

CONTENT

18	CONCLUSIONS	1
18.1	INTRODUCTION	1
18.2	CONSIDERATION OF ALTERNATIVES	1
18.3	AIR QUALITY	4
18.4	NOISE	5
18.5	WATER QUALITY	5
18.6	WASTE MANAGEMENT	6
18.7	TERRESTRIAL ECOLOGY	7
18.8	MARINE ECOLOGY	9
18.9	FISHERIES	10
18.10	LANDSCAPE AND VISUAL IMPACT	12
18.11	CULTURAL HERITAGE	13
18.12	HAZARD TO LIFE	14
18.13	LAND CONTAMINATION PREVENTION	14
18.14	ENVIRONMENTAL MONITORING AND AUDIT (EM&A)	14
18.15	ENVIRONMENTAL OUTCOME	15
18.16	ENVIRONMENTALLY RESPONSIBLE DESIGNS	15
18.17	ENVIRONMENTAL BENEFITS OF THE PROJECT	15

18 CONCLUSIONS

18.1 INTRODUCTION

This *Section* presents a summary of the key conclusions of this EIA associated with the construction and operation of the proposed LNG terminal at South Soko. The purpose of the assessment was to thoroughly evaluate the South Soko LNG terminal and associated facilities in terms of predicted impacts to key environmental sensitive receivers and to determine whether this option can meet the requirements of the *EIAO-TM*.

18.2 CONSIDERATION OF ALTERNATIVES

This EIA Study has examined a series of Alternatives as follows:

- Consideration of Alternative Site Locations (*Part 1, Section 4*);
- Consideration of Different Layouts and Design Options (*Part 2, Section 2.1*);
- Consideration of Alternative Construction Methods (*Part 2, Section 2.2*);
- Consideration of Pipeline Alignment (*Part 2, Section 2.3*); and,
- Consideration of Power and Water Supply (*Part 2, Section 2.4*).

18.2.1 Consideration of Alternative Site Locations

CAPCO conducted a preliminary evaluation of the options for a LNG receiving terminal in Hong Kong which included Gravity Based Structure, Floating Storage Regasification Unit, Artificial Island and a Coastal Location. The assessment concluded that a coastal location was the only viable option for a receiving terminal in Hong Kong that could reliably supply natural gas to the Black Point Power Station.

An alternative site location study was conducted to determine the most suitable coastal site(s) in Hong Kong for the LNG terminal. A phased approach to the screening and assessment of sites within Hong Kong was utilised. The results of this Hong Kong wide site location study indicated that two sites were worthy of further analysis based on their relative performance against a series of other shortlisted sites in relation to environmental, risk, planning, social, marine traffic and engineering criteria. The two preferred sites were South Soko Island, at the location of the former detention centre, and Black Point, on the headland adjacent to the existing power station (BPPS).

18.2.2 **Consideration of Different Layouts and Design Options**

An assessment of different layouts and design options was conducted to investigate not only the environmental considerations of each preliminary layout and design options, but to include an in depth examination of the engineering aspects for various layouts. The preferred layout that was taken forward to the EIA stage was based on locating the terminal in the centre of South Soko Island with the LNG receiving jetty on the southeastern coast. This layout provided a series of environmental benefits when compared to the other layouts examined, including:

- A substantial reduction in the length of the approach channel for the LNG carrier and consequently a four fold reduction in dredging volumes (approximately 5 Mm³ to 1.07 Mm³). The reduction in dredging volumes has contributed to a reduction in impacts to water quality, fisheries and marine ecological sensitive receivers.
- The siting of the jetty to the southeast has avoided the need to conduct substantial dredging for the approach channel and turning circle in the water between North and South Soko.
- A substantial reduction in the size of the reclamation works required to site all of the terminal facilities from approximately 13 ha to 0.6 ha. The reduction in reclamation size has contributed to a reduction in impacts to water quality, fisheries and marine ecological sensitive receivers.
- The amount of natural coastline lost to the reclamation works has been reduced by half from over 1 km to 300 m. The reduction in natural coastline loss has contributed to a reduction in impacts to marine ecological sensitive receivers.
- By locating the terminal facilities in the centre of the island, the disturbance to natural habitats on land has been reduced.
- The LNG storage tanks are located in cuts into the northern hill on South Soko, which although results in an increase in excavated rock, has the significant benefit of reducing impacts to visual sensitive receivers by shielding the tanks from views on Lantau Island.

