

EIA Register
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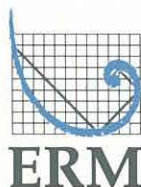
Castle Peak Power Company Limited



Environmental Impact Assessment
of Black Point Power Station:
Phase I Summary Report

September 1993

ERM Hong Kong
10 & 11/F Hecny Tower
9 Chatham Road, Tsimshatsui
Kowloon, Hong Kong
Telephone 722 0292
Facsimile 723 5660



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1 INTRODUCTION

1.1 Background

Castle Peak Power Company Ltd (CAPCO), a joint venture of Exxon Energy Limited and China Light and Power Company Limited (CLP), proposes to develop a large thermal power station (LTPS) of about 6,000 MW capacity in Hong Kong to meet forecasted increases in electricity demand during the late 1990s and into the next century. CLP will act on behalf of CAPCO as the Project Manager for the construction and operation of the LTPS.

In November 1989 CLP commissioned ERM Hong Kong then known as ERL (Asia) Ltd to lead a team of consultants to undertake a Site Search Study which recommended Black Point as the preferred location for the LTPS (see *Figure 1a*). The site was judged to have major advantages over the other sites under consideration but it was noted that significant engineering and navigation issues would need to be resolved.

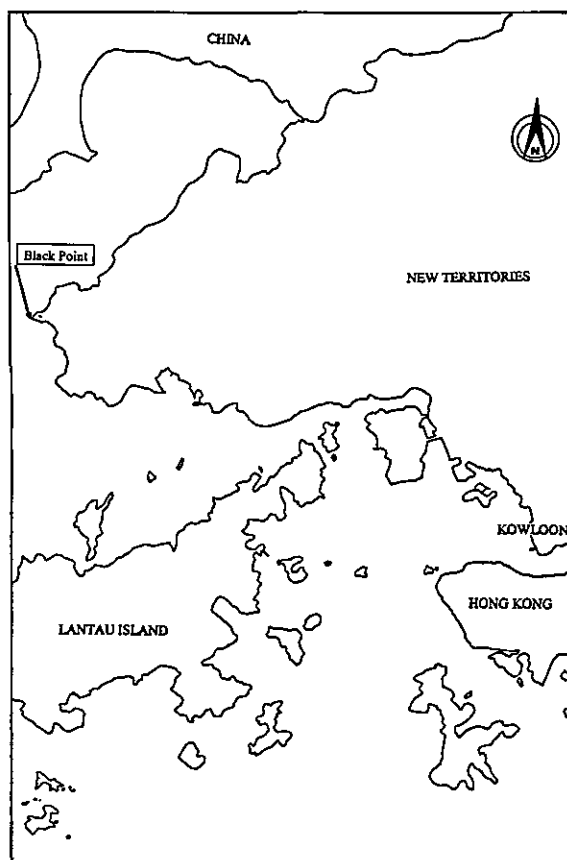


Figure 1a The Location of Black Point within the Territory of Hong Kong

The findings of the Site Search Report were endorsed by the Lands Department Policy Committee and the reservation of a site at Black Point was subsequently approved in principle by EXCO. A comprehensive and detailed Environmental Impact Assessment (EIA) of the LTPS at Black Point was then undertaken.

The EIA concluded that, subject to recommended mitigation measures being adopted in the design, construction and operation, the Phase 1 development, which comprises 4 x 600MW gas-fired units with industrial diesel oil as the backup fuel, would be environmentally acceptable. For other fuel options such as coal, a supplementary assessment will need to be carried out to address any outstanding issues associated with Phase 2 development and to review the recommended mitigation measures taking into account the environmental standards and the technology at that time.

1.2 The Phase 1 Summary Report

In Phase 1, CLP proposed to proceed with 4 x 600 MW gas-fired combined-cycle gas turbine (CCGT) units fired primarily on gas with industrial diesel oil as backup. The first two units were scheduled to be installed in the power station at Black Point and commissioned in 1996 and 1997 respectively, with the third and the fourth units scheduled to be installed in either Black Point or Tsing Yi Power Station and commissioned in 1998 and 1999.

