HONG KONG GOVERNMENT
ENVIRONMENTAL PROTECTION DEPARTMENT

NORTH LANTAU REFUSE TRANSFER STATION CONSULTANCY STUDY

Agreement No. CE 42/92

INITIAL ENVIRONMENTAL
IMPACT ASSESSMENT REPORT

April 1995

Balfours International (Asia)
Consulting Engineers Ltd
in association with
Black & Veatch International
CES Consultants in Environmental Sciences (Asia) Ltd

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Only a few typo changes have been made since last issue which was 3/94. Thus, no technical review has been undertaken.

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1 INTRODUCTION

1 INTRODUCTION

1.1 Background

1.1.1 The White Paper on Pollution and the Waste Disposal Plan have set out the long term municipal waste disposal strategy for the Territory. This requires the provision of 3 major strategic landfills located in relatively remote areas of the New Territories. These landfills will replace the existing smaller landfills, located in or near the urban areas, and existing municipal incinerators. In view of the location of the landfills, the strategy requires a network of transfer stations located near the main areas of waste arisings from which waste can be transported in bulk. The first of the new generation of transfer stations was constructed at Kowloon Bay and commissioned in 1990. The second to serve the east of Hong Kong Island, called the Island East Transfer Station, was commissioned in 1992. The Sha Tin transfer station contract has recently been let and is due to be commissioned in 1994.

1.1.2 The use of refuse transfer stations (RTS) allows for more efficient removal and transport of refuse to the landfill. The location of transfer stations near the main areas of waste arisings maximises the efficiency of waste collection, while the bulk transfer of waste to the remote landfill sites minimises vehicle movements, thereby minimising running costs and environmental impact of the transfer operation. In the case of the North Lantau Refuse Transfer Station (NLRTS) the impact of transfer between RTS and Landfill will be further reduced by the use of barges.

1.1.3 The entire collection, transfer and disposal strategy is considered more environmentally acceptable than the former system. In view of its status as part of the ten-year environmental protection strategy it is critical that the system of transfer stations and major landfills does not create new environmental problems in pursuit of solutions to existing ones.

1.2 Context of the Initial Environmental Impact Assessment

1.2.1 Considering the proposed New Town Developments at Tung Chung and Tai Ho Wan regions, the proposed new airport development at Chek Lap Kok and the Port development at the North East Lantau, it was recommended under the North Lantau Development Study (NLDS) that the Government should adopt a long term waste disposal strategy for North Lantau Island. This strategy was to transfer refuse generated from domestic and commercial/industrial sources to an RTS network for onward transfer to the strategic landfills in the New Territories.

1.2.2 The NLRTS will take the domestic waste generated in the Tung Chung New Town, the Tai Ho Wan region in North Lantau, and possibly from the proposed developments in Ma Wan. It will also take waste generated at the Chek Lap Kok Airport and support facilities and the Port Peninsula Development. The NLRTS will provide for the reception, unloading of collected waste, compacting and reloading into purpose built containers for bulk transport, by sea, to the West New Territories (WENT) Landfill.

1.2.3 This Initial Environmental Impact Assessment (IEIA) has been carried out to assess environmental feasibility of NLRTS based on the outline design. It will outline key environmental issues to be considered at detailed design stage and environmental performance requirements. Thus, it will provide the basis in terms of scope, content and background, for completion of an EIA study (if this is required).

1.3 Objectives of the Initial Environmental Impact Assessment

1.3.1 The IEIA of the NLRTS has been undertaken in order to:

- Address all environmental impacts likely to arise with respect to sensitive receivers (SRs)
- Identify likely mitigation, monitoring and post-implementation audit requirements
- Make recommendations on the need for further assessment and
- Set out the key issues for the preferred tenderer to assess as part of an EIA study, if this is required.

1.3.2 The approach to the IEIA is to establish control limits for construction and operation of the RTS which can be incorporated into tender documentation, to determine the environmental parameters requiring monitoring and subsequent auditing so that compliance with the pre-determined control limits is achieved and to define, in consultation with EPD, the scope of work and terms of reference for a subsequent formal EIA study on remaining issues that must be assessed in more detail than is possible in this Study.

1.4 Scope of the Initial Environmental Impact Assessment

1.4.1 The study area in which environmental impacts are identified in the IEIA includes the proposed NLRTS site at Siu Ho Wan, a marine reception area at WENT Landfill and a wider area in which SRs are located.

1.4.2 The tasks undertaken during the IEIA may be summarised as follows:

- Identification of SRs potentially subject to air quality impacts, definition of control limits on air pollutants, assessment methodology for prediction of impacts and assessment in the context of existing air quality and identification of a range of mitigation measures
- Identification of noise sensitive receivers (NSRs), determination of major potential noise sources during construction and operation, evaluation of vehicle noise, interpretation of statutory requirements and planning guidelines and identification of a range of mitigation measures

- Identification of waste water sources and discharge points and pre-treatment effluent quality requirements
- Recommendations on avoidance of negative aesthetic impacts and attention to social impacts
- Establishment of ambient, construction impact, and operational compliance monitoring as well as post-implementation audit procedures.

2 THE STUDY AREA

2 THE STUDY AREA

2.1 Site Description

2.1.1 The proposed North Lantau Development (Figure 2.1) includes high speed rail and road transport links (e.g North Lantau Expressway (NLE) and Airport Express Line) and a New Town Development incorporating residential, industrial and commercial activities and all the necessary back up infrastructure required both for the town itself and to serve, where practicable, the airport.

2.1.2 The NLRTS, as one of a number of other North Lantau Development projects, has been proposed to be located on a reclamation at Siu Ho Wan in North Lantau which will be constructed under the NLE Contract. The Siu Ho Wan site is about 2.2 hectares and is intended to be used for RTS, WSD chlorine drums unloading area and RSD depot, as shown in Figure 2.2.

2.1.3 The NLRTS site will be handed over to its contractors in two parts as Works Areas F1 and F2. Works Area F1 is currently expected to be completed by the end of 1994 and released for the construction of the RTS. Works Area F2 which consists of the vertical seawall with approximately 140 m frontage was scheduled to be formed by December 1993 for marine delivery of materials, plant and labour for Airport Core Projects (ACPs). This area will be handed over for RTS construction in October 1996.

2.1.4 In addition to the proposed site for NLRTS at North Lantau Island, the project area also includes a container reception area at WENT Landfill (including container storage area, vehicle parking space, manoeuvring area for interchange of containers etc). This exclusive reception area is 70 m wide by 100 m long. It is adjacent to five similar size areas available to 4 other RTS operators. The remaining site is reserved for sludge disposal of a sewerage treatment works, which will be located on a reclamation northeast of the landfill site.

2.2 Site Access

2.2.1 The RTS has good road access to the site with additional water frontage for barge access. The road access is dependent on the phasing of the North Lantau Developments and particularly the associated highway infrastructure to be provided.

2.2.2 Prior to 1997, there will be no road access to the site. The only route to the site for construction equipment will be by marine access.

2.2.3 On completion of the RTS, there will be a single road access to the Station via the underpass near Sham Shui Kok from the Utilities Services Road (USR), as shown in Figure 2.3. Refuse collection vehicles (RCVs) from the new airport and Tung Chung area will approach from the west and enter the USR at the Tung Chung town centre. This underpass access will be used for at least 10 years. RCVs collecting waste from Port Peninsula will approach from Yam O in the east along the USR until at least year 2001.

2.2.4 Between 2006 and 2011, RCVs from the Airport and Tung Chung area will travel along the NLE, Tai Ho interchange, Road P3 and then Road P1 to RTS (Figure 2.4). RCVs from Port Peninsula will travel either along NLE to Tai Ho Interchange, or continue to use the route previously identified.

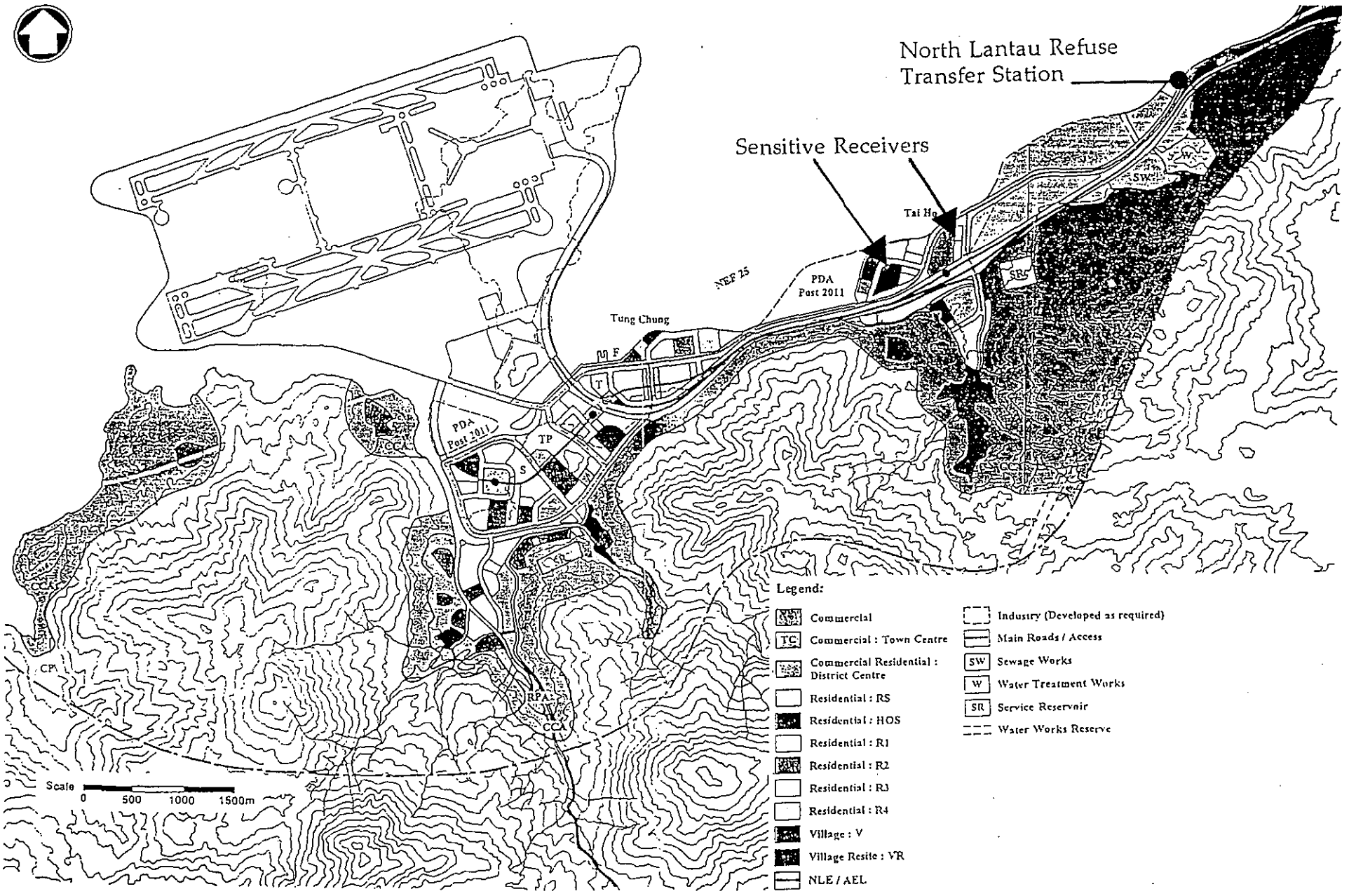
2.2.5 When the distributor Road P1 is completed, it will be the long term access to the RTS instead of the underpass. RCVs may use the NLE and Tai Ho Interchange, or along Road P1 which runs from Tung Chung or from Yam O (Figure 2.5).