18.2.3 **Consideration of Alternative Construction Methods**

- *Reclamation:* Two construction options have been considered, the Fully Dredged Option and the Partially Dredged Option. It is considered, that whilst there may be benefits from the Fully Dredged Option from a schedule perspective, the benefits associated with potentially less on site dredging and offsite disposal mean that the Partially Dredged Option should be taken forward as the preferred construction method for the reclamation.

- *Jetty*: For the construction of the LNG Jetty, two alternatives for the installation of marine piles have been assessed. These are bored or percussive piling methods. The assessment proposed that either method would be suitable for the construction of the LNG Jetty as part of the South Soko terminal.
- *Approach Channel and Turning Circle*: Two dredging plant have been assessed, i.e. using grab dredgers and trailing suction hopper dredgers (TSHD). Both are commonly used in Hong Kong and as such have been considered as a viable option.
- *Submarine Gas Pipeline, Water Main and Power Cable*: Due to the marine traffic regime of the proposed alignments for the water main and power cable, the installation of these facilities will require both dredging and jetting operations. The natural gas pipeline will require a combination of grab dredging and trailing suction hopper dredging which were assessed as the preferred alternative for reducing water quality impacts and impacts in important marine mammal habitat and the Marine Park. Jetting has been proposed for the water main and power cable where burial depth and additional protection measures against anchor drop and drag are not required.

18.2.4 **Consideration of Pipeline Alignment**

Four route options for the South Soko-BPPS gas pipeline have been assessed:

1. *Base Case*: Entirely Offshore Route Passing West of Lantau Island
2. *Option 1 (A and B)*: Route Crossing Lantau Island Overland to the West
3. *Option 2*: Route Crossing Lantau Island Through a Tunnel
4. *Option 3*: Route Crossing Lantau Island Overland to the East

The assessment concludes that *Option 1 (A + B)* and *Option 3* are the least preferred. Both options have greater potential for water quality, ecological and landscape impacts within the Country Parks (North Lantau and South Lantau) and along the roads in Lantau.

The tunnel option is a more uncertain undertaking resulting in a minimum delay to the LNG Receiving facility operation start date of 15 - 26 months and an additional cost of HK\$ 0.5 billion. There are significant uncertainties with the tunnel option *inter alia* unexpected ground conditions, planning issues, community issues related to private lots and potential extra EIA studies which could increase the delay further. The conclusion is that when compared to the *Base Case* (Marine Route), the tunnel (and other land based options) are not reasonable or practicable alternatives when the risks and schedule uncertainties are all considered.

In addition, the environmental constraints, safety issues and physical constraints associated with all four route options indicate that the Marine Route remains the preferred gas pipeline route option. From a scheduling aspect the marine route can be installed without resulting in delays in commissioning of the LNG terminal whereas the other options will lie on the critical path and introduce significant delays to project start-up. The schedule delays brought about by the non-marine option will mean that CAPCO cannot meet the Government's 2010 emission initiatives.

18.2.5 Consideration of Power and Water Supply

Four alternative routes were assessed for the power cables and water main route from South Soko to Shek Pik. The assessment investigated both the environmental and engineering aspects of each option and concluded that the most direct route passing to the west of South Soko and directly up to Shek Pik was the preferred option due to the shortest route and its avoidance of most of the major elements including the Country Park, Green Belt and locations of higher dolphin and porpoise sighting density.

18.3 AIR QUALITY

The potential impacts to air quality caused by construction and operational activities of the LNG terminal and its associated facilities at South Soko have been assessed in *Section 4* of 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 4 and 12* respectively.