This proposal was based upon the following considerations which indicate an overall preference for gas-fired units for Phase 1:

- ease of implementing environmental protection;
- economic advantage and cost of electricity to the consumer; and
- engineering simplicity and rate of development.

These considerations do not constrain options for future expansion. Phase 2 development could be based upon gas or coal-fired main generating units and will be subject to separate approval of the Government in the future. No open-cycle gas turbine units are included in the current proposals.

In December 1992, EXCO approved CLP's proposal to install and commission the first two units. Proposals to install two further 600 MW gas-fired units during the periods 1998-2000 and 1999-2001 were also accepted, subject to further studies being carried out to determine the optimum location and date of commissioning.

The purpose of this report is to summarise the key findings of the EIA relating to Phase 1 of the LTPS development. Further details of the proposed development and the technical analyses underlying the assessment have been presented in the Initial Assessment Report (IAR) and the three Key Issue Reports (KIRs) completed so far as part of the EIA.

The general objectives of the EIA were:

- to review the proposed construction, operation and decommissioning of the LTPS with respect to Hong Kong Planning Standards and Guidelines and relevant environmental regulations;
- to minimise pollution, environmental disturbance and nuisance arising from the total development and its construction, operation and decommissioning;
- to identify any aspects which may have a significant impact on the surrounding environment during the construction, operation and decommissioning phases of the development, including transboundary pollution;
- to assess the significance of any potential impacts by quantitative or qualitative methods, as appropriate;

• to recommend, where necessary, appropriate mitigation measures to ensure any impacts are rendered acceptable; and

• to outline a monitoring and audit programme to ensure the continued environmental acceptability of the development throughout its lifetime.

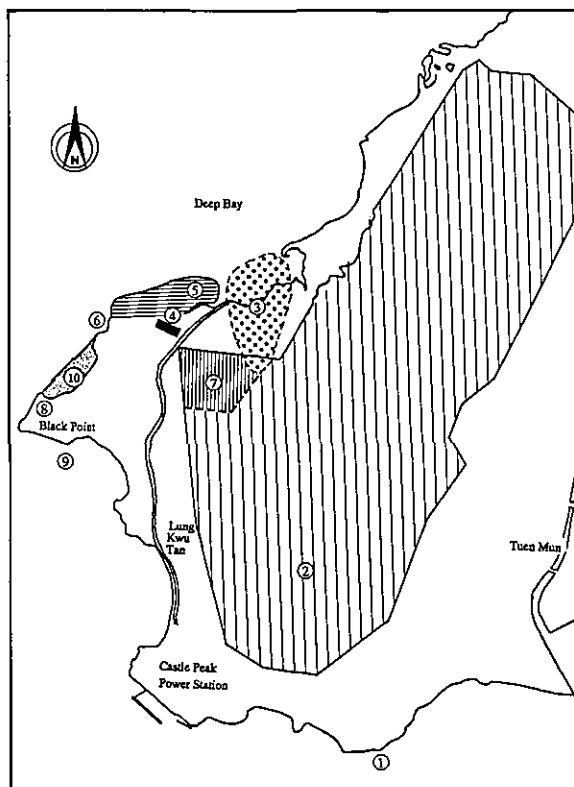
Before the formal approval of Phase 2 of the LTPS development, the findings of the EIA will be reviewed with regard to the specific development proposals under consideration to ensure that the conclusions and any recommendations for mitigation contained within the report are still valid and appropriate.

2. IMPACTS DURING CONSTRUCTION OF THE LTPS

2.1 Key Aspects of Construction

The construction of Phase 1 of the LTPS will be completed in two stages, each estimated to take about three years. The first two 600 MW units are scheduled to be commissioned between 1996 and 1997 followed by the second two between 1998 and 2001. Figure 2a and 2b shows the surrounding area and general plant layout. The following main aspects of construction were considered in assessing the potential for impacts:

- site formation, including excavation, reclamation and seawall construction;
- berthing facilities (for barges);
- foundation work;
- steelwork (including chimneys), superstructure and site services; and
- cooling water intake and outfall.