2.3 Identification of Sensitive Receivers

2.3.1 This development will be located on the reclamation, amongst other airport related developments where the potential nearby land users are predominantly industrial including water treatment works, sewage works, fuel storage, and RSD depot which are not defined as Noise Sensitive. At present, the study area has a predominantly quiet and rural environment. The main concentration of noise sensitive receivers (NSR) will be future residential areas in the New Town located in Tai Ho Wan, some 2.4 km west from the proposed NLRTS (Figure 2.1). There will be, therefore, no NSR in the immediate vicinity of this development. For air quality impact, industrial uses are air quality sensitive and to plan for a better environment EPD specify a limit of 2 odour units, at the site boundary, to control potential odour impact from the NLRTS.

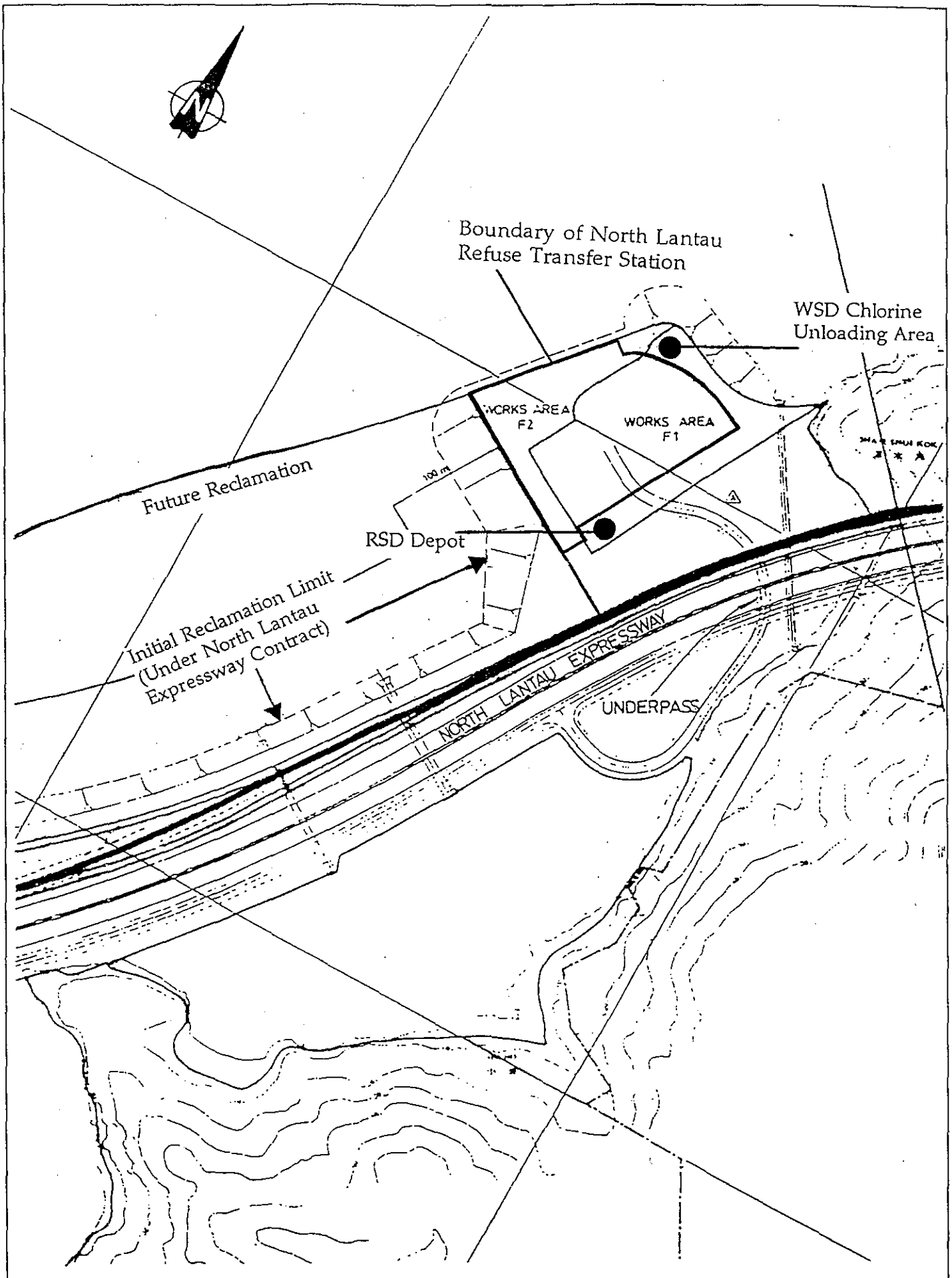
2.3.2 In terms of visual impact, SRs can also include road and rail travellers. The detail is described in Section 7.3.

2.3.3 At the WENT Landfill, there are residential developments at Ha Pak Nai, Pak Nai etc. The closest SRs are located some 350 m north-east of the container reception area boundary (Figure 2.6).



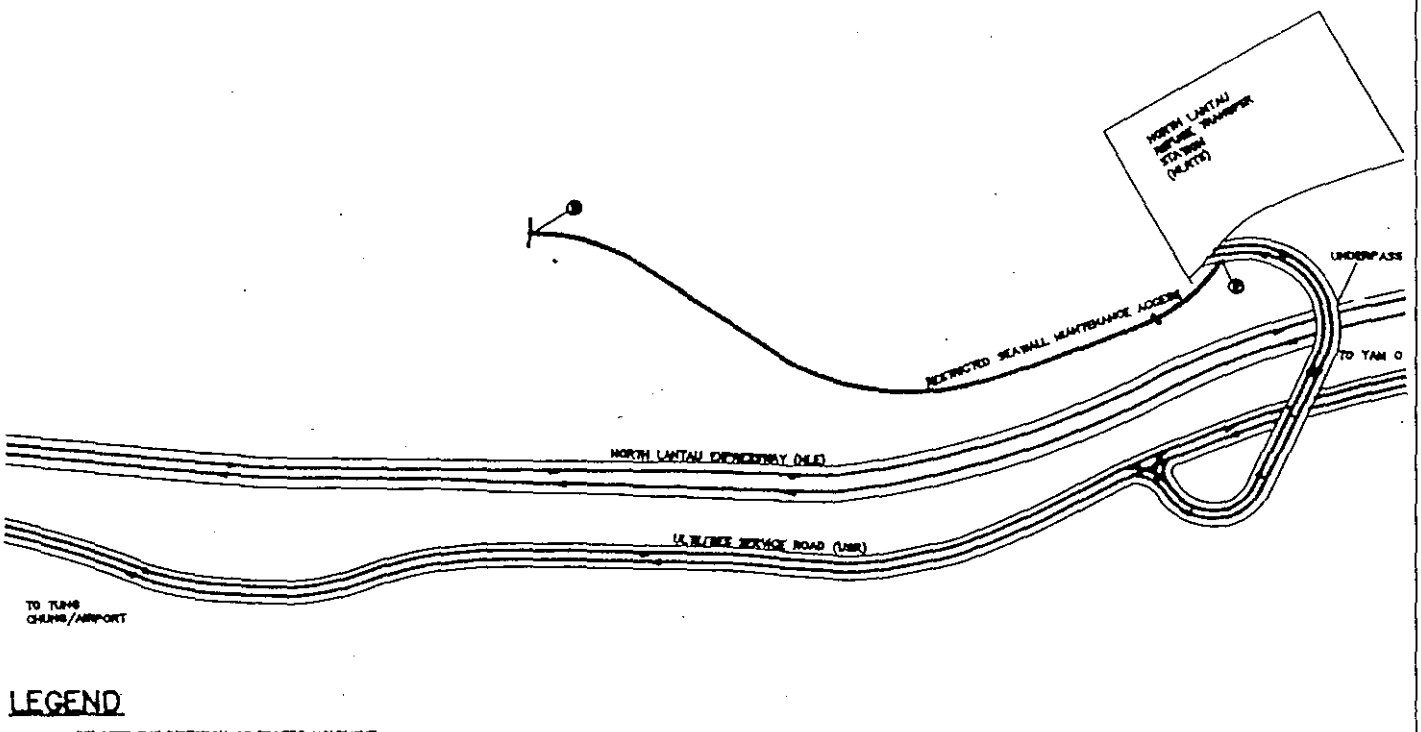
General Location of North Lantau Refuse Transfer Station and Sensitive Receivers

Figure 2.1

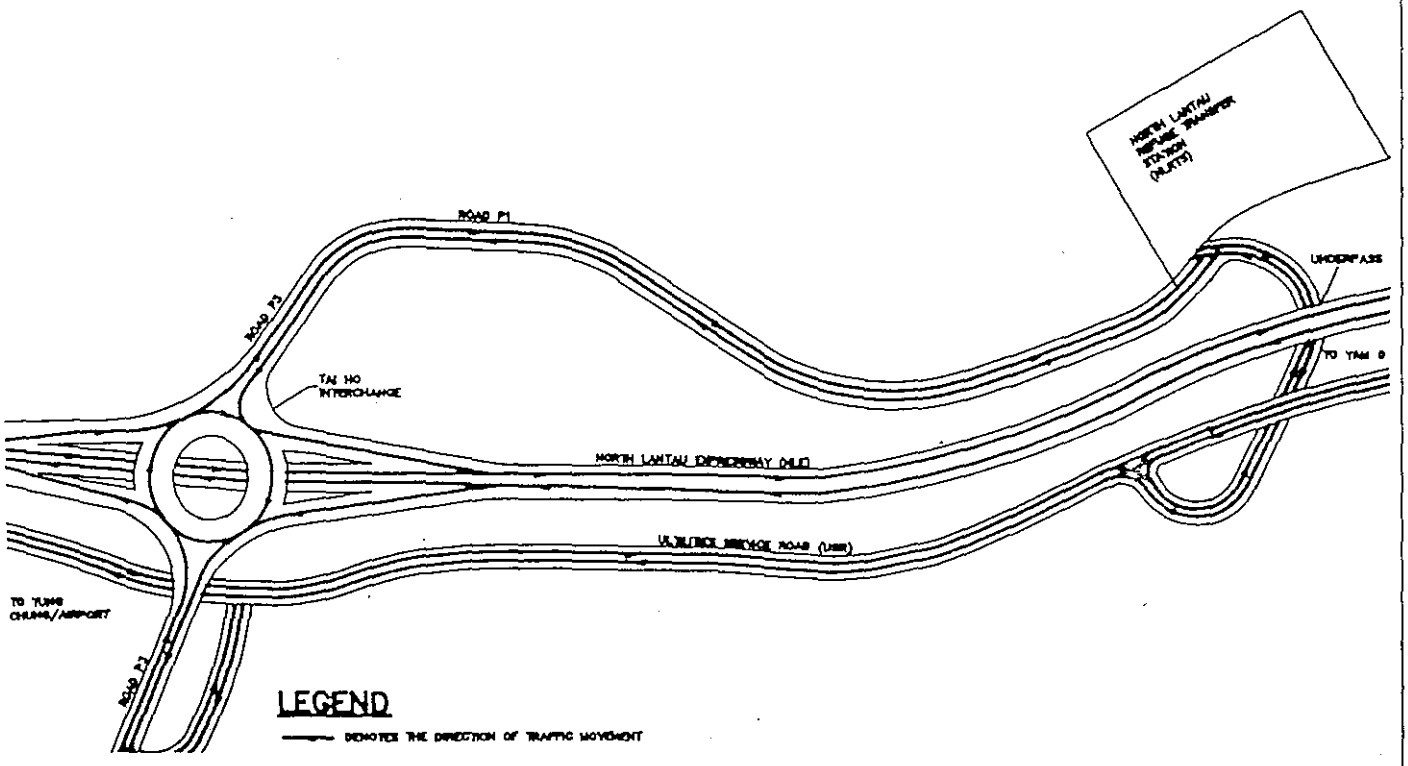


Location of North Lantau Refuse Transfer Station
(Scale - NTS)

