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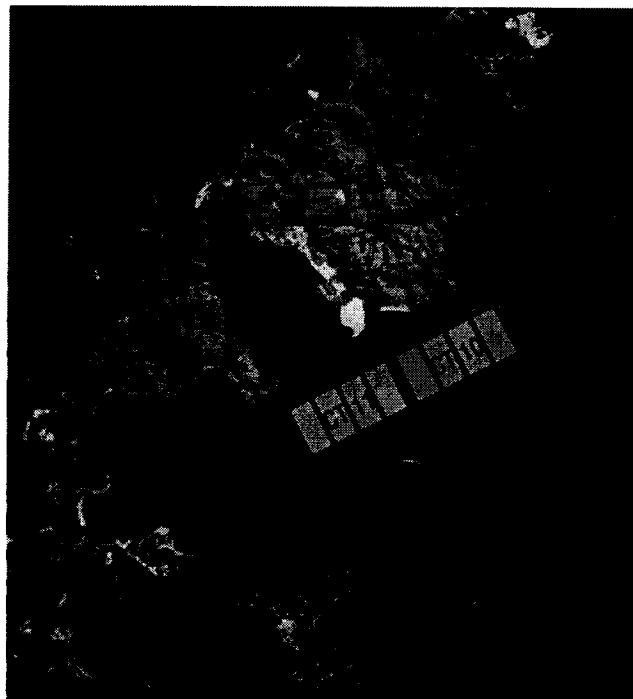
Civil Engineering Office

Agreement No. CE 10/93

Lantau Port Development Stage 1 Container Terminals 10 and 11 Preliminary Design Study

**Executive Summary
Container Terminals EIA**

March 1995



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1 INTRODUCTION

1.1 BACKGROUND

A principal recommendation of the Port and Airport Development Strategy (PADS) Study was that the majority of Hong Kong's future port requirements will be accommodated in the Lantau Port at northeast Lantau and in the Western harbour off the east coast of Lantau Island. In mid 1991 two studies, collectively referred to as the LAPH Studies, investigated the feasibility of developing land and marine based port facilities on the north-eastern coast of Lantau and in the Western Harbour. The LAPH Studies recommended that the Lantau Port be developed in four phases, each phase comprising one terminal with all four phases comprising seventeen berths.

In April 1993 the Land Development Policy Committee recommended that detailed planning and design for the first stage of development of Lantau Port should include the first 8 container berths as identified in LAPH Studies.

1.2 THE MAIN STUDY

The Lantau Port Development (LPD) is made up of a number of elements subject to different reporting requirements. This LPD study, termed the Lantau Port Development (LPD), Stage 1 - CT10 & CT11 Preliminary Design, relates specifically to the preliminary design of CT10 and CT11 and an investigation into the feasibility of using the Tsing Chau Tsai (TCT) peninsula as a source of land based borrow material for the reclamation required for the terminals. A parallel study deals with design and operation of "Ancillary Works" which are the areas behind CT10 & 11 and the new industrial zones.

The final report for this LPD study is presented in five volumes:

- Volume 1 - Main Study
- Volume 2 - Container Terminals EIA
- Volume 3 - TCT Borrow Area EIA
- Volume 4 - Appendices to Main Study
- Volume 5 - Drawings

This document is the Executive Summary of the second volume - Container Terminals Environmental Impact Assessment (EIA).