- | | |
|-------------------------------------|---------------------------------------|
| ① Location of Pillar Point outfall | ⑥ Location of Borrow Area Jetty |
| ② Castle Peak Firing Range Boundary | ⑦ Borrow Area |
| ③ WENT Landfill | ⑧ Location of Vessel Tracking Station |
| ④ BBC Relay Station | ⑨ Location of NWNT Outfall |
| ⑤ Tsang Tsui Ash Lagoons | ⑩ Large Thermal Power Station |
| | — Southern Access Road |

Figure 2a Black Point Area
Infrastructural Plan

2.2 Air Quality

Potential for air quality impacts will arise from:

- dust, generated from earth moving activities and from large areas of exposed surfaces; and
- exhaust emissions (SO_2 , NO_x , CO, particulates, hydrocarbons) which will come from both mobile and stationary equipment sources.

Peak emissions are likely to occur during the first stage of construction (1993-94) when reclamation and other large-scale civil construction activities are underway.

The isolated nature of the LTPS will reduce the potential for off-site impacts, especially considering that there will be relatively few, small sources of exhaust emissions, spread over a large site, and that the prevailing wind directions will generally disperse dust and other pollutants offshore.

The quantities of dust generated will be determined largely by the efficiency of dust control measures, such as wheel washing, speed restrictions, water spraying and compaction of unpaved roads. A range of such measures will be implemented as a matter of good practice which, in conjunction with careful siting of dust generating activities, will effectively reduce the generation of dust by up to 90%. Quantitative analyses have shown that this will ensure that adverse impacts on the environment and workforce are minimised and that offsite dust levels will remain within the Air Quality Objectives (AQOs).

Due to the implementation of these mitigation measures, impacts on air quality during construction are not expected to be significant. Air quality monitoring will be carried out during construction.

2.3 Noise

The principal sources of potential noise impact will be associated with:

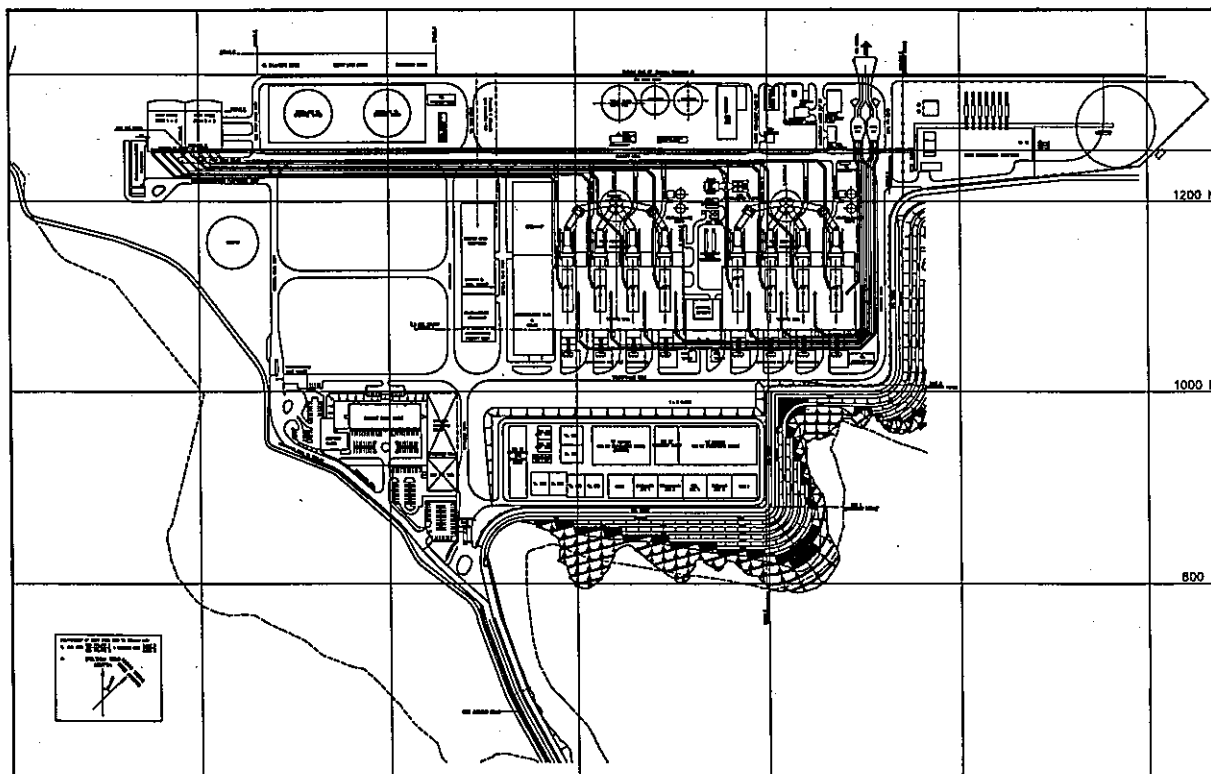


Figure 2b Site Layout

- site reclamation and formation activities (including dredging, rock drilling, blasting and crushing);
- pile driving;
- road construction; and
- plant installation.

The site is relatively remote from major population areas and only a small number of residents are likely to be affected. The assessment focused on impacts at two sensitive receptors to the northeast of the site (Tsang Tsui and Tai Shui Hang) and three receptors to the southeast (Lung Kwu Sheung Tan, Pak Kong and Lung Tsai).

Work is currently scheduled to continue through the night for some activities and so the assessment has included quantitative analyses of daytime and night-time off-site impacts during the periods of construction likely to result in the greatest noise emission levels.

Daytime noise levels during construction works are predicted to be well within the criterion proposed by EPD for receptors in

the Black Point area, i.e. that additional noise intrusion should not exceed 10 dB(A) above the existing background. However, the night-time noise criterion of 45 dB(A) is predicted to be exceeded at four of the five sensitive receivers, as a result of night-time dredging and marine support activities.

Consequently, it is intended that silenced equipment (particularly for diesel plant) and, as far as practicable, the quietest type of dredger will be used in order to reduce night-time impacts to an acceptable level. Ultimately, if necessary, dredging activities would be limited to the daylight hours only. These mitigation measures will be included within the construction contract, and vetted in the course of Construction Noise Permit applications. Noise monitoring will be carried out during construction.

2.4 Water Quality

Potential for marine water quality impacts will arise mainly from the dredging of marine sediment from along the line of the

sea-wall and its subsequent disposal. There is the potential for physical and chemical impacts on marine life from these activities. The significance of any impacts will depend on:

- the extent and duration of dredging activities;
- the amount and quality of material removed;
- the method of removal;
- the disposal site; and
- the proximity of identifiable sensitive receptors.

The principal concern relates to the sensitive receptors in Deep Bay, notably the mariculture sub-zone in Outer Deep Bay (running 9 km northeast of Nim Wan), the Pak Nai SSSI⁽¹⁾ (about 6 km northeast of the site), the Mai Po Marshes SSSI in Inner Deep Bay and the Lung Kwu Chau, Tree Island and Sha Chau SSSI.

Sediment plume modelling performed during the site search indicates that the elevation in suspended solids at these receptors is expected to be within acceptable limit, ie not exceeding the natural range of concentration by more than 30%. In accordance with the Deep Bay

Guidelines for Dredging Reclamation and Drainage Works, monitoring will be carried out during dredging works to ensure compliance with the Deep Bay Water Quality Objective regarding concentrations of suspended solids. The Guidelines require that dredging activities are modified should monitoring results indicate non-compliance.

⁽¹⁾ Site of Special Scientific Interest

Analyses of the sediments⁽²⁾ indicate no toxic metal contamination according to the Government's adopted criteria and so there should be no risk of significant impacts upon marine organisms as a result of any metals released during dredging.

Other construction activities, being essentially land-based, will have a much lower potential to affect the marine environment and it will be possible to avoid any adverse impacts through good practice and standard control measures on site.

2.5 Waste Disposal

Construction activities at the LTPS will generate a significant amount of waste material which will require ultimate disposal. Site debris and other wastes suitable for landfilling can be disposed of at the adjacent WENT landfill⁽³⁾. Chemical wastes will be taken to the Chemical Waste Treatment Centre on Tsing Yi.