Two Air Sensitive Receiver (ASR) were identified (at Shek Pik for the LNG terminal and BPPS administration building for the GRS) and the potential impacts arising from the construction and operation phases of the LNG terminal to the ASRs has been evaluated. From the assessment it emerges that dust generated from the construction activities and gaseous emissions from construction plant are the potential concerns during the construction phase, whilst air emissions from LNG terminal equipment and LNG carrier are the principal concern during the operational phase.

Potential dust nuisance from dust generating activities and gaseous emission from construction plant during construction of the LNG terminal have been considered. With the implementation of standard mitigation measures, no adverse impact is anticipated. The gaseous emissions from the construction plant are also minimal and no adverse impact to the ASRs are anticipated.

During the operation of the LNG terminal, air emissions from submerged combustion vaporisers (SCVs), the gas-turbine generators and the LNG carrier generators during LNG unloading and gas heaters at Gas Receiving Station at Black Point were identified as potential sources of air quality impacts. As a conservative assumption, it was assumed that the SCVs, gas-turbine generators, the LNG carrier generators and gas heaters were operating

continuously. Even with this set of assumptions, the modelling indicated that the air quality impacts are low and well within the respective criteria at the identified ASRs.

18.4

NOISE

The potential impacts of noise caused by construction and operational activities of the LNG terminal and its associated facilities at South Soko have been assessed in *Section 5* of this EIA Report. The impacts have been identified and analysed to be in compliance with the criteria and guidelines stated in the *EIAO – TM Annexes 5 and 13* respectively.

Noise sensitive receivers (NSRs) have been identified and the potential impacts arising from the construction and operational phases have been evaluated. In both cases, the noise assessment was conducted using a conservative approach assuming each work activity operates simultaneously in the construction phase and without attenuations due to foliage of trees and shrubs, ground effects and buildings during the operation phase assessment.

No NSRs have been found on South Soko and the nearest NSR has been identified on Lantau Island (N1 - Staff Quarters of the Shek Pik Prison) which is located approximately 6 km away from the site. The predicted construction noise levels at NSRs are within the stipulated noise criterion of 75 dB(A). In view of the insignificant construction noise impact, mitigation measures are not required during the construction phase.

Based on the most conservative case, the noise levels generated from the equipment during the operation of the LNG terminal have been predicted. Due to the large separation distance between the NSR and the noise source, the predicted operational noise level is within daytime and night-time noise criteria, and therefore mitigation measures are not required during the operational phase.

In view of the insignificant noise impact in both construction and operational phases, noise monitoring is not considered to be necessary.

18.5

WATER QUALITY

The potential impacts to water quality caused by construction and operational activities of the LNG terminal and its associated facilities at South Soko have been assessed in *Section 6* of 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 6 and 14* respectively.

Sensitive receivers potentially affected by construction and operational activities of the LNG terminal have been identified and the potential impacts have been evaluated. The key sensitive receivers include marine mammal habitat, the Sha Chau and Lung Kwu Chau Marine Park, commercial fisheries

spawning habitat, fish culture zones, ecologically sensitive areas, beaches and water intakes. The assessment, utilising water quality and hydrodynamic models, has included the potential impacts caused by marine works (i.e. dredging, reclamation, pipeline and utilities installation) on water quality due to the increases of suspended sediments concentrations, potential decreases of dissolved oxygen and increases in nutrients concentration, as well as those caused by operational activities such as the alteration of the hydrodynamic regime, discharges of cooled water and antifoulants.

Potential impacts arising from the proposed dredging, backfilling and jetting works are predicted to be mainly confined to the specific works areas. Modelling results indicate that the suspended solids elevations as a result of dredging and jetting for the installation of the submarine utilities are expected to be compliant with the assessment criteria at all sensitive receivers in both seasons. In the few exceptions in which the modelling results indicate elevations above the criteria these are of short duration (typically less than one day) and not considered sufficient to cause an unacceptable deterioration of water quality. The elevation predicted at Pak Tso Wan beach and at the False Pillow Coral location can be mitigated through the adoption of silt curtains. Hence it is anticipated that such elevations above the criteria would be temporary and unacceptable impacts would be unlikely to arise. Overall the predicted elevations of suspended sediment concentrations during the construction phase are transient in nature and not predicted to cause adverse impacts to water quality at the sensitive receivers.