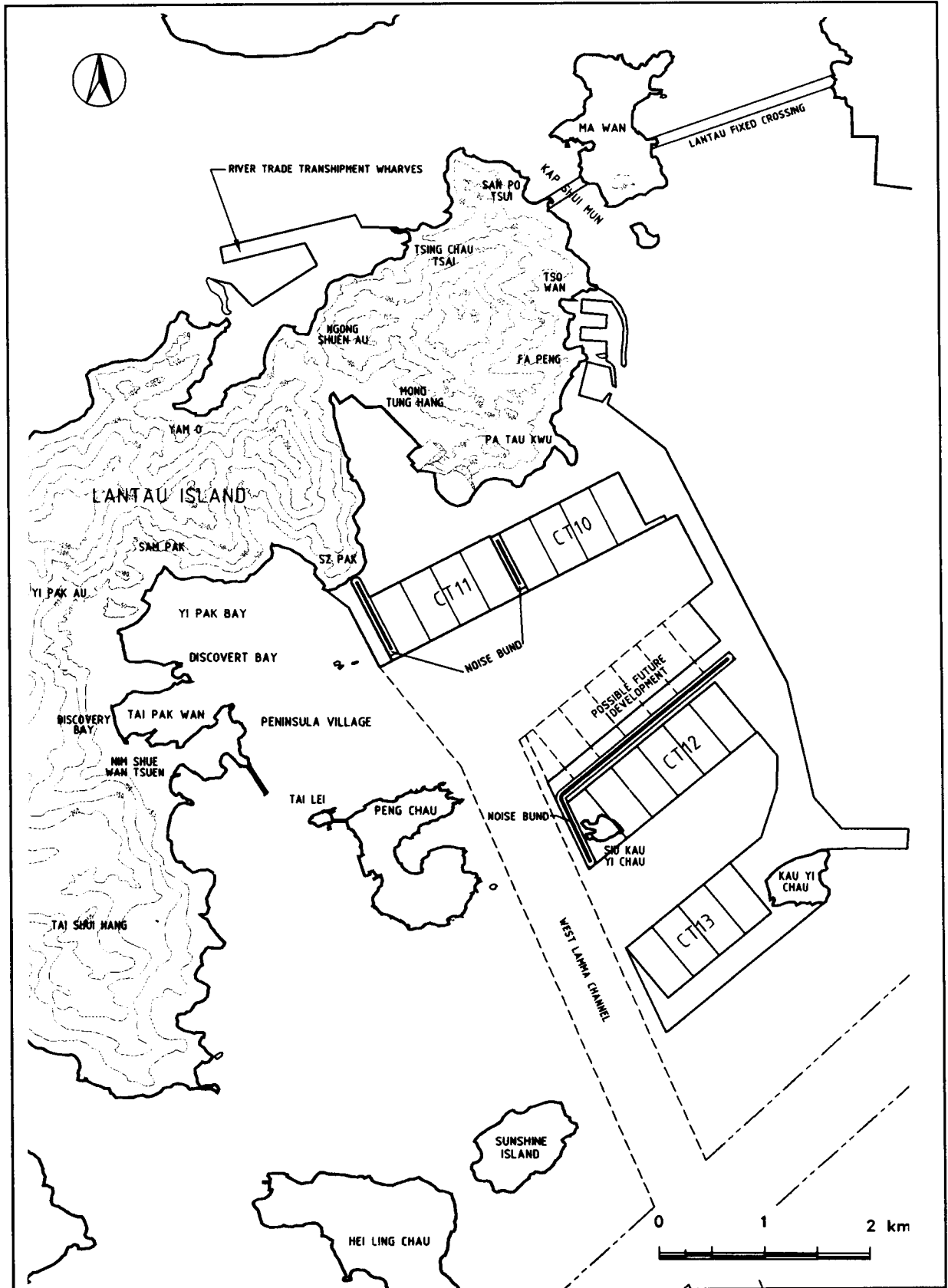
1.3 THIS EXECUTIVE SUMMARY

The present EIA takes forward the findings of the LAPH Studies. During the engineering design study a number of assumptions made in the LAPH have been updated with new information. The changes in basic assumptions have altered the potential for environmental impact and additional assessment has been carried out to identify areas of adverse impact, propose mitigation and identify any areas of residual impact. This document (i) summarises the changes in assumptions, impact and adjustments to the LAPH design, (ii) identifies the assumptions and criteria against which the terminals are assessed and (iii) discusses the findings of the EIA on the container terminals CT10 and CT11. It should be noted that engineering design has been confined to the construction and operation aspects of CT10 and CT11 but environmental studies have been extended to include cumulative assessment of port operation noise when Phases I, II, III & IV are commissioned (CT10, 11, 12 and 13 respectively).