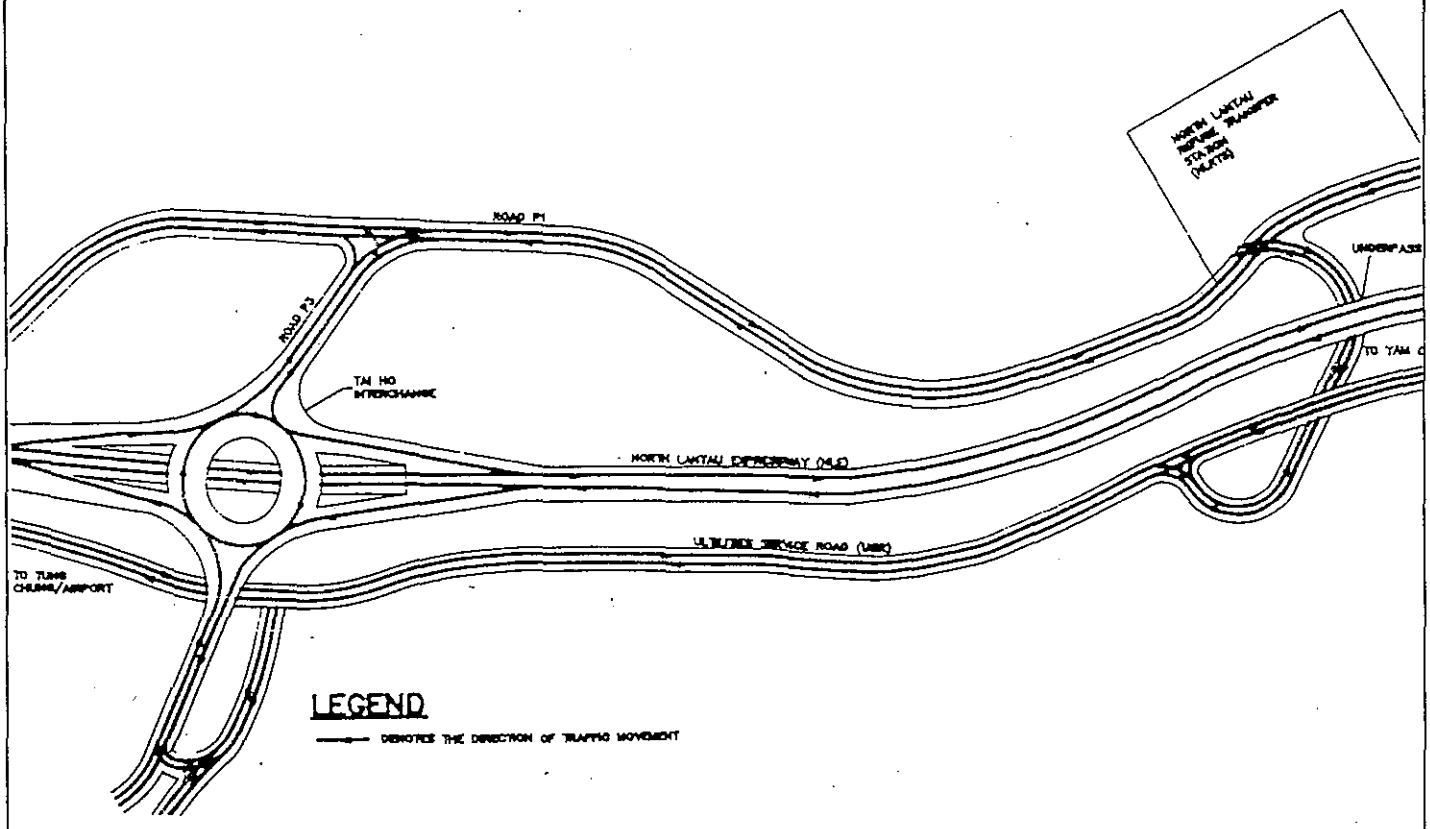
Figure 2.2



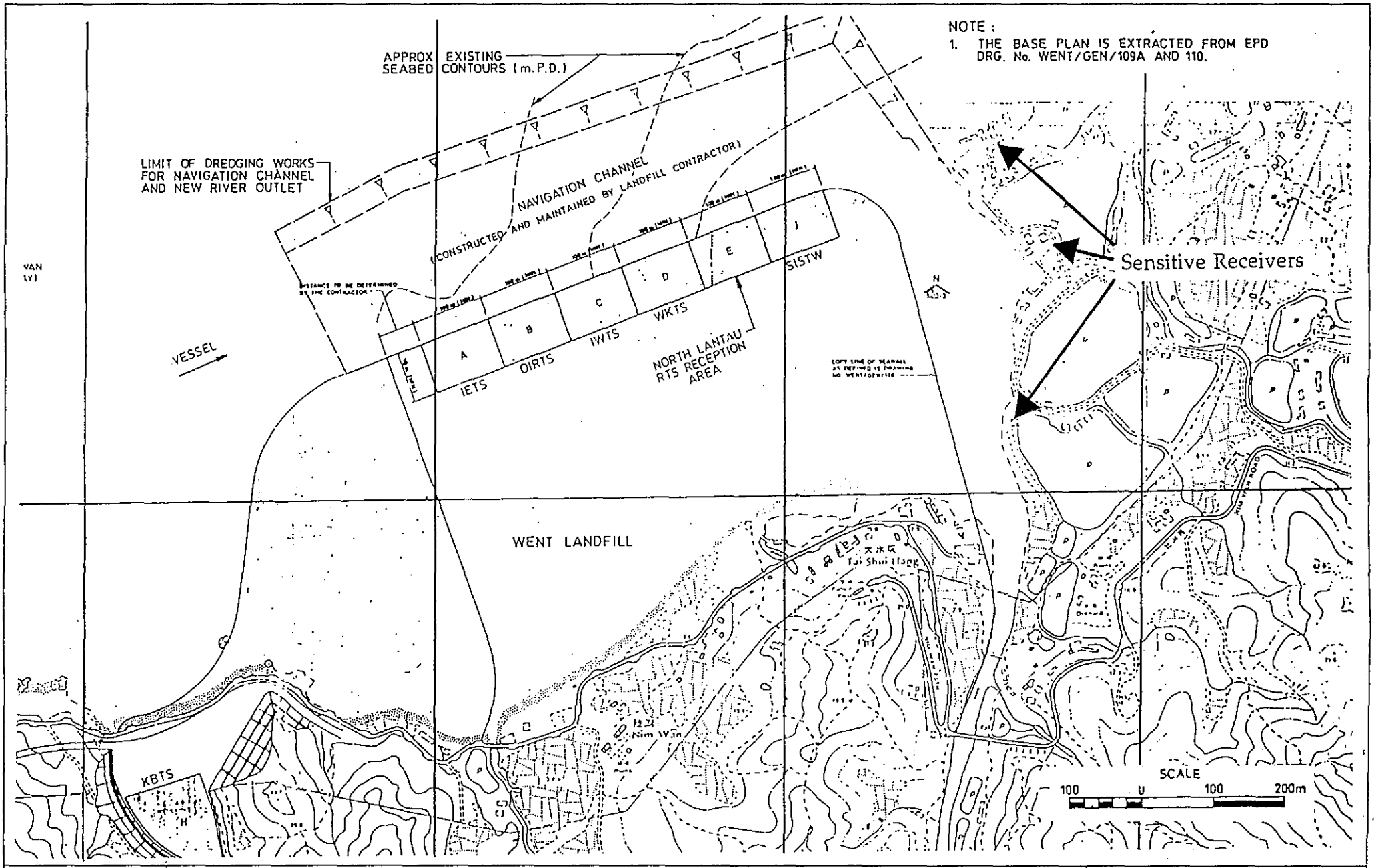
Traffic Movement in Year 1997 (Scale - NTS)	Figure 2.3



Traffic Movement in Year 2006 (Scale - NTS)	Figure 2.4



Traffic Movement in Year 2011 (Scale - NTS)	Figure 2.5



Sensitive Receivers at WENT Landfill Reception Area
(Scale - NTS)

Figure 2.6

3 TRANSFER STATION OPERATION

3 TRANSFER STATION OPERATION

3.1 General Layout

3.1.1 The major features of the RTS include:

- Weighbridges
- Transfer building
- Waste water treatment plant
- Container storage area
- Wash bay
- Administrative office
- Maintenance workshop

General layout of the Station is shown in Figure 3.1.

3.1.2 RCVs will drive across a weighbridge before climbing up a ramp which will lead into the push-pit hall in the enclosed transfer building. The empty RCVs will exit on the same ramp and will be washed at the vehicle washing station before leaving the site.

3.2 Transfer Operation

3.2.1 RCVs carrying a typical payload of 3.5 to 5 tonnes will tip their loads directly into the push-pits or reception hoppers on the first floor level in the tipping hall. The contents of each push-pit will pass to a compactor unit on the ground floor level, which will compact refuse into containers with approximately 14 - 22 t payloads depending on the size of containers used. The containers will be fitted with doors capable of providing a complete seal and these doors will be closed before transfer to the WENT landfill. Liquors draining from RCVs in the tipping hall or from refuse during its compaction will be diverted to a collection drain and thence to the waste water treatment plant.

3.2.2 The transfer operation will be enclosed within a transfer building which will be negatively ventilated to prevent escape of dust and odour and ensure that build up of dust and other air pollutants does not occur. The ventilation system will be designed to ensure that all exhaust air is treated to remove dust, gaseous pollutants and odorous substances to an acceptable degree.

3.2.3 The push-pits, compactors and ventilation systems will all be powered by equipment located within the transfer building, which will provide screening against visual impact, noise and air pollution. Activities taking place externally will be limited to vehicle

movement, container stacking, waste water treatment (which will be totally enclosed) and vehicle washing. No waste will be deposited or stored externally (except in sealed containers awaiting transfer).

3.2.4 The hours of receiving waste at the WENT Landfill are normally restricted to 0800 - 2000 hours. The NLRTS may operate outside these hours at both RTS and WENT landfill marine reception sites (Ref Section 3.3.3).

3.2.5 The tipping face of the WENT landfill will be opened every day of the year to receive waste between the hours of 0800 and 2000. In view of the travel time of a vessel to WENT, it will be necessary to store waste received after 1800 hours until the landfill re-opens on the following day. All waste entering the RTS site should be transferred to containers and not left in the tipping hall or in RCVs parked overnight. Containers stored overnight at the RTS would be the first to leave for the WENT landfill on the following day.