During the operation phase, adverse impacts to water quality are not expected to occur as the area affected by the cooled water and antifoulants discharge is extremely small and in the direct vicinity of the discharge point.

No other projects are planned to be constructed in sufficient proximity to the Project to cause cumulative effects and hence, cumulative impacts are not expected to occur.

Water quality monitoring and auditing is recommended for the construction phase and the specific monitoring requirements are detailed in the *Environmental Monitoring and Audit Manual (EM&A Manual)* associated with this EIA Report. As no unacceptable impacts have been predicted to occur during the operation of the LNG terminal at South Soko Island, monitoring of impacts to marine water quality during the operational phase is not considered necessary. It is noted that discharges from the site will require a license under the WPCO which stipulates regular effluent monitoring as part of the license conditions.

18.6 WASTE MANAGEMENT

The potential impacts to waste management caused by construction and operational activities of the LNG terminal and its associated facilities at South Soko have been assessed in *Section 7* of this EIA Report. The impacts have

been identified and analysed to be in compliance with the criteria and guidelines stated in the *EIAO – TM Annexes 7 and 15* respectively.

The key potential impacts during the construction phase are related to wastes generated from site clearance, site formation, blasting, dredging, reclamation, seawall construction, filling and concreting. The storage, handling, collection, transport, disposal and/or re-utilisation of these materials and their associated environmental impacts have been the primary focus of the assessment.

During the construction phase it is estimated that a total of approximately 3.89 Mm³ of marine sediment will be dredged and that approximately 60 % of the sediments are uncontaminated and could be disposed of at open sea disposal site. A considerable amount of excavated rock (approximately 1.80 Mm³) and soil (approximately 0.56 Mm³) will be generated from the site formation works, which will be used, to the extent practical, as fill material for the reclamation, seawall construction and armouring of the submarine utilities. The excavated rock and soil will be stored temporarily off-site. Other wastes produced during the construction phase are of small quantity and will be disposed of according to their nature, avoiding any potential adverse impact. The potential environmental impacts associated with the storage, handling, collection, transport and disposal of waste produced during operational activities have been estimated to be not significant and will therefore meet the criteria specified in the *EIAO-TM*.

Unacceptable impacts as a result of the waste produced during the construction phase have been reduced through the adoption of specific mitigation measures and in particular through the establishment and implementation of a Waste Management Plan (WMP).

In order to ensure that the construction Contractor(s) has implemented the recommendations of the EIA Report, regular site audits will be conducted of the waste streams, to determine if wastes are being managed in accordance with the approved procedures and the site WMP. An appropriate audit programme should be undertaken with the first audit conducted at the commencement of the construction works. Routine weekly site inspections should also include waste management issues.

18.7 TERRESTRIAL ECOLOGY

The potential impacts to terrestrial ecology caused by construction and operational activities of the LNG terminal and its associated facilities at South Soko have been assessed in *Section 8* of 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 8 and 16* respectively. The terrestrial habitats and wildlife on South Soko Island were characterised through the conduct of seasonal surveys during 2004, 2005 and 2006. The surveys covered habitats, vegetation, mammals, avifauna, herpetofauna,

dragonflies, butterflies, aquatic invertebrates and fish.

The potential direct and indirect impacts to terrestrial ecology assessed include loss of habitats, disturbance to wildlife, disturbance to ecologically sensitive areas and pollution.

The terrestrial ecological resources recorded on South Soko Island comprise plantation, secondary woodland, shrubland, grassland, backshore shrubland, seasonal stream, abandoned wet agricultural land, abandoned dry agricultural land, abandoned reservoir and disturbed areas, with their associated wildlife. Of these habitats, a small patch of secondary woodland (approximately 0.2 ha) inside of the Project Area has moderate ecological importance. The rest of plantation, shrubland, abandoned wet agricultural land and seasonal stream have low to moderate ecological importance. The remaining habitats are of low or negligible ecological importance. The terrestrial ecological resources recorded at Shek Pik are of low to moderate ecological importance and include plantation, shrubland and backshore shrubland. The remaining developed areas are estimated to be of negligible ecological importance.

