permanent habitat loss - Minor significance Impingement and entrainment - Minor significance 	<p>No</p>	<p>dredging associated with approach channel and turning basin for vessels to reach shallower water in coastal locations associated with land-based LNG Terminal.</p> <ul style="list-style-type: none"> LNG Terminal site was selected based on a review of alternative locations and took account of relatively lower FP densities and little use of these waters by CWD, thus avoiding the most important areas with high sightings densities of these species. Location of the LNG Terminal and the associated pipeline routes are selected to avoid the existing, proposed and potential marine parks. Shore landing works for the BPPS Pipeline and LPS Pipeline are both located at existing artificial seawall, thus avoiding adjacent natural shores. The proposed GRS at the LPS and GRS at the BPPS are located within existing urbanised/ disturbed areas within the site boundaries of these premises, avoiding impacts on the surrounding terrestrial natural habitats. A combination of vibratory/ hydraulic 'pushing' and hydraulic hammering method for the Jetty construction results in less disturbance to marine mammals. Use of Jacket structures for the Jetty significantly reduced the number of piles required, shortening the construction duration and minimizing disturbance to marine mammals. Adoption of appropriate working rates and mitigation measures for dredging and jetting to avoid unacceptable indirect impacts to marine ecological sensitive receivers and resources have been avoided. 	<ul style="list-style-type: none"> No dumping policy. Vessels well-maintained. Water quality mitigation measures as stated above. <p>Specific Measures for Marine Mammals/ Marine Parks:</p> <ul style="list-style-type: none"> Selected pipeline dredging/ jetting works avoid the peak months of CWD calving (May and June). Selected pipeline dredging / jetting works restricted to a daily maximum of 12 hours (0700 - 1900). Use of vibratory/ hydraulic pushing method. During underwater percussive piling works: <ul style="list-style-type: none"> Use of quieter hydraulic hammer; Noise Reduction System; acoustic decoupling; ramp-up procedures; and bubble curtain; Daytime (0700 - 1900) works only for a maximum of 12 hours; and Avoid the peak season of FP (December to May). Use of predefined and regular routes for Project vessels; Avoid encroachment (anchoring/ anchor spread/ silt curtain deployment) into the existing and proposed marine parks; No stopping over or anchoring within the existing and proposed marine parks; Use of appropriate dredging and jetting rates with the use of silt curtain; <p>Precautionary measures to further reduce impacts to Marine Mammals/ Marine Parks:</p> <ul style="list-style-type: none"> Vessel operator briefing; Vessels speed of 10 knots around the Project's marine works areas and areas with high dolphin and porpoise usage, including existing and proposed marine parks; During underwater percussive piling works, implement a marine mammal 	<p>column within the footprint of the piles at the Jetty.</p> <ul style="list-style-type: none"> Loss of about 2.5ha of Finless Porpoise and offshore avifauna habitats within the footprint of the Jetty. The assessment of residual impacts associated with the habitat loss for the Project is considered to be acceptable.

Sensitive Receivers/ Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions	Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
		<ul style="list-style-type: none"> • Mooring for LNG transfer - Negligible significance • Changes in water quality - Minor significance • Temporary habitat loss and disturbance - Minor significance • Short-term changes in water quality - Minor significance • Underwater sound - Minor significance • Effects of glare from light sources and emergency gas flares - Minor significance • Accidental spillage and leakage of fuel / chemicals, including incidents e.g. typhoons - Minor significance • Ecological Impacts to Marine Mammals <ul style="list-style-type: none"> • Permanent habitat loss - Minor significance • Underwater sound - Minor significance • Increased marine traffic - Minor significance • Changes in water quality - Minor significance • Temporary habitat disturbance and short-term changes in water quality - Minor significance • Accidental spillage and leakage of chemicals/ fuel, including incidents e.g. typhoons - Minor significance • Ecological Impacts to Marine Parks <ul style="list-style-type: none"> • Underwater sound - Minor significance • Increased marine traffic - Minor significance • Mooring for LNG transfer - Negligible significance • Changes in water quality - Minor significance • Temporary habitat disturbance and short-term changes in water quality - Minor significance • Implementation of safety zone- Negligible significance • Accidental spillage and leakage of chemicals/ fuel, , including incidents e.g. typhoons - Minor significance • Ecological Impacts to Offshore Avifauna <ul style="list-style-type: none"> • Potential for bird interactions and collision risk - Minor significance • Habitat disturbance, e.g. light and noise emissions - Minor significance • Accidental spillage and leakage of chemicals/ fuel, , including incidents e.g. typhoons - Negligible significance • Terrestrial Ecological Impacts (excluding Offshore Avifauna) <ul style="list-style-type: none"> • Habitat disturbance - Negligible significance 			<p>exclusion zone within a radius of 500m;</p> <ul style="list-style-type: none"> • During marine dredging or jetting operations, implement a marine mammal exclusion zone within a radius of 250m; • A spill contingency plan. 	