There were seven key areas of concern identified in the Volume 2 document which will be addressed in the following sections. They are:

- (i) Construction Noise
- (ii) Operation Noise
- (iii) Construction Dust
- (iv) Construction Water Quality
- (v) Operation Water Quality
- (vi) Waste Management
- (vii) Visual and Glare Issues

Ecological impact assessment of the reclamation activities are being dealt with in the "Ancillary Works" Study and are reported as part of that study.



General Arrangement of the Lantau Port Terminals

2 SENSITIVE USES

2.1 INTRODUCTION

The terminals will be sited on reclamation adjacent to a relatively isolated area of Hong Kong identified for major change to commercial/industrial in the future. In this subsection the sensitive receivers (SR) which could be adversely affected by the construction and operation of the terminals are identified.

2.2 RESIDENTIAL DEVELOPMENT

Discovery Bay is a mix of high, medium and low rise housing with limited commercial development approximately 2.0 km to the west of the closest terminal. Closest sensitive receivers are sited on a promontory south of the developments' ferry terminal, called Peninsula Village. Peninsula Village represents the southern boundary of the Discovery Bay development, other residential areas occupy bays and lower slopes of hillsides to the north. In the future there is development planned at Yi Pak on the northern side of Discovery Bay.

Peng Chau is an island off the east coast of Lantau approximately 3.0 km south west of CT10 and 11 but less than 1.5 km west of the proposed Phase III (CT12). The population is concentrated in low and medium rise residential areas in the centre of the island, though there are isolated dwellings on the headland which forms the northern part of the island.

Ma Wan Island sustains two small communities on the west side of the island, and one of the 26 gazetted fish culture zones in the Territory. In the future it is noted that there is major residential development proposed for the island. The residential areas are over 3.0 km from the terminals and there is topographic shielding from the TCT peninsula and southern uplands of Ma Wan.

Hei Ling Chau is an island approximately 4 km south west of the Phase IV terminal (CT13). It has restricted access and is

managed by the Correctional Services Department. It is home to four institutions: an Addiction Treatment Centre; Correctional Institution; Nei Kwu Detention Centre and Hei Ling Chau Detention Centre.

Fa Peng and Tso Wan represent two small, isolated villages on the east side of the TCT peninsula, immediately to the north of the Terminals. The villages were identified as SR in the LAPH Studies though site inspection during this study revealed that the village of Fa Peng was deserted with dwellings derelict and topographic shielding. However, Fa Peng is retained as an indicator point in these studies.

2.3 PENNY'S BAY

Penny's Bay is immediately north of CT10 and CT11, there are two existing users within Penny's Bay, Cheoy Lee Shipyard and the Penny's Bay Power Station, operated by CLP. Penny's Bay will be reclaimed as part of the LPD projects and commercial/industrial development will be encouraged. The Cheoy Lee Shipyard will have to close prior to completing the reclamation of Penny's Bay.

2.4 MARINE WATERS

Marine water quality around the Tsing Chau Tsai peninsula is dominated by the effects of the Pearl River which forms a major source of sediment, nutrients and industrial effluent in the area. Discovery Bay itself is a relatively shallow bay with low water velocities.

Residential developments at Discovery Bay and Peng Chau discharge domestic effluent into Discovery Bay and Cheoy Lee Shipyard and the CLP station discharge into Penny's Bay.

Mariculture is carried out at Ma Wan Island to the north east of the TCT peninsula and there is local fishing activity south of Penny's Bay.