Marine sediments dredged from the site are classed as uncontaminated and hence there should be no restriction on disposal of the dredged spoil on this basis and will be acceptable for disposal at Gazetted Dump Sites.⁽⁴⁾

⁽²⁾ Recent Sediment analysis indicated that some sediment samples are classified as moderately contaminated under the Technical Circular TC No.1-1-92 issued on 9 November 1992. The Fill Management Committee has confirmed that the dredged material from the Black Point area is acceptable to gazetted Marine dumping ground. With special care taken during dredging and transport, no unacceptable impacts on marine organisms is anticipated.

⁽³⁾ Under the New Disposal Arrangement for Construction Wastes, site debris would be sorted on-site for disposal at public dump and landfills.

⁽⁴⁾ The Fill Management Committee confirmed that the dredged material from the Black Point site can be disposed of at gazetted marine dump sites at South Cheung Chau and/or East of Ninepins.

2.6 Traffic Minimisation

The construction of the LTPS will require the movement of large amounts of equipment and materials to and from the site. CLP have decided to use marine transport as far as possible to minimise impacts upon the relatively limited road transport system. This would be consistent with existing maritime traffic and within the navigational capacity of the channel. In conjunction with the scheduling of road deliveries outside peak hours and the careful location of site exits, this should ensure that no significant traffic impacts will occur as a result of LTPS construction.

2.7 Ecology

The existing terrestrial ecology of the site is of relatively low conservation value. Any wildlife present will be able to move away, for example, to the main Castle Peak Range, during initial site clearance. Selected specimens or seeds of the two protected plant species namely, *Gardenia jasmi noides* and *Phoenix hanceana*, found within the site will be transplanted, either to AFD gardens or as part of the landscaping for the LTPS. The construction activities are therefore not expected to cause significant impacts to the terrestrial ecology of the area.

Marine ecological impacts will include direct effects at the site, with the loss of some inter-tidal and sub-tidal areas and their associated benthic (sea-bottom dwelling) communities. The loss of the inter-tidal rocky shore community to the north of Black Point will be temporary and is likely to be replaced by a larger community on the new rocky seawall for the LTPS. Overall impacts are therefore not anticipated to be significant.

The Deep Bay Pearl River Estuary area has long been considered an area of moderate productivity in terms of fisheries. Recent fish surveys revealed that the fisheries resource in the immediate area is unlikely to be important in view of the low number of fish that were found and that the low commercial value of most species.

Surveys of the marine ecology of the waters have not revealed any rare species, although the presence of two Kingcrab species and the Pearl River Dolphin are of ecological interest. Along with other developments planned for the shores of the Brothers Channel and Urmston Road, the LTPS construction works may disturb their habitat (eg. the presence of machinery working in the water) but no significant impacts are likely. Recording of dolphin sightings and movements is currently planned in relation to the new airport development. Similar research programmes have been proposed for the Kingcrab. This will assist in clarifying and confirming their ecological requirements and hence their ability to respond to the overall development of local coastal areas. This information will be useful for subsequent development of the LTPS and CLP will participate, as necessary and appropriate, in the dolphin monitoring and research programme already planned.

2.8 Civil Aviation

Consultation with Civil Aviation Department and the New Airport Master Plan Study consultants has confirmed that none of the construction activities would violate the obstacle limitation surfaces associated with the future Chek Lap Kok airport or the existing Kai Tak flight paths. No impacts are therefore predicted.

2.9 Socio-Economics

The construction of the LTPS will provide a source of employment for the Tuen Mun area. This in turn will lead to the development of other goods and service related industries which will have a positive social effect on the area. The site is located sufficiently far from population centres such that reductions in property value as a result of disturbance from the LTPS construction work is unlikely.

2.10 *Cultural Heritage*

The Black Point area has been identified by the Antiquities and Monuments Office (AMO) as an important archaeological site. Selection of the site has provided an opportunity for thorough site investigation and recording of the archaeological resources, which otherwise may not have occurred. A full plan for the investigation of these resources was prepared to the satisfaction of AMO and the work has revealed a wealth of educationally valuable material relating to the history of the area.

2.11 *Recreational and Visual Amenity*

Yung Long Beach, a non-gazetted local recreational resource, will be removed as part of the LTPS construction.

The siting of the LTPS to the north of Black Point limits the extent of potential visual impact during construction substantially. Practices such as good house-keeping and the restoration of slopes with indigenous plant species will help to develop the positive visual aspects of the site.