Sensitive Receivers/ Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions	Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
Fisheries						
Fisheries Sensitive Receivers within: <ul style="list-style-type: none"> • Deep Bay WCZ • Southern WCZ • Second Southern Supplementary WCZ • North Western WCZ • North Western Supplementary WCZ 	<ul style="list-style-type: none"> • Annexes 9 and 17 of the EIAO-TM • Fisheries Protection Ordinance • Marine Fish Culture Ordinance • Water Pollution Control Ordinance 	Construction Phase: <ul style="list-style-type: none"> • Direct disturbances of fisheries habitat and Loss of Access to Fishing Ground - Minor significance • Underwater sound generated from marine construction activities - Minor significance • Perturbations to key water quality parameters from marine construction activities - Minor significance • Changes in water quality from discharges and runoff from land-based and jetty topside construction activities, and pipeline hydrotesting - Minor significance 	No	<ul style="list-style-type: none"> • Relevant avoidance measures as detailed above for the water quality and ecology aspect • Avoid areas of high fisheries importance • Proper planning and design of the marine construction works • Appropriate notification, communications, site protection and marking would be adopted to reduce navigation risks with fishing vessels. 	<ul style="list-style-type: none"> • Water quality mitigation measures. • Marine ecological mitigation measures. • Appropriate design of the intake screens on the cooling water intake. 	<ul style="list-style-type: none"> • The Jetty structure has the potential to mimic an 'artificial reef' that provides habitat and shelter for juveniles or adult fisheries resources. The reduced fishing pressure may also have potential positive effect on fisheries resources within and adjacent to the LNG Terminal. Residual impact from loss of potential fishing grounds within the LNG Terminal Safety Zone remains within acceptable levels.
		Operational Phase: <ul style="list-style-type: none"> • Changes in fisheries habitats at the Jetty - Minor significance • Loss of access to fishing ground at the LNG Terminal - Minor significance • Impingement and entrainment of fisheries resources at the seawater intake of the FSRU Vessel, and through ballast water uptake of the LNGC - Minor significance • Indirect impacts arising from the alteration of marine water quality due to the discharge of cooled water with residual chlorine, concentrated seawater from the freshwater generator, and treated sewage from the FSRU Vessel - Minor significance • Underwater sound generated from the FSRU Vessel and LNGC transits - Minor significance • Change in water quality during maintenance dredging at the LNG Terminal - Minor significance • Potential risk of accidental spillage due to the operation of the LNG Terminal - Minor significance 	No			
Visual						
Visual Sensitive Receivers (VSRs) that may be affected by the Project	<ul style="list-style-type: none"> • Annexes 10 and 18 of the EIAO-TM and associated Guidance Note 8/2010 • Hong Kong Planning Standards and Guidelines (HKPSG) • Lands Administration Office (LAO) Practice Note No. 7/2007 Tree Preservation & Tree Removal Application for Building Development in Private Projects • DEVB TC(W) No. 7/2015 - Tree Preservation • ETWB TCW No. 11/2004 - Cyber Manual for Greening • DEVB TC(W) No.6/2015 - Maintenance of Vegetation and Hard Landscape Features 	Construction Phase: <ul style="list-style-type: none"> • Acceptable prior to mitigation. 	No	<ul style="list-style-type: none"> • Project site located in remote locations avoiding impacts to VSRs • No trees will be felled for the construction of the GRSs at the BPPS and LPS. • Appropriate design of the LNG Terminal will avoid standing out from the natural background. • Controlled lighting will reduce night-time impacts. 	<ul style="list-style-type: none"> • Appropriate architectural design. • Reinstatement of temporary construction areas and preservation of vegetation. • Control of light intensity and beam directional angles. 	<ul style="list-style-type: none"> • No unacceptable residual visual impacts are expected.
		Operational Phase: <ul style="list-style-type: none"> • Acceptable and not significant. 	No			