3 ASSUMPTIONS

3.1 INTRODUCTION

This study differs from the previous LAPH Studies in its underlying equipment assumptions, with the numbers of terminal equipment increased due to :

- i) An increase in terminal throughput from the maximum 1.6 million Twenty Foot Equivalent Units (TEU's), per terminal (0.4 M/berth) used in the LAPH Studies to maximum 2.0 million TEU's per terminal; and
- ii) Reassessment of plant requirements within the terminals, confirmed during discussions with terminal operators in Hong Kong, which indicated that the equipment schedules and numbers of vehicles operating within the terminals were greater than those anticipated in the LAPH Studies.

The implication of these changes was to increase noise impact at sensitive receivers identified in the LAPH Studies. To mitigate these adverse impacts additional mitigation was incorporated into the design including modification to the later phases of the terminals. The location and general arrangement of CT 10/11 remain unchanged.

3.2 ASSUMPTIONS FOR TERMINALS

Sound Power Levels / Equipment noise : In the LAPH Studies it was concluded that a positive approach to noise mitigation, through equipment selection, would be required if the terminals were to operate within the required criteria. The LAPH Studies suggested that quieter equipment may be available than that which is presently used at terminals in Hong Kong, incorporating reasonable levels of noise mitigation. During this study approaches were made to manufacturers to confirm that the equipment had been manufactured and was performing within the claimed noise specification. To date this technical

information has not been confirmed and the assessment therefore uses equipment proven in operation. Sensitivity tests were carried out with quieter equipment which offered some improvement in the impact at sensitive receivers.

External tractor units which collect and deposit containers at the Terminals are not under the direct control of the terminal operator and for this reason a higher sound power level has been used for these elements to take account of an older, less well maintained vehicle fleet.

Noise Attenuation Barriers : The LAPH Studies identified barriers at the western end of Phases I/II and III/IV to mitigate noise. In this study the raised activity levels are found to generate higher noise levels and a taller barrier was identified to provide additional mitigation. For engineering stability it is not possible to construct a noise bund higher than 25 metres above reclamation level. Early modelling indicated that the single noise barrier in Phases I/II would not be effective and a "second" barrier was provided between the terminals in Phases I and II.

Configuration of the Terminals : To improve the effectiveness of mitigation in Phases III/IV a clockwise reorientation of the later phases of the terminals was modelled which indicated more effective shielding to the residents of Discovery Bay. However, this arrangement created severe operating difficulties, in particular the sharp turn from the access channel into the berths of Phases III/IV and was not pursued.

An east facing terminal shape was modelled and offered significant improvement in the noise impact on identified noise sensitive receivers (NSR) over the west facing options. The configuration was not pursued due to an advised concern over marine impact.

To take full advantage of noise attenuation bunds in Phases III/IV the bund should be sited on the northern and western terminal boundary. Phases III/IV were reviewed and an alternative configuration identified where Phase III occupied the position of Phases

III/IV and phase IV was moved south to a position off Kau Yi Chau, identified as a possible future extension in the LAPH Studies. Noise bunds were modelled on the north and west edges of the Phase III terminal island.

3.3 RECLAMATION MATERIAL

During the early part of this study it was assumed that the majority of material required for the reclamation of the terminals would be supplied from a mega borrow area at Tsing Chau Tsai. The rate of extraction within the borrow area needed to meet programme requirements raised concern and concurrent construction activities were predicted to raise air quality (dust) impacts within Pennys' Bay to levels in excess of the Air Quality Objectives (AQO). The Steering Group therefore instructed the Consultants to assume that marine sand would be used for the reclamations of CT10 & CT11. However, the source is still to be advised.

3.4 ADOPTED ASSUMPTIONS

In the operation phase assessment the following assumptions were adopted and where there are significant differences to the LAPH assumptions they are identified :

- CT10 (the terminal to be advanced first) refers to the eastern terminal and CT11 to the western terminal. *The LAPH study assumed that CT10 was the western terminal*
- Noise attenuation bunds will be required to mitigate noise impact and a noise bund is provided at the western end of CT11 and a second bund at the western end of CT10, bund height is 25 metres. *LAPH assumed a single bund at the west of Phase I/II of approximately 13.7 metres;*
- Reclamation material will be supplied from an as yet unidentified marine source.
- Updated operating assumptions. With throughput of 2.0 million TEUs per terminal, increased activity in the terminals and amended sound power levels for external vehicles accessing

the terminals *LAPH assumed 1.6 million TEUs, and had lower equipment utilisation;*

- Modification to Phases III/IV, with a noise bund assumed on the northern and western edge of Phase III and Phase IV moved south to Kau Yi Chau.
- Operating characteristics of the backup areas derived by the Ancillary Works consultant.