The LNG terminal and its associated facilities will be located mainly in habitats of low ecological value such as the already disturbed areas which were formerly part of the now demolished Vietnamese Detention Centre. The construction impact on the natural habitats and associated wildlife is considered to be low, and no adverse residual impact is expected after the implementation of the recommended mitigation measures.

The proposed electricity cable circuit and water main at Shek Pik will be located in habitats such as the developed area which is adjacent to the existing Shek Pik Prison and concrete road. The impact on natural habitats is considered to be low, and no adverse residual impact is expected after the implementation of the recommended mitigation measures.

During the operation phase of the LNG terminal and associated facilities no adverse impacts to terrestrial ecology are expected.

Appropriate mitigation measures have been adopted for the construction phase and no adverse residual impacts are expected. These measures include the adoption of appropriate construction practices at all construction sites, transplantation and compensatory tree/shrub planting. Temporarily affected areas such as the plantation and shrubland habitats at South Soko and the plantation at Shek Pik will be reinstated immediately after completion of construction works, through on-site tree/shrub planting. Nine individuals of Golden Eulophia will be transplanted to a similar habitat (i.e., shrubland with open canopy and south facing, which can be found in the southern part of South Soko). Approximately 2.8 ha of plantation, 6.4 ha of shrubland, 0.5 ha of abandoned wet agricultural land, 0.5 ha of grassland and 5.6 ha of disturbed area will be permanently lost and 0.5 ha of plantation, 0.3 ha of disturbed area and 1 ha of shrubland will be temporarily lost. The affected areas are considered to be low quality habitats. No adverse residual impact

due to the construction and operation of the LNG terminal is expected at South Soko after the implementation of the proposed mitigation measures including provision of approximately 0.2 ha of compensatory secondary woodland planting, approximately 1.9 ha of shrub planting, 1.3 ha of grass planting and transplantation of individuals of the Golden Eulophia.

After transplantation, monitoring will be undertaken to check the performance and health conditions of the transplanted individuals. The implementation of these mitigation measures will be included within the environmental monitoring and audit requirement during the construction period. Regular site inspections should be carried out during the construction phase in order to ensure that the mitigation measures are implemented and are working effectively. No other terrestrial ecology specific measures are considered necessary.

During the operational phase, adverse impacts are not expected to occur. Therefore, no terrestrial ecology monitoring will be required.

18.8

MARINE ECOLOGY

The potential impacts to marine ecology caused by construction and operational activities of the LNG terminal and its associated facilities at South Soko have been assessed in *Section 9* of 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 8 and 16* respectively. The potential direct and indirect impacts to marine ecology assessed include loss of habitats, disturbance to wildlife, disturbance to ecologically sensitive areas and pollution.

A series of detailed seasonal field surveys were conducted during 2004, 2005 and 2006 examining the organisms present on intertidal and subtidal shores and within the soft seabed around South Soko Island. Land and vessel based marine mammal surveys were also conducted around South Soko Island and along the submarine gas pipeline and submarine utility alignments.

Ecologically sensitive receivers have been identified and the potential impacts arising from the construction and operation phases of the LNG terminal to these have been evaluated. The key sensitive receivers include habitats of the Indo-pacific Humpback Dolphin (*Sousa chinensis*) and Finless Porpoise (*Neophocaena phocaenoides*), the Sha Chau and Lung Kwu Chau Marine Park and other ecologically sensitive areas.

Potential construction phase impacts to the marine ecological resources of the Study Area, including marine mammals, may arise from the permanent loss of habitat due to reclamation, disturbances to benthic habitats in the turning circle and approach channel, or through changes to key water quality parameters, as a result of the dredging, reclamation and installation of the gas pipeline and submarine utilities.