A viewing facility will be provided to enable interested groups to obtain educational value from the development during the construction process.

3 IMPACTS DURING OPERATION OF THE LTPS

3.1 Key Aspects of Operation

The key aspects of the operation of Phase 1 of the LTPS which have been considered in assessing the potential for impacts are as follows:

- carriage of fuel to the site, by pipeline and marine transport;
- storage of fuel on site;
- power generation; and
- transport of people and equipment on- and off-site by road.

3.2 Air Quality

The assessments undertaken have covered the full range of potential air quality impacts associated with operation of the power station. Extensive analyses have been undertaken using both computer models and wind-tunnel tests to predict the impacts of emissions of SO₂, NO_x and other pollutants on air quality in Hong Kong.

Given that the EPD's Best Practicable Means for emissions control are implemented, it has been concluded that the potential for human health impacts is insignificant. Allowing for the contribution to background levels from other existing and planned sources, it is estimated that pollutant levels will remain comfortably within the AQOs at all receptors affected by the LTPS emissions. This conclusion is valid for the use of either gas or light industrial diesel oil as the fuel for the CCGT units.

An analysis was also made of the potential for regional impacts from acid deposition resulting from the LTPS emissions. It is estimated that there would be only a 1% increase in acid deposition due to emissions from the gas-fired CCGT units or 1-2% if light industrial diesel oil is used. This is an insignificant amount, well within the normal year-to-year range of variability,

and no 'acidification' impacts on the natural environment would occur due to this increase.

3.3 Noise

Detailed assessment of noise impacts from the operation of the LTPS included a survey of noise emissions from the existing Castle Peak power station as well as estimated emission levels from plant manufacturers. The impact of overall noise emissions on nearby sensitive receivers was then estimated using a noise propagation model for a range of different site layouts and operating conditions.

The analytical results indicate that in all cases, for all receivers, there will be a comfortable margin, of more than 10 dB(A) between predicted noise levels and the relevant criteria agreed with EPD. No significant impacts are therefore anticipated at any time of the day or night.

3.4 Water Quality

The key issue identified regarding water quality impacts was the thermal plume impacts from the cooling water discharge.

Other liquid effluents from the site will be comparatively minor with less significant potential for off-site impacts.

Detailed computer modelling results indicate that the preferred design will cause no significant impacts on sea flow patterns. Modelling of the dispersion of cooling water was undertaken for different outfall locations and depths. These have allowed an acceptable engineering design to be achieved which will ensure:

- the prevention of recirculation between intake and outfall of the LTPS and between the LTPS and Castle Peak power station cooling water systems;

- avoidance of any adverse interaction between the cooling water intake/outfall and the outfall of the NWNT sewer; and
- the prevention of any unacceptable warming of Deep Bay or of the waters affecting nearby SSSIs at Lung Kwu Chau, Tree Island and Sha Chau (see *Section 3.7*).

Other liquid effluents such as effluent from demineralisation plant, domestic sewage, boiler blowdown and oily water will be minor with no potential for off-site impacts. They will be managed by an efficient effluent control system, such as the neutralisation system and the oil/water separation system built into the design of the plant to meet all Hong Kong standards for effluent discharges.

3.5 Waste Disposal

Since solid fuels will not be used and Flue Gas Desulphurisation (FGD) will not be required for gas-fired or light industrial diesel oil-fired operations, there will be very little solid waste generated by the LTPS during the first phase of operations. However, other wastes generated will still require proper disposal. Operational waste such as MARPOL⁽⁵⁾ and oily waste will be sent to the Chemical Waste Treatment Centre for subsequent treatment and will not give rise to significant impacts.

3.6 Traffic

Operational road traffic from the LTPS is not likely to have a significant impact. Traffic generation from the plant will be light and potential congestion will be avoided by appropriate design of site exits,

⁽⁵⁾ Under the International Convention for the Prevention of Pollution from Ships, Marine Pollution waste from ships is termed MARPOL waste.

signalling and site exiting procedures. Marine traffic generation is not predicted to be significant.