Sensitive Receivers/ Assessment Points	Relevant Standards and Criteria	Results of Impact Predictions	Extents of Exceedances Predicted	Impact Avoidance Measures Considered	Mitigation Measures Proposed	Residual Impacts (After Mitigation)
Cultural Heritage						
Areas affected by the marine and dredging works of the Project.	<ul style="list-style-type: none"> Annexes 10 and 19 of the EIAO-TM Guidelines for Marine Archaeological Investigation (MAI) 	Construction and Operation Phase: <ul style="list-style-type: none"> No terrestrial cultural heritage impacts are expected. No marine archaeological potential within the Project's impact area - no marine archaeological impact is expected. 	No	<ul style="list-style-type: none"> LNG Terminal site and the associated pipeline routes avoid areas of marine archaeological potential. The proposed GRS at the LPS and GRS at the BPPS are located within existing urbanised/ disturbed areas, avoiding impacts on declared monument protected, graded/ recorded heritage resources, built heritage or sites of archaeological interest 	<ul style="list-style-type: none"> No mitigation measure is required. 	<ul style="list-style-type: none"> No unacceptable residual impacts are expected.

This EIA Study has critically assessed the overall acceptability of the environmental impacts likely to arise as a result of the construction and operation of the Project. It has demonstrated the acceptability of any residual impacts from this Project and the protection of the population and the environmentally sensitive resources. The EIA Study concluded that, with the implementation of the recommended mitigation measures, the Project would be environmentally acceptable and in compliance with the relevant assessment standards/criteria of the *EIAO-TM*. Where appropriate, EM&A mechanisms have been recommended to verify the accuracy of the EIA predictions to ensure the effectiveness of the recommended mitigation measures.

The implementation of this Project is in line with the HKSAR Government's objective of improving air quality and reducing carbon intensity of Hong Kong, and is consistent with the HKSAR Government's strategy of increasing the use of natural gas for local power generation. The Project also increases Hong Kong's optionality regarding the sourcing of future gas supplies, providing (i) certainty of gas supply and timely availability; (ii) supply security; and (iii) adequate volume and flexibility to augment existing gas supplies and flexibility to meet future gas demand growth and seasonal demand.








NOTES

This EIA Report has been prepared to comply with the requirements of the EIA Study Brief and the EIAO-TM, as a basis for the Director of Environmental Protection to consider granting the Environmental Permit to allow the construction and operation of this Project.

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

The submission of this Environmental Impact Assessment (EIA) Report and the said Environmental Permit application(s) does not amount to a commitment by or on behalf of CLP/CAPCO and/or HK Electric to proceed with the Project.

圖例 Legend

-  香港特別行政區邊界
Boundary of HKSAR
-  擬議龍鼓灘發電廠內的天然氣接收站
Proposed GRS Location at BPPS
-  擬議南丫發電廠內的天然氣接收站
Proposed GRS Location at LPS
-  連接龍鼓灘發電廠的海底管道建議路線
Proposed Route of BPPS Pipeline
-  連接南丫發電廠的海底管道建議路線
Proposed Route of LPS Pipeline
-  擬議海上液化天然氣接收站
Proposed Site for LNG Terminal
-  擬議海上液化天然氣接收站安全區
Proposed LNG Terminal Safety Zone