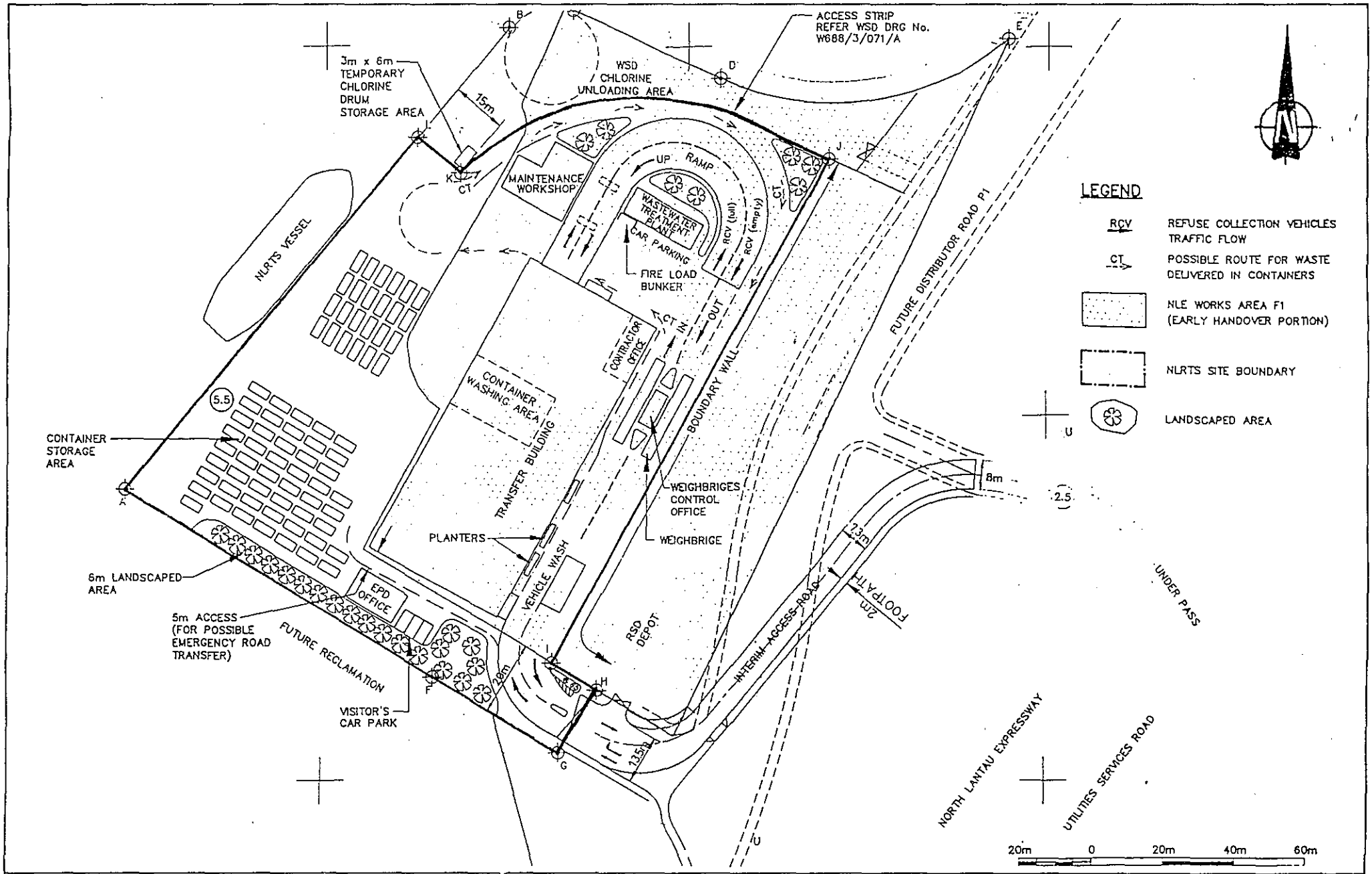
3.2.6 The containers stored at the NLRTS site would allow for one day (24 hours) of waste deliveries under normal conditions. Site storage could be extended up to three days (72 hours) during typhoon interruption or emergency situations. On resumption of normal operation the RTS contractor would endeavour to transport the back log of containers by utilising spare capacity in the barge available during the early years of operation, and additional passage of the barge (Ref Working Paper No.1A).

3.3 Route to WENT Landfill and Reception Area

3.3.1 Containers will be transported to the WENT Landfill reception area by marine vessels except during emergency or unusual conditions when road transport may be selected by a contractor.

3.3.2 During the early years of the contract, the waste quantities can easily be transported by 1 vessel per day. During peak periods of the later years of operation, i.e. 2011, 1 vessel with 2 journeys per day will be required.

3.3.3 Immediately after an emergency situation (ie. typhoon interruption), extended hours of container loading/unloading operation at the reception area in the evening (2000 to 2300 hours) may be required.



Concept Layout of North Lantau Refuse Transfer Station
(Scale - NTS)

Figure 3.1

4 AIR QUALITY

4 AIR QUALITY

4.1 Environmental Quality Objectives, Standards and Guidelines

Pollutants

4.1.1 The most significant airborne pollutant arising from construction work is dust, which is measured and monitored in terms of total and respirable suspended particulates (TSP and RSP respectively). During construction, the most significant source of dust will be the fines from the fill used in site formation.

4.1.2 When the transfer station is operational, the pollutants with greatest potential for impact on air quality are dust and odour from refuse and exhaust emissions from RCVs within the station.

Statutory Limits

4.1.3 Air Quality Objectives (AQOs) have been defined under the Air Pollution Control Ordinance. The AQOs apply to ambient air and those relevant to this assessment are presented in Table 4.1.

Table 4.1 Statutory Air Quality Objectives for Pollutants of Concern

Parameter	Average Concentration, μgm^{-3} [a]			
	1-Hour [b]	8-Hours [c]	24-Hours [c]	Annual [d]
TSP	-		260	80
RSP[e]	-		180	55
NO_2	300		150	80
CO	30 000	10 000	-	-

a *At 298 K and 101.3 kPa*
b *Not to be exceeded more than 3 times per year*
c *Not to be exceeded more than once per year*
d *Arithmetic mean*
e *Respirable suspended particulates means suspended particles in air with a nominal aerodynamic diameter of 10 μm or smaller*

Guidelines

4.1.4 The statutory limits given in Table 4.1 are intended to apply to ambient air. Those for TSP and RSP, in particular, apply only to relatively long averaging periods and are not entirely appropriate as standards for controls over short term impacts. Furthermore, some common pollutants are not covered by statutory limits and are subject only to guidelines.

4.1.5 An hourly average TSP of 500 μgm^{-3} is not a statutory limit, but has been applied to construction sites in Hong Kong where a dust problem is likely. Typically, this limit would apply at the site boundary and/or the nearest SR. Short term average reference or guideline values permit closer control over potentially polluting activities.

4.1.6 Within the confines of the transfer station building when in operation, a maximum 24-hour average dust level of 1 mgm^{-3} is recommended.

4.1.7 There is no AQO for odour. However, a commonly adopted maximum limit of 2 odour units (Dilution Factor 2) at the site boundary is normally recommended by EPD for potentially offensive installations. A limit of 2 odour units corresponds to a concentration of twice the odour detection threshold of known odorous chemicals: in the case of complex or unknown mixtures it can only be measured by a technique known as dynamic olfactometry, which is based on the sensory response of a panel of suitable individuals. The limit is intended to protect the public from nuisance and it is desirable that it should not be exceeded at any time.

4.1.8 The AQO for NO_2 and other pollutants in vehicle emissions is an ambient air quality parameter, covering emissions from all sources. This is of little relevance in the assessment of impacts from the relatively small number of RCVs associated with the transfer station. Emissions from these vehicles are of more significance in respect of indoor air quality within the transfer station. Limits of 5 and 55 mgm^{-3} as 8-hour time weighted averages for NO_2 and CO, respectively, are recommended. These limits are consistent with the Occupational Exposure Standards (OES) approved in the UK by the Health and Safety Executive. They were also specified in the Island East and Shatin RTS tender documents.

4.2 Existing Air Quality

4.2.1 Existing relevant data on air quality are sparse. There is no known odour level database.

4.2.2 Air quality monitoring data for Lantau Island is limited. The closest EPD air monitoring stations are located at the Tsuen Wan site on the mainland and the Central/Western Hong Kong Island sites.

4.2.3 A short term, 1 week, continuous monitoring was carried out at a site in Tung Chung during the North Lantau Development study. Measurement included NO_2, NO, SO_2, CO and TSP, wind speed and direction. The overall results indicated that the measured pollutant levels at the site were all very low. Due to construction of Chek Lap Kok Airport and other ACPs, elevation of dust levels is likely.

4.2.4 The predominant wind directions within the Study Area are east to south east with frequent northerly winds.

4.3 Impacts of Construction

4.3.1 Impacts of dust emissions during construction will be slight because of substantial distance to the SRs (approximately 2.4 km from the site). This assessment does not include formation of the construction platform, which is outside the scope of this study. This study assumes construction on a pre-formed platform involving limited foundation works and general construction works. In addition, compared to other airport related developments, the scale of the NLRTS will be much smaller. Thus, no dust dispersion modelling has been carried out.

4.3.2 At the WENT Landfill marine reception site, construction of an office block and paving of the reception area will take place. Due to the small scale of construction activities of this development in comparison with other landfill construction activities, dust impact will be negligible on the SRs.

4.3.3 Nevertheless, in order to minimise the dust impact, incorporation of mandatory dust suppression measures in the tender documentation is proposed. The dust suppression measures recommended for inclusion in the tender documentation include:

- Use of regular watering, with complete coverage, in dry periods to reduce dust emissions from unpaved roads
- Imposition of speed controls for vehicles on unpaved site roads, 8 kmh^{-1} being the limit recommended by EPD
- Paving of frequently-used site roads
- Use of frequent watering for particularly dusty static construction areas
- Side enclosure and covering of any aggregate or dusty material storage piles greater than 20 m^3 to reduce emissions. Where this is not practicable owing to frequent usage, aggregate fines should be watered frequently
- Vehicles with an open load carrying area shall have side and tail boards. Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards and shall be covered by a clean tarpaulin when in transit. The tarpaulin shall be properly secured and shall extend at least 300 mm over the edges of the side and tail boards
- Establishment and use of vehicle wheel and body-washing stations at site exit before entry onto public roads, combined with cleaning of public roads where necessary and practical. Water in the wheel cleaning facility should be changed at frequent intervals and sediment shall be removed regularly
- Where feasible, routing of vehicles and positioning of construction plant at maximum possible separation distances from sensitive receptors
- Use of high-level alarms on cement storage silos, to prevent overfilling

- Use of fabric filters on vents on cement silos weigh hoppers. Provision of either shaking or pulse-air cleaning mechanisms on dry mixers. An air to cloth ratio (filtering velocity) of 0.01 to 0.03 m s^{-1} is recommended

- Instigation of a control programme to monitor the construction process in order to enforce controls and modify methods of work if dusty conditions arise.

4.4 Impacts of Operation

4.4.1 RCVs will be weighed at a central weighbridge complex to determine the net weight of their respective loads. At peak times they may queue up at this complex and at other locations on the site. This will occur in the open air away from SRs the impact of exhaust emissions should be low.

4.4.2 Major operations occur within the transfer building and there will be no direct emissions to atmosphere outside the building. The assessment will therefore focus on air quality requirements within the transfer station, the ventilation system design and air exchange rate necessary to secure compliance with these requirements and the suitability and efficiency of the scrubbing/filtration system through which the exhaust air will pass.

Impacts within the Refuse Building

4.4.3 Tipping of refuse into the push-pits is not a particularly dusty activity because the refuse is wet (typically greater than 30% moisture content). However, with dry loads and during certain periods of the year, the unloading of waste into the compactor feed pits can generate dust. Thus dedicated extractors will be required for each push-pit to control airborne particulates that may arise infrequently.

4.4.4 A dust control system in the EIA study for Kowloon Bay Transfer Station (KBTS) was developed with equal emphasis given to both preventive and arrestance measures. The basic rationale was to minimise the volume and contamination level of air treated as well as to control dust below the stipulated level of 1 mgm^{-3} within the transfer building. The recommended dust control system included:

- Design/installation of a negative pressure ventilation system, drawing air in through the entrance/exit points to prevent fugitive emissions. All air drawn inside the building was forced to exit through the dust arrestor system

- Using misting sprays to coalesce intense dust clouds as well as to relieve the challenge to the arrestor

- Provision/installation of a dual ventilation system to deal separately with the first and ground floor. At first floor (tipping hall) an air exchange rate of 8 hr^{-1} was recommended. Air was drawn across the building from north to south and exited through vents positioned over each of the six push-pits, and through dust removal filters. At ground floor, where small quantities of dust could arise, an air exchange rate of 2.5 hr^{-1} with similar system design was adopted. Air was

drawn in across the building, exited through intake vents at a level above the container vehicle tail pipe. The air then passed through a dust filter.

In addition, regular, scrupulous cleaning of the tipping hall floor was also recommended to further reduce dust levels within the transfer station.

4.4.5 The main source of vehicular emissions (e.g CO and NO_2) in the tipping hall is expected to be particulates in the diesel exhaust emission from RCVs. Therefore, individual ducts are required over the points at which RCVs are positioned when tipping. Experience has shown that CO and NO_2 from the diesel powered RCVs are also potentially of concern for occupational health reasons. The extractor ducts positioned close to vehicle exhausts will ensure that quality criteria are met for these pollutants.