The results of the water quality modelling activities indicate that the impacts arising from the marine works will be transient and confined to the works areas and compliant with the assessment criteria. It is therefore predicted that there will be no unacceptable impacts to the marine ecology (including marine mammals) of the Study Area as a result of the LNG terminal construction activities. As a result of the small size of habitat directly affected by the works and the relatively low ecological value of the organisms present, the impacts were classified as acceptable.

Potential operational phase impacts may arise from the discharge of cooled treated water as well as from the alteration of the hydrological regime of the coastline, maintenance dredging, increased vessel traffic and impingement and entrainment of marine life within the LNG terminal's water system. Unacceptable impacts from discharges of cooled water and antifoulants are not anticipated to occur, as they will be localised to the direct vicinity of the outfall and will remain predominantly in the bed layer. The remaining operational phase impacts to marine ecological resources are not expected to be unacceptable.

Unacceptable impacts to marine ecology sensitive receivers have been avoided through the adoption of mitigation measures including the provision of rubble mound/armour rock seawalls on the edges of the reclamation to facilitate colonisation by intertidal and subtidal organisms. All marine vessels involved in the Project will be required to observe a speed limit in areas where marine mammals are present. Additional measures include the adoption of exclusion zones during marine percussive piling work for the construction of the jetty, and for dredging works along the pipeline. The mitigation measures designed to mitigate impacts to water quality to acceptable levels (compliance with assessment criteria) are also expected to mitigate impacts to marine ecological resources.

Monitoring and audit activities are designed to detect and mitigate any unacceptable impacts to water quality and will serve to protect against unacceptable impacts to marine ecological resources. The water quality monitoring programme will provide management actions and supplemental mitigation measures to be employed should impacts arise, thereby ensuring the environmental acceptability of the project. Details of the marine mammal monitoring programme are presented in full in the *EM&A Manual* associated with this EIA Report.

Operational phase impacts are not expected to occur to marine ecological resources, thus no marine ecology specific operational phase monitoring is considered necessary.

18.9

FISHERIES

The potential impacts to commercial fisheries caused by construction and operational activities of the LNG terminal and its associated facilities at South

Soko have been assessed in *Section 10* of 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 9 and 17* respectively. The potential direct and indirect impacts to commercial fisheries assessed include the potential loss of fishing grounds as well as loss of fish/shrimp spawning and nursery grounds.

Fisheries sensitive receivers have been identified and the potential impacts arising from the construction and operation phases of the LNG terminal have been evaluated. To determine the status and sensitivity of the identified fisheries spawning/nursery grounds of the waters around South Soko potentially impacted by the LNG terminal, an *Ichthyoplankton and Fish Post-Larvae Survey* was also completed.

Potential impacts to fisheries resources and fishing operations, as well as impacts to fish fry, may arise from the permanent loss of habitat due to reclamation, disturbances to benthic habitats on which the fisheries resources depend for food, or through changes to key water quality parameters, as a result of the marine works. The *Water Quality* modelling activities completed in *Section 6* indicate that the impacts arising from the proposed dredging or jetting works are predicted to be largely confined to the specific works areas and the predicted elevations in suspended sediment concentrations are not predicted to cause large areal exceedances of the assessment criterion. Adverse impacts to water quality are thus not predicted and neither are consequential impacts to any fishing grounds or species of importance to the fisheries.

Significant operational phase impacts to fisheries resources and fishing operations are not expected to occur. Entrainment of fisheries resources will be reduced through the appropriate design of the intake screens. Unacceptable impacts from discharges of cooled water are not anticipated to occur as the effects from these discharges will be localised to the lower layers of the water column in direct vicinity of the outfall. Compliance with the relevant discharge standards to control water quality impacts to within acceptable levels is also expected to control impacts to fisheries resources.

No fisheries-specific mitigation measures are required during the LNG terminal's construction or operation activities. The construction of rubble mound seawalls on the edges of the LNG terminal's reclaimed land will however provide habitat and shelter for juveniles or adult fisheries resources as ecological assemblages colonise and grow on the boulders.