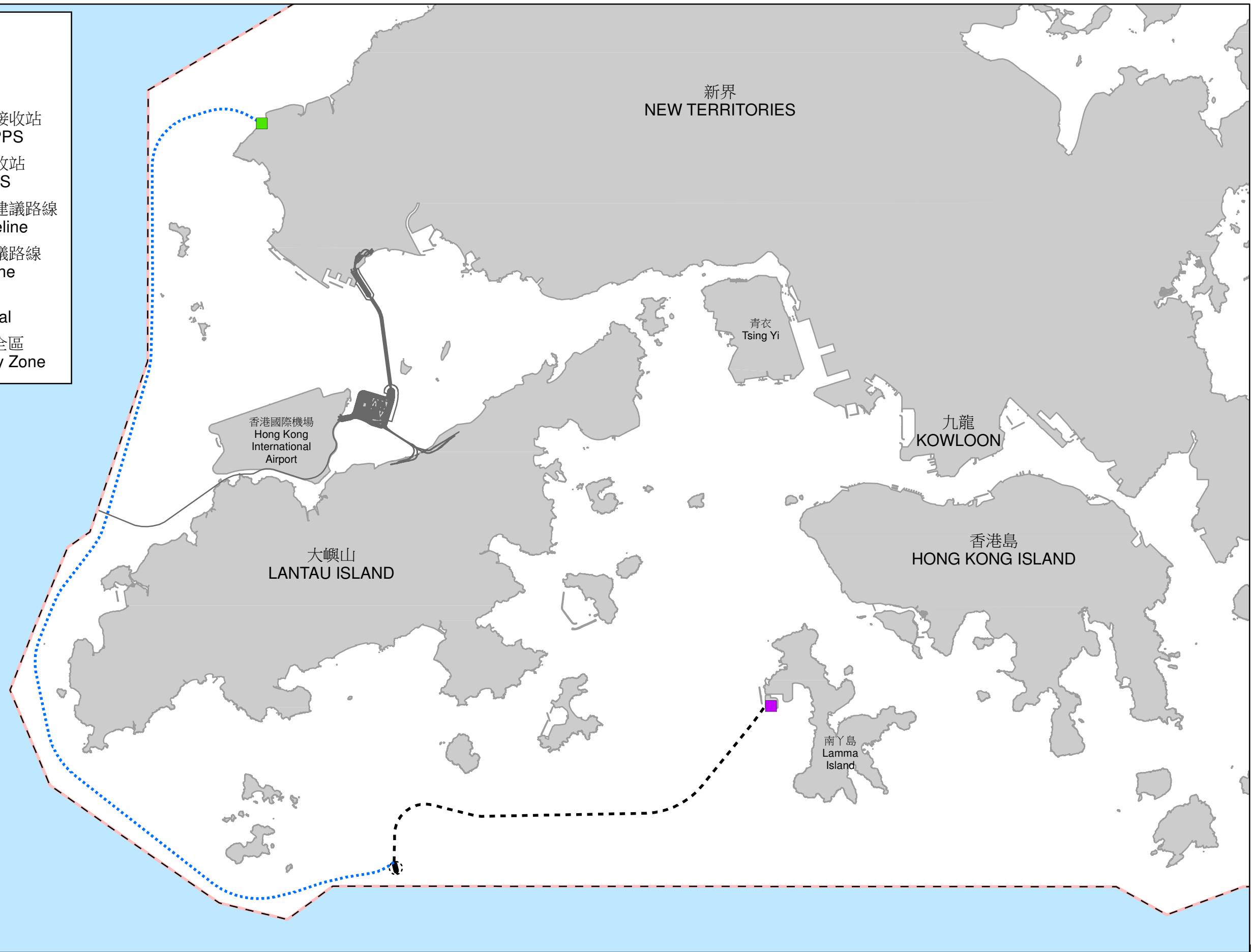


圖 3.1
Figure 3.1

工程項目主要組成部份的初步位置圖
Indicative Location of Key Project Components

圖例 Legend

 擬議龍鼓灘發電廠內的天然氣接收站
Proposed GRS Location at BPPS