4.4.6 Comparison of the ratios of CO and NO_2 concentrations in diesel vehicle exhausts with the recommended OES shows that NO_2 concentration is the limiting factor. The US EPA publication AP-42 gives emission factors, without emission control, for stationary heavy diesel vehicles of 0.92 $gmin^{-1}$ for NO_x and 0.87 $gmin^{-1}$ for CO at sea level. In confined spaces it is normally assumed as a worst case that 20% of NO_x is NO_2. The equivalent rate of emission per vehicle is therefore 248 $mgmin^{-1}$. For a tipping hall of volume V, ventilated at rate Q and with a total emission rate of P, the concentration of NO_2 in the tipping hall can be determined by mass balance:

$$VdC_i/dt = QC_i + P - QC_o$$
$$= Q(C_i - C_o) + P$$

Where C_i is the concentration of NO_2 in the make up air which is assumed to be 90 μgm^{-3} (North Lantau Development - Environmental Assessment Report, TR10). At steady state ($VdC_i/dt = 0$), the ventilation rate required to maintain a value of C_o (5000 μgm^{-3}) equal to the OES is

$$Q = P/(C_o - C_i)$$

The ventilation rate required can then be related to the number of vehicles in the tipping hall as follows:

Vehicles	P ($mgmin^{-1}$)	Q ($m^3 h^{-1}$)
5	1 240	15 153
10	2 480	30 306
20	4 960	60 611

4.4.7 For workers' health and safety the transfer building ventilation system should also be designed to limit personal exposure of NO_2 and CO to 5.0 mgm^{-3} and 55 mgm^{-3} respectively as an 8-hour time weighted average.

4.4.8 The atmosphere within the tipping hall will be odorous. This is particularly so if the waste from the new airport catering facility is disposed to the site, as this refuse will comprise a large proportion of wet putrescible wastes. This is unavoidable, but is

controlled to some degree by the ventilation rate. The ventilation system must, therefore, be fitted with an odour scrubbing unit. Essential features of such a unit are that it should have a very high affinity for volatile organic nitrogen and sulphur compounds, and should be easily renewable upon exhaustion of the adsorbent. Chemical odour masking is not recommended, partly because the masking agents themselves have the potential for nuisance, or at least draw attention to the existence of odours, and partly because they introduce a chemical handling requirement. Experience at KBTS has shown that there are no significant odorous emissions from the transfer station itself. Detectable odours in the vicinity of the station are usually traceable to incoming RCVs. Despite daily collection, refuse in Hong Kong putrefies very rapidly and can become odorous within hours. The optimum solution to the problem of odour in transit is avoidance of traffic congestion and queuing on approach and access roads, rapid processing of waste at the station, and efficient washing of outgoing vehicles.

4.4.9 The surrounding uses at the NLRTS site would be industrial. If the maximum limit of 2 odour units (dilution factor 2) at the site boundary as required by EPD is achieved, odour is unlikely to cause impact at the industrial areas.

4.4.10 The requirement to filter or scrub all air exhausted from the transfer station building ensures that particulate emissions are low in relation to background. In view of the scale of development anticipated in the area and the proximity of industrial areas and NLE it is unlikely that dust emissions from the facility will affect ambient conditions to any significant degree. The AQOs presented in Table 4.1 are standards for ambient air and do not relate to emissions from individual sources. Consequently, any detectable non-compliance with the AQOs cannot necessarily be ascribed to such individual sources. If dust concentrations within the station are controlled to 1 mgm^{-3}, which is the limit set in the contract clauses for Island East and Kowloon Bay RTSs, and the scrubbing/filter system is at least 90% efficient, it is extremely unlikely that ambient average concentrations at or beyond the site boundary will exceed the 24-hour average AQO of 0.26 mgm^{-3} as a result of excessive emissions from the transfer station.

4.4.11 The main features of the ventilation system and building design will include:

- The tipping hall being maintained under slight negative pressure, thus preventing fugitive emission via open doors and the RCV access
- An air conditioned control room for the tipping hall controller
- Enclosure of the tipping hall as far as practicable, while maintaining vehicular access
- Flexible dust seals around the compactor/container interface
- Circulation of air through dust filters to ensure that dust emissions to the atmosphere are low
- Circulation of air through an odour control unit in order to meet the odour standard at the site boundary

- Good drainage falls on the tipping hall floor to ensure that the cleaning programme is effective and particle resuspension is minimal.

4.4.12 Operational procedures to be adopted in addition to the ventilation and scrubbing system described above include:

- No refuse to be stored or left in the push-pit overnight
- A stringent cleaning programme
- Immediate cleaning of spillages.

Impact Outside the RTS

4.4.13 Dust generated outside the transfer station building, but within the site will be minimised by regular cleaning of the site.

4.4.14 Containers at the NLRTS site would be stored for 24 hours for deliveries under normal condition and would be for maximum 3 days during emergency situations (i.e. typhoon interruption). Because waste is compacted and enclosed in sealed containers, it is unlikely to cause odour problems at the RTS site. However, due to decay of putrescible waste within the containers, it may create odour at the WENT discharge point when the containers are opened.

4.4.15 Due to small number of RCV movements on the roads, impact of vehicle emissions on the SRs is considered to be insignificant in comparison with the dominant emissions from the NLE.

4.4.16 Under emergency and unusual situations such as plant breakdown, blockage of access,etc., diversion of the RCVs directly to the WENT Landfill or West Kowloon RTS may be required. RCVs directed to the WENT Landfill would travel via the NLE, Lantau Fixed Crossing and Tuen Mun Highway and those directed to the West Kowloon RTS would travel via NLE and West Kowloon Expressway. The effect of the marginal increase in road traffic would have an insignificant effect on vehicle emissions.

4.5 Areas for Further Assessment

4.5.1 Assessment of construction impacts on air quality should not be required since this preliminary assessment has shown that dust impact would be negligible due to the absence of SRs in the vicinity of the development.

4.5.2 The adoption of the dust suppression measures identified in the text should be incorporated into the contract clauses to minimise dust generation, thereby preventing significant deposition and adverse visual impact.

4.5.3 It will be necessary to evaluate the efficacy of the proposed ventilation and scrubbing systems in maintaining internal air quality requirements for the tipping hall and

operational areas and in preventing the escape of pollutants to the outside. Meaningful dispersion modelling of external emissions is not possible. In view of the absence of SRs nearby, adjacent land use and experience elsewhere, this should not be required.

4.5.4 Tenderers will be required to show that the air exchange rate within the transfer station building is sufficient to maintain acceptable air quality under worst case conditions. A mass balance method of calculation similar to that identified earlier in the text would be appropriate.

5 NOISE

5 NOISE

5.1 Environmental Quality Objectives, Standards and Guidelines

Statutory Limits Applied for the NLRTS Site

5.1.1 Noise generated by industrial and related operations, general construction activities and percussive piling is controlled under the Noise Control Ordinance (NCO).

5.1.2 Under the NCO, the acceptable noise levels (ANLs) for general construction work are determined by the methodology specified in the Technical Memorandum on Noise from Construction Work other than Percussive Piling. An Area Sensitivity Rating (ASR) of "A" is given for this area due to the nature of rural surrounding. The relevant ANLs are presented in Table 5.1. A Construction Noise Permit (CNP) will be required for any work undertaken during the hours for which ANLs are specified in Table 5.1.

Table 5.1 Acceptable Construction Noise Levels at the Nearest Sensitive Receiver

Time Period		L_{eq} (5 min), dB(A)
Day time	(0700 - 1900)	-
Evening	(1900 - 2300)	60[a]
Night time	(2300 - 0700)	45

a Including holidays and Sundays between 0700 - 2300 hours.

5.1.3 Noise generated by percussive piling is similarly subject to control under the NCO by provisions described in the Technical Memorandum on Noise from Percussive Piling. The separate CNP required for piling includes restrictions on the hours during which piling can take place. The permitted hours of operation are presented in Table 5.2. These are based on the extent to which the Corrected Noise Level (CNL) at the NSRs exceeds the ANL.

Table 5.2 Permitted Hours of Operation for Percussive Piling

Amount by which Percussive Piling CNL exceeds 85 dB(A) at Tai Ho Wan	Permitted hours of operation on any day not being a general holiday
More than 10 dB(A)	0800 - 0900, 1230 - 1330 and 1700 - 1800
Between 1 dB(A) and 10 dB(A)	0800 - 0930, 1230 - 1400 and 1630 - 1800
No exceedance	0700 - 1900

5.1.4 It is an offence, under NCO to drive piles between the hours of 1900 and 0700 unless an exemption has been granted.

5.1.5 The NCO also provides the statutory basis on which noise from specific sources may be controlled. The relevant criteria for operational noise are contained in the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites.

5.1.6 Due to the commissioning of the new airport after June 1997 and other developments, eg. NLE, an ASR of `B' is likely to be assigned. ANLs for the NLRTS site are, therefore, those given in Table 5.3.

Table 5.3 Acceptable Operational Noise Levels at the Nearest Sensitive Receiver

Time Period		L_{eq} (30 minutes), dB(A)
Day time	(0700 - 1900)	65
Evening	(1900 - 2300)	65
Night time	(2300 - 0700)	55

Statutory Limits Applied for the WENT Waste Reception Area

5.1.7 ASR of "B" is given for the area due to construction and operation of the WENT Landfill. The relevant ANLs for both phases are presented in Table 5.4.

Table 5.4 Acceptable Construction and Operational Noise Levels at the Nearest Sensitive Receiver

Time Period		Construction Phase	Operational Phase
		L_{eq} (5 minutes), dB(A)	L_{eq} (30 minutes), dB(A)
Day time	(0700 - 1900)	-	65
Evening	(1900 - 2300)	65[a]	65
Night time	(2300 - 0700)	50	55

a Including holidays and Sunday between 0700 - 2300 hours.

Guidelines

5.1.8 A day time construction noise limit is not specified in the NCO, nor is a limit recommended in the Hong Kong Planning and Guidelines (HKPSG). However, in keeping with the spirit of the White Paper, and in accordance with recent practice a day time noise limit of 75 dB(A) for both NLRTS and WENT Landfill marine reception sites are recommended, though this is not a statutory requirement.

5.1.9 The HKPSG states that in order to plan for a better environment, the noise source should be located and designed so that the noise level at the NSR is at least 5 dB(A) below the ANL presented in Table 5.3 or no higher than the background noise if the latter is more than 5 dB(A) below the ANL. These limits are therefore dependent on the level of background noise, but may not exceed 60 dB(A) during the day and evening, and 50 dB(A) at night in any event for both the NLRTS site and the WENT Landfill marine reception area.

5.1.10 The HKPSG road traffic noise standard is a peak hour L_{10} of 70 dB(A) at the facade of residential buildings. This limit applies to road traffic noise generated from all traffic, including RCVs and container vehicles, on the road. Noise from a smaller number of vehicle movements within a particular site would be assessed in accordance with the provisions outlined in paragraph 5.1.5 and would therefore be subject to statutory control.

5.2 Existing Noise Level

5.2.1 No long term background noise data is available for the study area. A baseline noise survey was carried out between January and February 1991 within the North Lantau Development study area. It was concluded that in general, the background noise level, expressed in L_{90} (1-hr), was in the range of 25 dB(A) to 45 dB(A). The main noise source in the area was local community background noise, including noises from TV, radio, people, dogs barking, etc although the noise environment varies slightly across the study area due to influence of localised noise sources.

5.2.2 Due to the North Lantau Development projects and commencement of the new airport reclamation, the area is experiencing rapid changes of environment from a quiet rural to urban surrounding. Ambient noise levels will inevitably increase.

5.2.3 Background noise monitoring at the WENT Landfill site has been conducted by an environmental study team for WENT Landfill. The background noise levels were found to be relatively high, between 48 - 50 dB(A). The WENT site bears marked similarities to the NLRTS site, the main noise sources were local community background noise from TV, radio, people and dogs. Due to commissioning of the WENT Landfill, ambient noise level is likely to increase.

5.3 Impacts of Construction

NLRTS Site

Construction Noise

5.3.1 Though identified future NSRs at Tai Ho (section 2.3) will not be in place at the time of construction of the NLRTS, a calculation for construction noise impact has been included for reference.