3.7 Ecology

On the basis of a previous Deep Bay Environmental Management Study, a temperature increase of 2°C was adopted as the criterion for judging impacts on the surrounding waters. Detailed modelling of the thermal plume dispersion showed the "2°C temperature envelope" to be relatively confined near to the LTPS in Outer Deep Bay and North Western Waters and will not affect any of the sensitive ecological areas identified in *Section 2.4*.

The Black Point site lies within a broad area of moderate commercial fisheries productivity, although no significant nursery or spawning ground were identified within the immediate area of Black Point during the marine ecology surveys. Therefore, the thermal effect from the cooling water is not anticipated to prove stressful to the reproductive stages of the marine species in the area. However, in conjunction with the effects of other developments in western Hong Kong, the LTPS discharge could contribute to cumulative stress on the Pearl River Dolphin and Kingcrab species, both of which have been observed in the area. As discussed in *Section 2.7*, CLP will take part, as appropriate, in the research programmes which have been proposed for these species.

Lowering of the seabed in the area that will form the access channel and turning basin and regular disruption through maintenance dredging every four years may cause disruption to benthic communities and thus the fishing species that rely upon them for food. In general, the estuarine biota in the Deep Bay area can generally tolerate the rapid physical and chemical changes. Impacts on the commercial fishery species that feed on the benthos are thus likely to be temporary as no permanent loss of benthic productivity is expected.



No significant impacts on terrestrial vegetation are likely to occur as a result of emissions to the atmosphere.

3.8 *Civil Aviation*

The LTPS chimneys will not project above the obstacle limiting surface of the new airport at Chek Lap Kok and there will be no risks to aircraft from thermal or cloud generation effects of the exhaust gases.

3.9 *Socio-Economics*

Operation of the LTPS will constitute a vital element in the continued economic and social welfare of Hong Kong by ensuring the supply of sufficient power for the ongoing infrastructural and industrial developments which will drive economic growth. There will also be direct and spin-off employment associated with the development.

The water quality assessment has concluded that there will be no adverse impacts on mariculture activities in Deep Bay and no other negative socio-economic impacts are anticipated.

3.10 *Cultural Heritage and Fung Shui*

No significant cultural impacts are anticipated as no additional land take will occur as a result of LTPS operation. Consultation on Fung Shui aspects of the LTPS construction has resulted in a number of possible modifications to project layouts to reduce any adverse impacts to the north of Black Point.

3.11 *Recreational and Visual Amenity*

Considerable effort has been made by CLP to reduce visual impacts of the LTPS. The location and layout of the first phase of the LTPS allows the Black Point ridge to be retained, ensuring no potential impact on views from the south. The impact on views

from the north will be minimised by careful design of plant layout and selection of a colour scheme to achieve compatibility with the surrounding landscape. Although the appearance of the northern side of the Black Point promontory will be altered, the coastal landscape is already semi-industrialised and the significance of the impact will not be great.

Exhaust gases from the chimneys will generally be invisible. Smoke will be visible on start-up of the units only when light industrial diesel oil is used.

3.12 *Risk*

An initial assessment of the risks posed by the storage of light industrial diesel oil and the piping of gas to the LTPS, concluded that no significant hazard will be posed to the local villages or PADS users south of Black Point. Separate studies of all potentially hazardous systems will be undertaken in stages, in line with progress on the design and engineering of the LTPS, through the use of risk specialists and consultation with the relevant government authorities. Typically, the systems to be studied would include: natural gas, hydrogen, corrosive chemicals, toxic chemicals and high temperature/pressure fluids.

3.13 *Environmental Monitoring and Audit*

Environmental monitoring for air, water and noise are required during the operation phase of the LTPS. Regular audits and review of the monitoring results are recommended to check compliance with regulatory requirements and to identify the need for any remedial work which may be required to mitigate the adverse impacts.

4 *DECOMMISSIONING*

Decommissioning of the LTPS is likely to be reviewed by CLP around 2030 for Phase 1 of the station. Whilst CLP will be required to comply with the environmental legislation in force at that time, the broad issues such as noise, dust, surface water quality and traffic from demolition work; soil contamination; takeup of landfill and marine disposal site by demolition waste have been identified, and general mitigation measures to minimise impacts have been recommended. These will be reviewed in advance of decommissioning and a set of detailed measures will be specified and agreed with the relevant government departments.