4 ASSESSMENT

4.1 NOISE

The construction noise assessment has been carried out assuming that CT10 & CT11 will be constructed in parallel and has included contributions from other activity areas outside the terminal site. The assessment assumes that construction activity will continue for a 16 hour day (0700hrs to 2300hrs), i.e., daytime and evening. Restricting the contractor to a 12-hour day would result in delays to the programme at considerable cost in terms of inefficiency and disbenefits. It is anticipated that there would be a delay in commissioning the first berth by 7 months and the first terminal by 10 months. For NSR at Discovery Bay, the exposed indicator on north Peng Chau and isolated receivers at Fa Peng / Tso Wan, unmitigated activity during concurrent construction of Berths 1 (Phase I) and 5 (Phase II), which represent the worst case, exceed the daytime assessment criterion of 60 dB(A). This daytime assessment criterion is taken from the HKPSG, section 4.4.1, and was identified in the LAPH Studies. During the evening, unmitigated construction noise is expected to exceed the NCO criterion of 60 dB(A). No construction activity has been considered at night-time, when the NCO criterion is lowered to 45 dB(A). In order to achieve the adopted daytime and NCO evening requirement, some form of mitigation will have to be incorporated into the construction activities. It is indicated in the main report that mitigation by reducing sound power levels of earthmoving equipment could achieve the 60 dB(A) limits. This is consistent with US reported reductions from partial enclosures and analysis of quieter plant which is commonly available. In addition the provision of barriers, both permanent and temporary, can further mitigate impact. Programming of activity allows control over positioning of concurrent activity to reduce levels of impact. The early construction of the noise bunds, which are required to mitigate operation noise impact, will help to mitigate construction noise impact though the effect of these attenuation structures has not been included in this assessment. In

the event of night work being required the stringent night-time noise criteria would place severe restrictions on the activities which could take place.

During the LAPH Studies and this study the Hong Kong Planning Standards and Guidelines (HKPSG) for an Area Sensitivity Rating (ASR) "A" (corresponding to 55 dB(A) for daytime and evening and 45 dB(A) for night-time) has been used for planning purposes to protect the existing noise climate. After the terminals are operational, the Noise Control Ordinance would then take into account all of the landuse characteristics existing at the time, including the terminals. Enforcement during operation would therefore be assessed against ASR "B" (corresponding to acceptable levels of 65 dB(A) for daytime and evening, 55 dB(A) for night-time).

The operation phase impacts cumulative assessment has been carried out to determine expected levels of impact for all terminal phases in operation. Night-time criteria are the most stringent and assessment has focused on the night time impact. The modelling suggests that there will be no exceedance of the advised enforcement criteria at either Discovery Bay or the main residential area of Peng Chau. The indicator receivers on the headland of Peng Chau and at Fa Peng are subject to noise impact in excess of the enforcement requirement for Phase I. For receivers at Peng Chau the screening topography between receivers and noise sources will effectively mitigate impact, but for any receivers adversely affected a noise attenuation barrier may be required at the receiver. The indicator point at Fa Peng detects an adverse noise impact but site visits have confirmed that the village at Fa Peng is deserted and houses there are derelict. In addition, topography will screen the village from most terminal activity. Distance attenuation and screening topography is sufficient to mitigate noise impact at Tso Wan. Modelling predicts that at the main concentrations of receivers at Discovery Bay and Peng Chau impacts do not exceed the advised enforcement criteria.