The water quality monitoring programme will provide management actions and supplemental mitigation measures to be employed should impacts arise, thereby ensuring the environmental acceptability of the Project. As impacts to the fisheries resources and fishing operations are small and of short duration, the development and implementation of a monitoring and audit

programme specifically designed to assess the effects on commercial fisheries resources is not deemed necessary.

18.10 LANDSCAPE AND VISUAL IMPACT

The potential impacts to the landscape and visual sensitive receivers caused by the presence of the LNG terminal at South Soko have been assessed in Section 11 of 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 9 and 17 respectively.

The assessment has covered a wide range of potential landscape impacts including the alteration of the landscape caused by the reclamation, the introduction of the LNG terminal and its associated facilities (including storage tanks, infrastructures and LNG carriers) in South Soko's natural landscape and the impacts on existing and planned sensitive receivers during construction and operation of the LNG terminal (including the glare impacts).

Compensatory planting of indigenous species will mitigate the effects of the development on many of the Landscape Resources. The effects on the rocky shoreline can be partially mitigated by the use of natural rock in the reclamation areas and the sandy beach will be partially mitigated by the natural accretion of sand. The overall residual impacts on the Landscape Resources are assessed as *slight*.

Visually the main land based viewing locations are located on the periphery of the viewshed from which the proposed development will not cause a significant change to the view. Most land based viewing locations particularly those to the north and east of the Soko Islands, will experience negligible to slight visual impacts. The VSR's to the western side may experience *slight-moderate* adverse impacts. There will be *moderate-significant* visual impacts from areas within the Soko Islands, however there are very low visitor numbers to these areas. The significance of the residual visual impact has been assessed in table 11.35. On balance, the overall residual visual impact is assessed as *moderate*.

Potential night time glow and visibility of maritime and aviation lighting may be visible on clear nights from land based and ocean based viewing locations, however given that lighting already exists on North Soko, the other night lighting sources as well as lighting associated with shipping and maritime uses, the additional night lighting from the proposed LNG terminal is considered acceptable.

The residual impacts on the existing Landscape Character of South Soko will vary from *slight* to *moderate-significant*. The overall impact on the LCA's is assessed as *moderate*.

According to the *Technical Memorandum on the Environmental Impact Assessment Process (EIAO-TM)* the Landscape and Visual Impacts are considered *acceptable with mitigation*.

18.11 CULTURAL HERITAGE

The potential impacts to cultural heritage caused by construction and operational activities of the LNG terminal and its associated facilities at South Soko have been assessed in *Section 12* of 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. The assessment has included a terrestrial and marine archaeological investigation as well as a built heritage investigation.

The impact assessment identified several terrestrial sites of cultural heritage importance. The landtake for the LNG terminal will cause direct impacts to the following: Tai A Chau Tin Hau Temple, 21 graves and one associated tablet, 7 earth shrines and the Tai A Chau archaeological site.

Potential direct impacts on archaeological deposits of the Tai A Chau Archaeological Site (Sites B to E) are considered unavoidable. Preservation in situ of the archaeological deposit within the footprint of the development area is also considered not feasible, as underground utilities need to be installed. Nevertheless, rescue excavation for Sites B to E will be undertaken to preserve the archaeological deposits by record prior to the start of construction works. The rescue excavation will follow an *Archaeological Action Plan* which is listed as a requirement prior to construction in the *Implementation Schedule* of the *EM&A Manual* attached to the EIA Report. To ensure that no surviving archaeological deposits are missed, an archaeological watching brief at the buffer areas of Sites B to E has been recommended during construction. It should be noted that the identified archaeological deposits have been heavily disturbed by previous construction and decommissioning works for the Vietnamese Detention Centre and by natural erosion. The site is not considered to be a well preserved archaeological site.

No marine sites of cultural heritage/archaeological value have been identified and thus no impacts to marine archaeological resources are expected.

Additional mitigation measures will be adopted to preserve the other cultural heritage resources directly affected by the construction of the LNG terminal, including the relocation of Tai A Chau Tin Hau Temple to a site with a similar cultural landscape, the relocation of the 7 earth shrines to another location and the relocation of the 21 graves and the associated tablets.