5.3.2 In Table 5.5, a typical powered mechanical equipment inventory for constructing a RTS is identified and listed, together with the respective sound power levels (SWLs). The analysis represents a worst case scenario of noise for this site. In reality, the prediction is likely to be conservative, it is unlikely that all equipment identified will be deployed at the same time. In addition, some barrier attenuation will occur and due to the large distance between source and NSRs, atmospheric absorption will be significant, actual values depending on frequency spectra of plant used. Noise level is thus likely to be lower than the prediction of 50 dB(A).

5.3.3 The predicted noise level is within the day time and evening limits of 75 dB(A) and 60 dB(A) respectively, but exceeds the night time limit of 45 dB(A). Therefore, mitigation should will be required for construction work during night time (1900-0700). If work outside of normal working hours is envisaged (1900 - 0700 and on general holidays including Sundays), this would be subject to the provisions of the NCO and would require a CNP issued by EPD. Should mitigation be required for night time working, or for any other reason, this could be achieved in part by the use of silenced equipment. Silenced compressor and generators are available, and if used could reduce noise levels at NSRs by 1 - 2 dB(A). Depending upon the degree of noise reduction required, other mitigation measures, such as reduced numbers of plant or scheduling of construction programme, could also be adopted.

Table 5.5 Construction Noise Impact at NLRTS

Item	SWL dB(A)	Number On Site	Total SWL
Air compressor, standard	104	2	107
Concrete lorry mixer	109	2	112
Crane, mobile (diesel)	112	1	112
Dump truck	117	2	120
Excavator/loader	112	1	112
Generator, standard	108	1	108
Lorry	112	3	117
Roller, vibratory	108	1	108
Winch (electric)	95	1	95
Combined sound power level			123 dB(A)
Distance to NSR			2400 m
Attenuation correction			- 76 dB(A)
Reflection correction			+ 3 dB(A)
Sound pressure level at NSR			50 dB(A)

Traffic Noise

5.3.4 No information on construction traffic is available at this stage. Construction material will likely be transported to the site by barge. It is therefore, considered highly unlikely that construction traffic would have a significant impact on the future local road network.

WENT Landfill Marine Reception Area

Construction Noise

5.3.5 Construction activities at the WENT Landfill waste reception area will be limited to the construction of an office block and the paving of the reception area. Noise calculation is summarised in Table 5.6.

Table 5.6 Construction Noise Impact at WENT Reception Area

Item	SWL,dB(A)	No on Site	Total SWL,dB(A)
Air compressor, standard	104	1	104
Concrete lorry mixer	109	1	109
Excavator/loader	112	1	112
Lorry	112	1	112
Roller, vibratory	108	1	108
Vibrating poker	113	2	116
Combined sound power level			119 dB(A)
Distance to NSR			400 m
Attenuation correction			- 60 dB(A)
Reflection correction			+ 3 dB(A)
Sound pressure level at NSRs			**62 dB(A)**

5.3.6 The predicted noise level of 62 dB(A) is within the day time and evening limits of 75 and 65 dB(A) respectively, but exceeds the night time limit of 50 dB(A). Noise mitigation will be required if night time work takes place.

5.4 Impacts of Operation

NLRTS Site

Operational Noise

5.4.1 At the NLRTS site, operational noise can arise from:

- RCV movements on the site

- The transfer building, including:
  - * ventilation exhaust fans
  - * RCVs in tipping hall
  - * compactor units
  - * push-pit units
- Waste water treatment plant
- Maintenance area activities (typically engines on a test bed).

5.4.2 Noise from RCVs on the site can be calculated from British Standard 5228:1984, as follows:

$$L_{eq} = L_{WA} - 33 + 10\log_{10}Q - 10\log_{10}V - 10\log_{10}d$$

Where L_{WA} is the SWL of a vehicle, (dB(A))
Q is the number of vehicle movements per hour
V is the average speed (kmh^{-1}) and
d is the distance to NSRs, (m)

Based on RCV waste capacities, estimated average vehicle movements between 1997 and 2011 are shown in Table 5.7. If vehicles with a SWL of 112 dB(A) move at an average speed of 20 kmh^{-1} within the site, noise levels between 1997 and 2011 at the nearest receivers (2400 m) would be between 34 to 40 dB(A) as summarised in Table 5.7. The assessment can be viewed as a worst case scenario, since there is no allowance for attenuation by barriers, buildings, topographic features or air absorption. The analysis shows no noise impact on NSRs from RCV operations within the site.

Table 5.7 Estimated Traffic Noise at Sensitive Receivers Between 1997 and 2001

Year	1997	2001	2006	2011
Max RCV/Hr	16	25	38	59
Equivalent to 2.5 passenger car units (p.c.u)	40	63	95	148
SWL, dB(A)	34	36	38	40

5.4.3 The combined SWL from site activities, except vehicle movements, can be used to assess on-site operational impact. Two different compactors and push-pit options have been considered in the outline design: standard compactor, the push-pit option, pre-load compactors and the moving floor pit. The former contains four push pits feeding four standard compactors. The later consists of three moving floor pits feeding three pre-load compactors. Table 5.8 shows the plant utilisation, associated SWL, and calculation of impact at the NSRs for both options. An attenuation of 10 dB(A) is assumed for activities carried out within the RTS.

Table 5.8 Operational Noise Impacts from RTS

Item	SWL dB(A)	No of Units	Building/Barrier Attenuation dB(A)	Total SWL dB(A)
1. *Standard Compactor Option*				
RCV*	112	16	- 10	114
Compactors	75	4	- 10	71
Push-pits	75	4	- 10	71
Blower	86	1	- 10	76
Large wheel loader	115	1	- 10	105
Small wheel loader	115	1	- 10	105
Maintenance	90	1	- 10	80
Road sweeper	112	1	0	112
Container handling unit	107	2	0	110
Container yard tractors	107	5	0	114
Combined SWL				119 dB(A
Distance to NSR				2400 m
Attenuation correction				- 76 dB(A)
Reflection correction				+ 3 dB(A)
Sound pressure level at NSR				**46 dB(A)**
2. *Pre-load Compactor Option*				
RCV*	112	16	- 10	114
Compactors	75	3	- 10	70
Push-pits	75	3	- 10	70
Blower	86	1	- 10	76
Large wheel loader	115	1	- 10	105
Small wheel loader	115	1	- 10	105
Maintenance	90	1	- 10	80
Road sweeper	112	1	0	112
Container handling unit	107	2	0	110
Container yard tailer	107	5	0	114
Combined SWL				119 dB(A)
Distance to NSR				2400 m
Attenuation correction				- 76 dB(A)
Reflection correction				+ 3 dB(A)
Sound pressure level at NSR				**46 dB(A)**

* *Assuming that 16 RCVs operate concurrently within the tipping hall at one time. Those queuing on the site outside the transfer building are not included.*

5.4.4 The RTS will be operated only during day time and evening. The predicted noise level of 46 dB(A) at NSRs under both options would not exceed the most stringent HKPSG criteria of 60 dB(A) for the day time and evening. In reality, sound pressure levels would be lower than predicted since the identified NSRs would be shielded by the permanent structures of the NLE. NSRs would be more directly affected by other developments, most particularly NLE and the new airport, which will dominate the noise environment. Even so, it is considered appropriate to limit the SWL emitted by these sources in order to protect the environment. It is recommended, therefore, that the noise level at site boundary should not exceed 90 dB(A) for day time and evening work, and 70 dB(A) during the night.

5.4.5 The waste water treatment plant will be located within its own building. Given the size of the facility, noise impact is considered to be negligible.

Traffic Noise

5.4.6 Maximum number of RCVs per hour on the public roads during year 1997, 2001, 2006 and 2011 are presented in Table 5.7. They are in the order of 16 to 59. The RCVs will travel to the RTS via different routes from various directions as described in Section 2.2. Predicted AM peak hour traffic flows in years 1997, 2001, 2006 and 2011 on the NLE and USR at Tai Ho and Yam O areas are presented in Figure 5.1 to 5.4. The predicted traffic flows at NLE are in the order of a few thousand. Comparing these predictions with RCVs movements, the flow of the latter on public roads would be very small. Therefore, it is believed that the impact of traffic noise from RCVs on NSRs will be negligible.

5.4.7 During emergency and unusual situations (see Section 4.4.14), when the NLRTS is unable to accept RCVs, RCVs will be re-routed directly to WENT (i.e NLE - Lantau Fixed Crossing - Tuen Mun Highway) or West Kowloon RTS (NLE - Lantau Fixed Crossing - West Kowloon Expressway). The marginal increase in vehicle movements on these major transport corridors will not contribute, significantly, to the noise generated.

<u>WENT Landfill Marine Reception Area</u>

5.4.8 Upon arrival of vessel at the WENT Landfill NLRTS marine reception area, containers will be unloaded from the vessel by a crane (or two cranes) onto container yard trucks, and then be driven to the landfill tipping face for disposal of waste. Operational noise could arise during container handling from these trucks and handling cranes.

5.4.9 In the Outline Design, it was assumed that a self-propelled barge of approximately 60 TEU capacity fitted with one gantry crane would be used to transport the containers. This vessel is able to achieve an interchange rate of 20 containers per hour. Based upon these assumptions and waste arising predictions, time requirements for container handling per vessel trip in Year 2003 and 2011 is summarised in Table 5.9.

Table 5.9 Time Requirements for Container Loading and Unloading Activities

Year	Waste Quantity (tpd)	No of Vessel Trips (pd)	No of Containers Per Vessel Trip	Time Requirement for Container Unloading Per Vessel Trip (hours)
2003	650	1	42	2.3
2011	1200[a]	2	46	2.15
2011	1470[b]	2	52	2.6

a Average day quantity of waste
b Maximum day quantity of waste

5.4.10 The worst case scenario would be trucks and cranes operating concurrently, which would last for 2.6 hours under the maximum day waste quantity scenario in Year 2011. Noise calculation is summarised in Table 5.10.

5.4.11 The predicted sound pressure level of 65 dB(A) at NSR would comply with the statutory ANL of 65 dB(A) for day time and evening, but exceed the night time limit of 55 dB(A).

Table 5.10 Operational Noise Impacts from the Container Reception Area

Items	SWL, dB(A)	No of Unit	Total SWL, (dB(A))
Container handling units	107	2	110
Container yard trucks	117	3	123
Barge Crane	112	1	112
Combined SWL			122 dB(A)
Distance to receivers			400 m
Attenuation correction			- 60 dB(A)
Reflection correction			+ 3 dB(A)
Sound pressure level at NSR			**65 dB(A)**

5.4.12 Concurrent container handling/operational activities are expected to be carried out by other RTSs contractors. Thus, cumulative noise impact assessment should be conducted. It is understood that this will be undertaken as part of EIA reporting for the WENT Landfill project.

5.4.13 In order to comply with the statutory noise limit of 65 dB(A) at NSR for day time and evening for operations at the whole WENT Landfill Reception Area, taking account of cumulative noise impacts from other RTSs, limits may have to be placed on each

operating area. The exact noise limit will be subject to the recommendation of the on-going Supplementary EIA carried out by the WENT Landfill contractor. Mitigation measures, including barriers, quiet plant or restrictions on concurrent plant usage, may have to be adopted for day time and evening work.

5.4.14 As mentioned in Section 3.3.3, if extended hours of work are required, operations would be limited to container loading and unloading activities, and no trucks will be required after evening closure of the landfill tipping face, ie. at 2000 hours. The resulting sound pressure level from operating container handling units would be 53 dB(A), as shown in Table 5.11. This figure is within evening ANL of 65 dB(A) as well as HKPSG criteria of 60 dB(A). Thus, container handling activities during evening at the site are not expected to cause significant noise impact on NSRs.

5.4.15 The prediction also suggests that night work between 2300 to 0700 hours would be within the statutory ANL of 55 dB(A), but exceed HKPSG limit of 50 dB(A) as stated in section 5.1. Therefore, night time work may need to be restricted, unless the tenderers can show that their plant would be able to operate while keeping impact at the NSR to below 50 dB(A) or background level whichever is lower. This also assumes that other RTS reception areas are not operating at the same time.