4.2 WATER QUALITY

Dredging and reclamation activities have a high potential to adversely affect water quality by the re-suspension or introduction of material into the water column. The assessment suggests that the mariculture zone and gazetted bathing beach at Ma Wan will not be adversely affected and that the non-gazetted beach at Discovery Bay will also have limited impact due to low water movement within the immediate reclamation area. There is limited small scale fishing activity that will be dislocated by the reclamation, but the main areas used by the fishing fleet are in the waters south of Hong Kong which are unlikely to be affected by reclamation activities. To reduce the impact of material dispersing into the water column, silt curtains were considered but are unlikely to be effective given the activity levels expected. Reducing the areas of exposed fill is regarded as a more practical approach. The magnitude of impacts due to nutrients and metals cannot be estimated at this stage as the physical and chemical characteristics of the marine fill are unknown. Nutrient levels were flagged as being of concern in previous studies which identified that the low current velocities and shallow waters of Discovery Bay, together with modified hydrodynamic characteristics caused by the physical barrier of the port development, left little scope for the immediate study area to assimilate additional nutrient loadings, due to accumulation of pollutants resulting from reduced flushing. Due to the lack of information on the chemical characteristics of the marine fill it has not been possible to evaluate the potential impact (if any) with respect to nutrients. If clean sand is used, it will be unlikely that there will be a problem with nutrients. However, if the fill contains a proportion of fines (mud) the potential for nutrient contamination will be dependent on the actual proportion of fines and the actual content of nutrients.

Disposal of dredged material will depend on its composition. Chemical analysis of sediments has found evidence of Class B and Class C contamination. More intensive sampling is required to confirm the presence and extent of this material. For Class C - seriously contaminated material - special

procedures are required with disposal to a specially designated dumping ground, for example the contaminated dump site at East Sha Chau.

Construction will be carried out sequentially in both terminals from west to east. Embayment is not considered to be a significant issue related to CT10, eastern terminal, construction. There is potential for impact at the interface between the CT10 activities and the backup areas and the phasing of this work will need further assessment. More critical will be the partial closure of the mouth of Pennys Bay during the construction of CT11 which will create a partial enclosure of Pennys Bay. No new discharges should be allowed into Pennys Bay during the period of embayment prior to reclamation of the Bay,

During the operation phase of the terminals, accidental spills, stormwater discharges and sewage disposal are identified as the key issues. Sewage will be directed to the new sewage treatment works to be constructed on North Lantau at Siu Ho Wan. In the interim any discharges should be directed east into the deeper faster flowing waters outside Discovery Bay. Storm drains will collect terminal runoff and direct it to discharge points in the southern side of the terminal. The use of grit and oil interceptors and a regular maintenance programme are identified as applicable mitigation. Accidental spillage, at refuelling areas and from rupture of containers, will require provision of bunded areas with interceptors, for refuelling operations, and the identification of procedures for a "quick response team" to follow in the event of a spill.

4.3 AIR QUALITY

Reclamation activities and the creation of large expanses of unsealed surfaces have a high potential to create adverse air quality impact from dust. The air quality assessment has assumed concurrent construction of CT10 & 11 and the predicted impacts were measured against the 24 hour and annual average for Total Suspended Particulates (TSP) (dust). The non statutory hourly average TSP guideline, was also used since it gives a better

appreciation of construction phase impact. The results of the assessment indicates that for CT10/CT11 construction there would not be exceedence of the 24 hour and annual average Air Quality Objectives (AQO) for TSP or the hourly average TSP guideline at identified sensitive receivers. Good site practice has been proposed backed by control clauses in contract documentation, to minimise dust emissions. This would include damping down, coverage of stockpiles, watering of haul routes etc., and the imposition of speed controls on site vehicles.

4.4 WASTE MANAGEMENT

Container terminal developments are not expected to generate significant waste management related impacts, provided good site practice is adhered to. Ships cargoes handled are containerised operations and are not expected to generate significant quantities of general wastes. General and commercial wastes are anticipated to include materials such as paper, plastic, food packaging and containers, scraps of food and similar wastes from canteen and administrative offices.