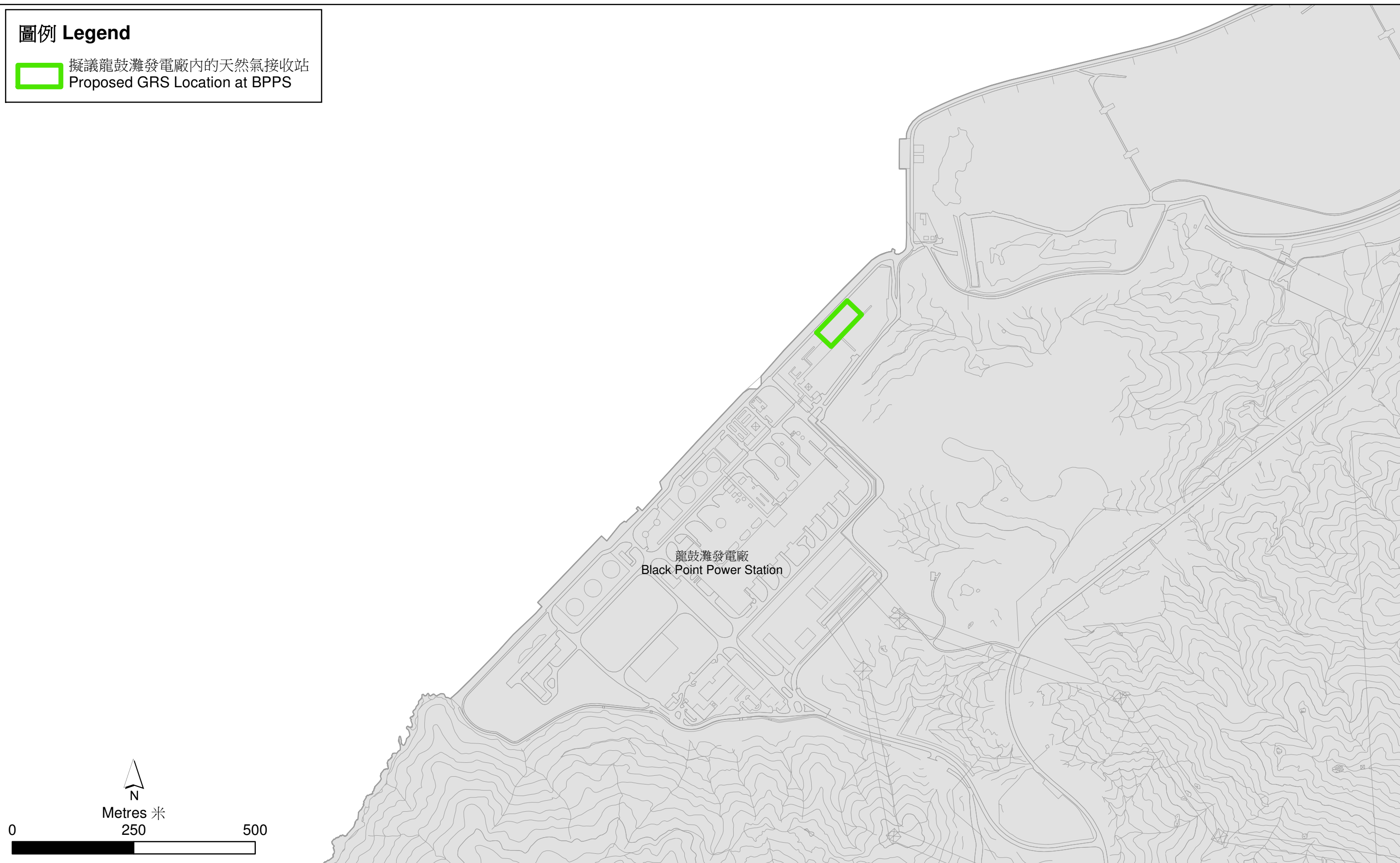


圖 3.2
Figure 3.2

龍鼓灘發電廠內的天然氣接收站初步位置圖
Indicative Location of the Gas Receiving Station at Black Point Power Station