Table 5.11 Noise Impact Arising from Container Loading and Unloading Activities

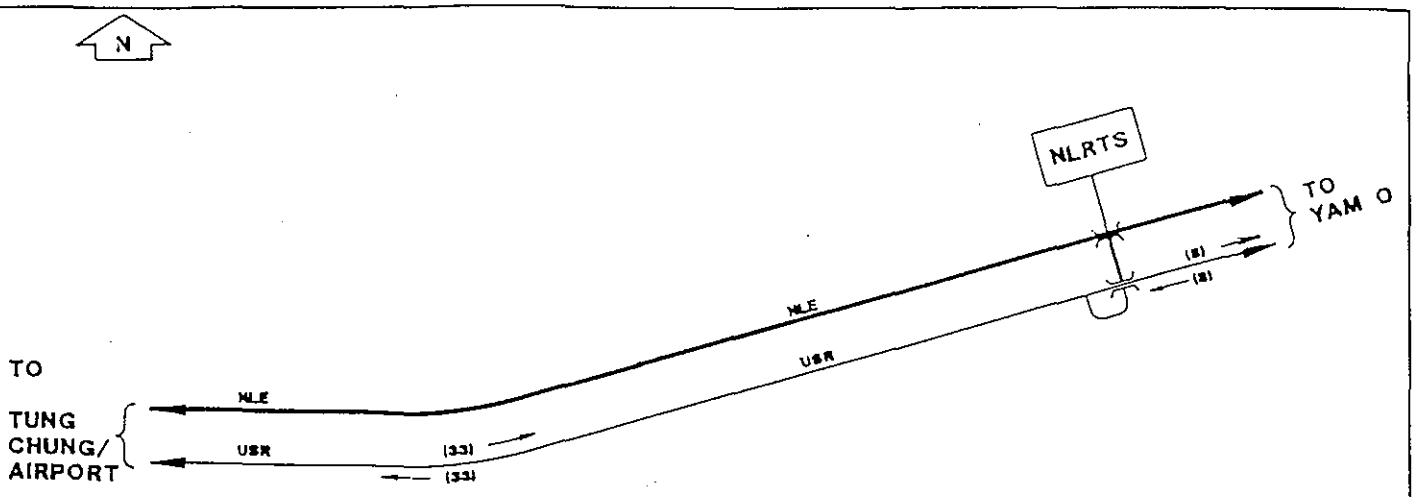
Items	SWL dB(A)	No of Unit	Total SWL, dB(A)
Container handling units	107	2	110
Distance to receivers			400 m
Attenuation correction			- 60 dB(A)
Reflection correction			+ 3 dB(A)
Sound pressure level at NSR			**53 dB(A)**

5.5 Areas for Further Assessment

5.5.1 Construction noise should not require further assessment if construction is confined to weekdays only and therefore is not subject to statutory control. For construction during hours for which basic noise levels are specified under the NCO (i.e. 1900 to 0700 hours), a CNP will be required. Tenderers should be encouraged to submit preliminary applications for CNPs with their tenders so that the acceptability of the proposed method of working can be assessed prior to award of contract. Subsequent detailed assessment should therefore not be required unless there are considerable changes to the method of working at a later stage.

5.5.2 The assessment of noise from vehicle movement has assumed the worst case SWL. Tenderers should be asked to include manufacturer's specification for SWL on the vehicle fleet in their tenders.

5.5.3 An appropriate day time and evening operational noise limit for the NLRTS marine reception area at the WENT Landfill will be finalised following the recommendations of the WENT EIA Study, and incorporated into the Tender Document. Tenderers will need to demonstrate noise mitigation measures to control noise within the appropriate ANLs.



NOTES:

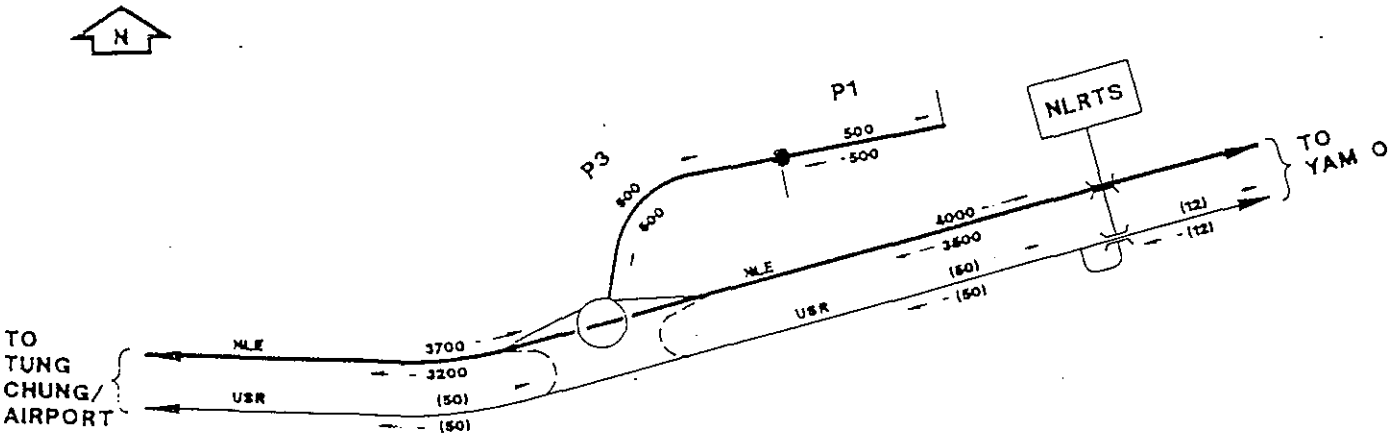
1. ALL FIGURES ARE IN PCU AND ARE REPRESENTING FLOWS CREATED BY ALL TYPE OF VEHICLES INCLUDING THOSE INDUCED BY THE RTS DEVELOPMENT.
2. FIGURES IN BRACKETS REPRESENT FLOWS INDUCED BY THE RTS DEVELOPMENT.

LEGEND

NLE	DENOTES THE NORTH LANTAU EXPRESSWAY
NLRTS	DENOTES NORTH LANTAU REFUSE TRANSFER STATION
P1, P3	DENOTES PRIMARY ROAD
USR	DENOTES ULTILITIES SERVICES ROAD

Predicted am Peak Hour Traffic Flow in 1997
(Scale - NTS)

Figure 5.1



NOTES:

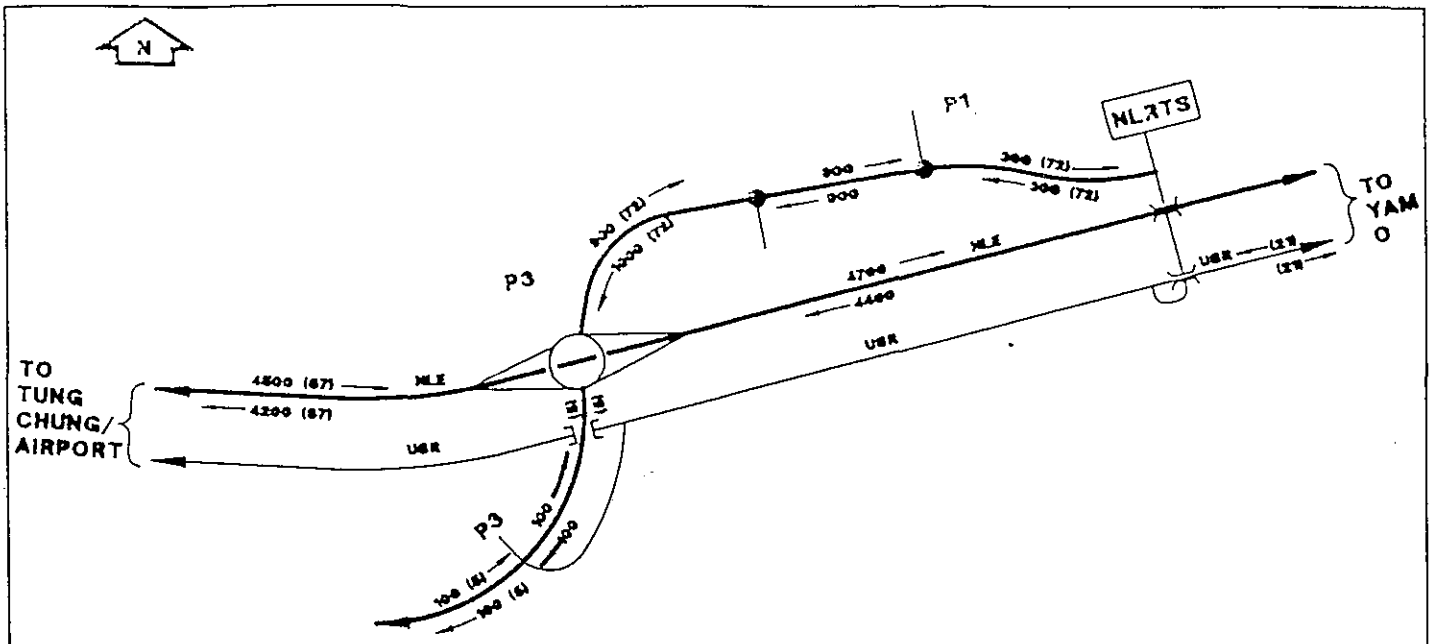
1. ALL FIGURES ARE IN PCU AND ARE REPRESENTING FLOWS CREATED BY ALL TYPE OF VEHICLES INCLUDING THOSE INDUCED BY THE RTS DEVELOPMENT.
2. FIGURES IN BRACKETS REPRESENT FLOWS INDUCED BY THE RTS DEVELOPMENT.

LEGEND

NLE	DENOTES THE NORTH LANTAU EXPRESSWAY
NLRTS	DENOTES NORTH LANTAU REFUSE TRANSFER STATION
P1, P3	DENOTES PRIMARY ROAD
USR	DENOTES ULTILITIES SERVICES ROAD
----	DENOTES POSSIBLE SLIP ROAD SUBJECT TO MTRC/HyD AGREEMENT

Predicted am Peak Hour Traffic Flow in 2001
(Scale - NTS)

Figure 5.2



NOTES:

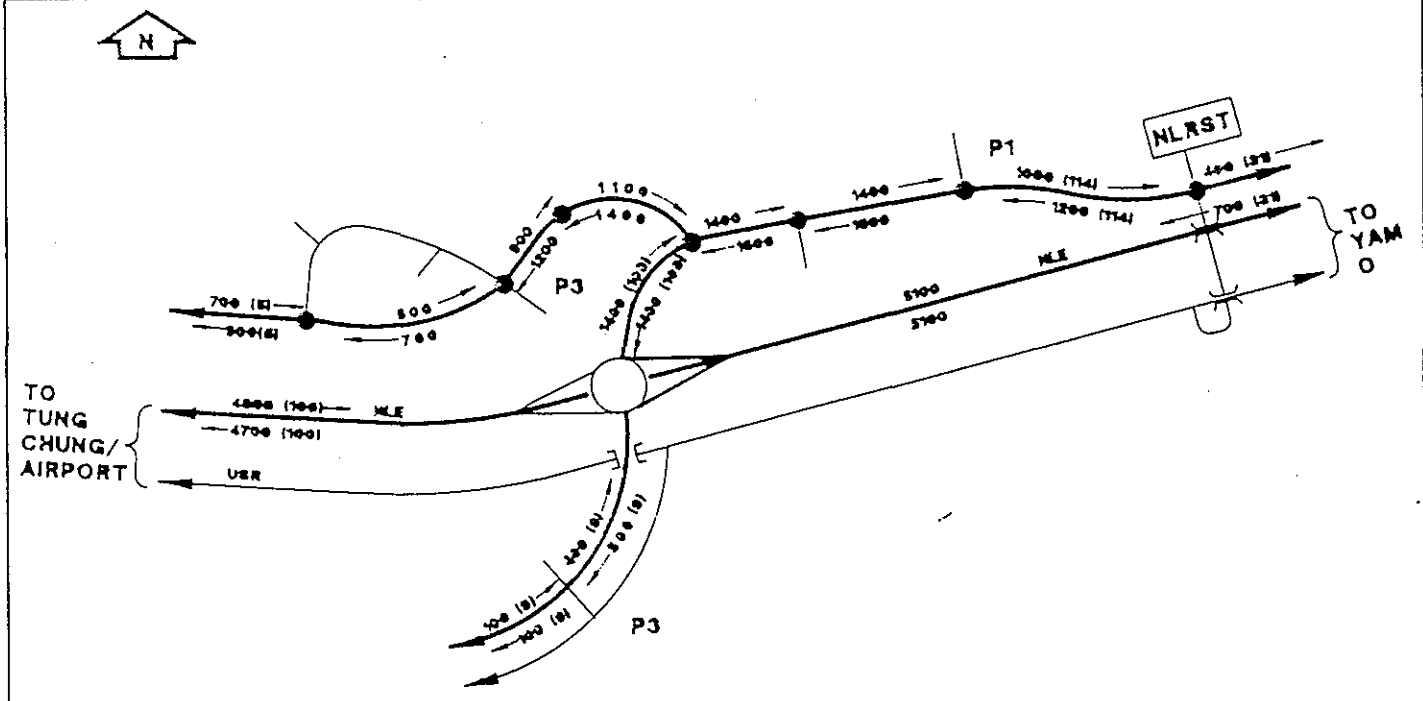
1. ALL FIGURES ARE IN PCU AND ARE REPRESENTING FLOWS CREATED BY ALL TYPE OF VEHICLES INCLUDING THOSE INDUCED BY THE RTS DEVELOPMENT.
2. FIGURES IN BRACKETS REPRESENT FLOWS INDUCED BY THE RTS DEVELOPMENT.