Wastes generated by ships are required by the MARPOL convention to be stored on board ship for disposal on arrival at port. These wastes will include fuel oil, oily bilge water and ballast from bunker fuel tanks, (MARPOL Annex 1), noxious liquids (MARPOL Annex II) and general rubbish (MARPOL Annex V). Annex I and II substances are classified as chemical wastes and would therefore require appropriate treatment at the chemical waste treatment centre at Tsing Yi. The facility has a dedicated collection/transfer barge and includes storage capacity for 5000 tonnes of MARPOL Annex I wastes at Tsing Yi.

In the event of damage and rupture to containers during transfer operations material could be deposited within the terminal and be washed through the storm drain system, or fall directly into the adjacent waters. Containment and absorption would be applicable in both cases and provision of an emergency action plan and a quick response team will need to be in place at port opening.

4.5 VISUAL IMPACT AND GLARE

The visual impact of the terminals will be experienced during the day-time as a physical change associated with blocking of views, and during the night-time from safety and security lighting creating potential glare impact.

Receivers to the west will be the most affected by the visual aspects of CT10 and CT11 developments. Residents at Discovery Bay will experience loss of their existing panoramic view from the 25 metre high, 600 metre long noise bund, though sympathetic landscaping will help to mitigate this impact. Other receivers to the south and east will be less severely affected since distance will relegate the terminals to a small part of the overall panorama. These receivers will also view the terminals against the backdrop of the TCT Peninsula or Sz Pak Headland. Within the terminals landscaping has been proposed to soften the edges of the terminal boundary.

Assessment has indicated that glare at certain positions along the road adjacent to the terminals may be significant and exceed the guideline limit considered acceptable by the Highways Department. This adverse impact may be mitigated by providing cut-off louvres for light towers within the terminals. Assessments of glare impact at Peng Chau and Discovery Bay indicate that glare ratings at these locations will be within guideline limits.

5 MONITORING/AUDIT

An environmental monitoring and audit manual (EM&A) has been produced for construction and operation activities associated with the container terminals. It aims to provide systematic procedures for environmental monitoring and auditing of the development.

The schedules and audit procedures are used to ensure that the environmental impacts are maintained within specified limits. An Action Plan provides for appropriate corrective measures to minimise the impact of pollution events and periodic audits check compliance, review monitoring schedules, record anomalies and identify areas for remedial action.

Hong Kong environmental legislation for air quality, noise and water quality and the Hong Kong Planning Standards and Guidelines have been used for the preparation of the EM&A Manual.

It will be problematic to monitor and assess the environmental impact caused by a single contractor or particular operation in isolation, since operations within the Ancillary Works area and associated infrastructure projects will all contribute to the environment of Northeast Lantau. It is proposed that an independent environmental office is set up, in an arrangement similar to the one adopted on the West Kowloon reclamation (Environmental Protection Office - ENPO).

Data would be collected from a number of locations, chosen for their ability to identify impact; that is either close to potentially environmentally detrimental activity or close to sensitive uses. The environmental office would monitor site activity on a daily basis, recording where construction activity was concentrated, time of activity, type of activity, plant involved, and a qualitative assessment/description of the activity. In the event of monitoring detecting an exceedance, records could be reviewed to identify the potential source of impact. The activities would then be assessed to determine whether a "one off" situation or a general deterioration due to

cumulative impact was developing. Focused monitoring could then be investigated to quantify levels of impact from particular activities. This information could be forwarded to EPD and could be used when formulating requirements for Construction Noise Permits (CNP) issue or renewal or when assessing implications of dust producing or water polluting activity.

For operation noise, the operators would be required to monitor and report to EPD details of the plant operating within their terminal. The information would include numbers of equipment, activity levels and sound power levels, in appropriate frequency spectra. This information would be compared with the findings of the noise impact assessment to confirm compliance and effectiveness of mitigation.