圖例 Legend

擬議南丫發電廠內的天然氣接收站
Proposed GRS Location at LPS

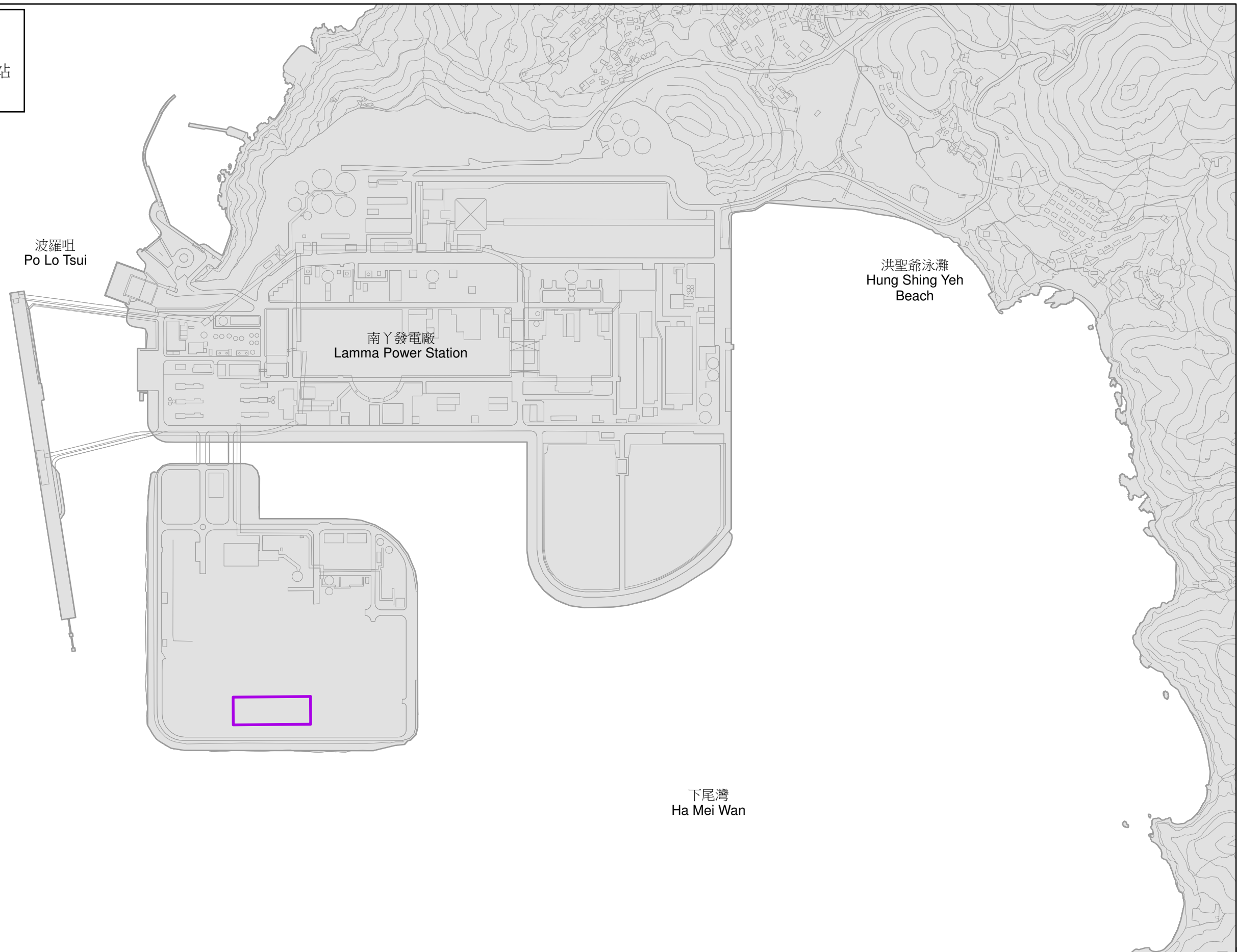


圖 3.3
Figure 3.3

南丫發電廠內的天然氣接收站初步位置圖
Indicative Location of the Gas Receiving Station at Lamma Power Station