18.12 HAZARD TO LIFE

The assessment has evaluated the hazards to life associated with the LNG terminal, the submarine gas pipeline and the Gas Receiving Station as well as the marine transit of LNG. The assessment has concluded that the risks related to transit of LNG to South Soko, the operation of the terminal, the submarine gas pipeline and the Gas Receiving Station are acceptable as per the individual and societal risk criteria set out in *Annex 4* of the *EIAO-TM*.

18.13 LAND CONTAMINATION PREVENTION

The potential impacts to land contamination caused by operational activities of the LNG terminal and its associated facilities at South Soko have been assessed in *Section 14* of this EIA Report. The impacts have been identified and analysed to be in compliance with the guidelines stated in the *EIAO – TM Annex 19*.

Potential sources of land contamination during the operation phase of the project were identified in the diesel fuel loading/unloading and storage facilities (i.e. vehicle tanking, emergency fire water pumps, power generation, etc.) and process water in SCV back up facility. Potential contaminants include total petroleum hydrocarbons (TPH), volatile and semi-volatile organic compound (VOCs/SVOCs).

A series of measures have been recommended to prevent, contain and clean-up spills and leaks during the operational phase of the LNG terminal, including: secondary containment for fuel/lubricating oil/chemical/chemical waste storage areas; individual drainage from lines/pumps/compressors etc. to the oil water separator; drain pans with drain system to the oil water separator where needed; spill containment/clean up equipment; and oil spill prevention training.

With the recommended mitigation measures in place, no land contamination or environmental concern would be expected to arise and no adverse residual impacts are predicted. Appropriate measures to further reduce land contamination risks have however been recommended. These include a design phase audit which is recommended to ensure that the design of the Project includes the necessary elements to manage any material that could lead to land contamination. Full details are presented in the *EM&A Manual* attached to the EIA Report.

18.14 ENVIRONMENTAL MONITORING AND AUDIT (EM&A)

The construction and operation of the proposed South Soko LNG terminal has been demonstrated in this EIA Report to comply with the *EIAO-TM* requirements. Actual impacts during the construction works will be monitored through a detailed Environmental Monitoring and Audit (EM&A) programme. Full details of the EM&A programme are presented in the

EM&A Manual attached to this EIA Report. This programme will provide management actions and supplemental mitigation measures to be employed should impacts arise, thereby ensuring the environmental acceptability of the construction and operation of the Black Point LNG terminal.

18.15 ENVIRONMENTAL OUTCOME

No unacceptable residual impacts have been predicted for the construction and operation of the South Soko LNG terminal or its associated facilities. It must be noted that for each of the components assessed in the *EIA Report*, the assessments and the residual impacts have all been shown to be acceptable and in compliance with the relevant assessment standards/criteria of the *EIAO-TM* and the associated *Annexes*.

18.16 ENVIRONMENTALLY RESPONSIBLE DESIGNS

The EIA Study has facilitated the integration of environmental considerations into the design process for the Project. One of the key environmental outcomes has been the ability to plan, design and ultimately construct the South Soko LNG terminal so that direct impacts to sensitive receivers are avoided, to the extent practical. A detailed assessment of alternative sites within the Study Area has been conducted as well as an assessment of the site layouts and construction methods (See *Section 18.2*).

18.17 ENVIRONMENTAL BENEFITS OF THE PROJECT

Implementation of the Project will make a significant contribution to managing emissions of air pollutants in Hong Kong and will secure sufficient and dependable supplies of clean fuel to meet future Black Point Power Station generation needs. Natural gas is acknowledged widely as a comparatively clean burning fuel (encouraged in the 2005 Policy Address) as it emits significantly less particulates and negligible SO_x, as well as less NO_x and CO₂ than other fossil fuels. Furthermore, locating the LNG terminal in Hong Kong will allow development of the project under one single jurisdiction with clear policy and regulations, thus enabling CAPCO to meet the Hong Kong SAR Government's emission targets earlier than alternative options outside Hong Kong.