LEGEND

NLE	DENOTES THE NORTH LANTAU EXPRESSWAY
NLRTS	DENOTES NORTH LANTAU REFUSE TRANSFER STATION
P1, P3	DENOTES PRIMARY ROAD
USR	DENOTES ULTILITIES SERVICES ROAD

Predicted am Peak Hour Traffic Flow in 2006
(Scale - NTS)

Figure 5.3



NOTES:

1. ALL FIGURES ARE IN PCU AND ARE REPRESENTING FLOWS CREATED BY ALL TYPE OF VEHICLES INCLUDING THOSE INDUCED BY THE RTS DEVELOPMENT.
2. FIGURES IN BRACKETS REPRESENT FLOWS INDUCED BY THE RTS DEVELOPMENT.

LEGEND

NLE	DENOTES THE NORTH LANTAU EXPRESSWAY
NLRTS	DENOTES NORTH LANTAU REFUSE TRANSFER STATION
P1, P3	DENOTES PRIMARY ROAD
USR	DENOTES ULTILITIES SERVICES ROAD

Predicted am Peak Hour Traffic Flow in 2011
(Scale - NTS)

Figure 5.4

6 WATER QUALITY

6 WATER QUALITY

6.1 Environmental Quality Objectives, Standards and Guidelines

Standards

6.1.1 The principal legislation is the Water Pollution Control Ordinance (WPCO) which makes provision for gazettal of Water Control Zones (WCZs). Water Quality Objectives are declared for each WCZ, based on beneficial uses of the waters of the zone. These in turn form the basis for limits on the quality of any discharges to sewers, drains and surface waters in the WCZ. The most recent amendments to the WPCO, implemented in 1990, are covered in the Technical Memorandum on Effluent Standards. The effluent standards presented in Table 6.1 provide a guide for EPD in setting standards in a license for effluent discharged to a foul sewer.

6.1.2 Under the WPCO the Authority may direct premises to connect to a foul sewer if one is available within 100 m of the premises. A foul sewerage connection is expected to be provided by the time the transfer station is operational.

Guidelines

6.1.3 HKPSG recommends no additional quantitative limit. However, there is one planning guideline which states that in the preparation of Outline Zoning and Outline Development Plans (OZPs and ODPs) adequate provision of suitable land and access for the necessary treatment and disposal facilities should be ensured.

Other Provisions

6.1.4 The transfer station must comply with statutory Building Regulations on drainage design. It must also comply with relevant lease conditions.

6.2 Impacts of Construction

6.2.1 Silty run-off or contaminated process effluent from construction sites can block storm water drains and contaminate surface waters to which they discharge. The WPCO covers all effluent and waste water, with the exception of unpolluted water and domestic sewage discharged to foul sewer. Site run-off is therefore subject to control under the WPCO. If it only contains unpolluted water, it will not be subject to WPCO control.

6.2.2 Storm water run off from the construction site could contain suspended solids at levels potentially higher than normal surface run-off. Consequently, diversion of run-off and other silty waters to silt traps prior to discharge to storm drains is recommended. Furthermore, where opportunities to reuse or recycle process water arise, these should be implemented.

Table 6.1 Standards for Effluents Discharged to Foul Sewer Leading into Government Sewerage Treatment Plants

Flow rate (m^3d^{-1}) / Determinand	≤10	>10 and ≤100	>100 and ≤200	>200 and ≤400	>400 and ≤600	>600 and ≤800	>800 and ≤1000	>1000 and ≤1500	>1500 and ≤2000	>2000 and ≤3000	>3000 and ≤4000	>4000 and ≤5000	>5000 and ≤6000
pH (pH units)	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10
Temperature (°C)	43	43	43	43	43	43	43	43	43	43	43	43	43
Suspended solids	1200	1000	900	800	800	800	800	800	800	800	800	800	800
Settleable solids	100	100	100	100	100	100	100	100	100	100	100	100	100
BOD	1200	1000	900	800	800	800	800	800	800	800	800	800	800
COD	3000	2500	2200	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Oil & Grease	100	100	50	50	50	40	30	20	20	20	20	20	20
Iron	30	25	25	25	15	12.5	10	7.5	5	3.5	2.5	2	1.5
Boron	8	7	6	5	4	3	2.4	1.6	1.2	0.8	0.6	0.5	0.4
Barium	8	7	6	5	4	3	2.4	1.6	1.2	0.8	0.6	0.5	0.4
Mercury	0.2	0.15	0.1	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.2	0.15	0.1	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Copper	4	4	4	3	1.5	1.5	1	1	1	1	1	1	1
Nickel	4	3	3	2	1.5	1	1	0.8	0.7	0.7	0.6	0.6	0.6
Chromium	2	2	2	2	1	0.7	0.6	0.4	0.3	0.2	0.1	0.1	0.1
Zinc	5	5	4	3	1.5	1.5	1	0.8	0.7	0.7	0.6	0.6	0.6
Silver	4	3	3	2	1.5	1.5	1	0.8	0.7	0.7	0.6	0.6	0.6
Other toxic metals individually	2.5	2.2	2	1.5	1	0.7	0.6	0.4	0.3	0.2	0.15	0.12	0.1
Total toxic metals	10	10	8	7	3	2	2	1.6	1.4	1.2	1.2	1.2	1
Cyanide	2	2	2	1	0.7	0.5	0.4	0.27	0.2	0.13	0.1	0.08	0.06
Phenols	1	1	1	1	0.7	0.5	0.4	0.27	0.2	0.13	0.1	0.1	0.1
Sulphide	10	10	10	10	5	5	4	2	2	2	1	1	1
Sulphate	1000	1000	1000	1000	1000	1000	1000	900	800	600	600	600	600
Total nitrogen	200	200	200	200	200	200	200	100	100	100	100	100	100
Total Phosphorus	50	50	50	50	50	50	50	25	25	25	25	25	25
Surfactants (total)	200	150	50	40	30	25	25	25	25	25	25	25	25

All units in mgl^{-1} unless otherwise stated; all figures are upper limits unless otherwise indicated.

6.2.3 Sewage generated from construction workforce is expected. Given the absence of disposal facilities in the area for the duration of the construction period on-site facilities or tankering away by sea are the only options available. The relatively small size of the construction team and short duration of the construction programme make septic tanks and soakaways the only practical site option. Tankering away by sea is an alternative which may need to be considered if a site discharge is unacceptable.

6.3 Impacts of Operation

NLRTS Site

Sources of Waste Water

6.3.1 Waste water will arise from the following four sources:

6.3.2 Group A - This includes liquors draining from RCVs, from waste compaction in the push-pits and the compactors, washdown from the tipping hall and other internal operational areas, and vehicle washwater.

6.3.3 Group B - This includes surface water drainage from potentially contaminated areas (i.e. areas which are not normally exposed to discharges, but which may be subject to occasional spillage or accumulation of deposits which could result in polluted run-off).

6.3.4 Group C - This group consists of surface water drainage from areas not subject to contamination.

6.3.5 Group D - Domestic sewage from site office, staff canteen, toilets etc. is included in this group.

6.3.6 Group A waste water would probably contain contaminants at levels above those permissible for discharge to foul sewer, and would therefore require treatment prior to discharge.

6.3.7 Group B waste water has the potential to be contaminated and may require separation and detection for discharge to foul sewer. It is proposed to intercept the first flush from these areas during storm events and discharge this to sewer. The areas intercepted would be the ramp to the tipping hall and RCV exit route, including the exit side of the vehicle wash. A first flush of five minutes is estimated to result in a volume of 17 m^3 from these areas.

6.3.8 The first flush will include run-off from areas which may be contaminated with spills or accumulated deposits. It is envisaged that a tank would be provided to trap the first flush. This tank should be pumped out to the sewer system at a rate which would not overload the system. The objective is to collect contaminated first flush, which is particularly important after a long, dry period. A subsequent storm event occurring before the tank has been emptied would bypass the interception and drain into the stormwater drainage system, without overloading the sewer.

6.3.9 Group C discharges will be of unpolluted storm water only, and may be discharged directly to storm water drains.

6.3.10 Group D, while consisting of domestic-type waste waters, including washing water from showers, does not arise from residential premises and is therefore subject to the provisions of the WPCO Technical Memorandum. This waste water may not require pre-treatment prior to discharge to foul sewer.

6.3.11 Small quantities of polluted liquids accumulated in the RCV sumps should be discharged at designated points in the tipping hall especially provided for this purpose. Discharge and leakage at any other location should not be permitted by RSD. For the purposes of this assessment this waste water is included in Group A.

Flows

6.3.12 Flows of waste waters in Group A are difficult to predict. They are dependent on the quality of solid waste received, seasonal factors, design of tipping hall and its drainage, design of push-pits and compactors and extent of washing down of working areas. For scoping purposes only a daily flow of about 36 m^3 and a peaking factor of two can be assumed. Almost all will be discharged during the operating hours of the station, with little or no flow during the night.

6.3.13 Approximately 6 m^3 of vehicle wash water will be included in 36 m^3 of Group A waste water. The wash water will be kept in a basin to be re-used and replaced in a batch discharge/replenishment approximately every seven days. Thus, actual daily flow of Group A during most of weekdays can be less than 36 m^3d^{-1}.

6.3.14 Group B and C flows will be dependent on the size of area drained. Group D waste water flows can be estimated from the number of employees on the site and are required for sizing the on-site treatment plant. Typical values for domestic waste water arising from factories are 55 - 90 ld^{-1} per employee. This would be equivalent to a total flow from an assumed 40 employees of 2.2 - 3.6 m^3d^{-1}.

Quality

6.3.15 The quality of Group A waste water is difficult to predict because it is dependent on many factors, including those which affect flow and dilution. The waste water treatment plant is expected to discharge water at a rate greater than 10 m^3d^{-1} and less than 100 m^3d^{-1}. Treated effluent should meet the standards given below in Table 6.2.

Table 6.2 **Standards for Effluent from the NLRTS Discharged to Siu Ho Wan Sewerage Treatment Works**

Parameter	Standard
pH (pH units)	6-10
Temperature	43°C
Suspended solids	1000 mgl^{-1}
Settleable solids	100 mgl^{-1}
BOD	1000 mgl^{-1}
COD	2500 mgl^{-1}
Oil & Grease	100 mgl^{-1}
Iron	25 mgl^{-1}
Boron	7 mgl^{-1}
Barium	7 mgl^{-1}
Mercury	0.15 mgl^{-1}
Cadmium	0.15 mgl^{-1}
Copper	4 mgl^{-1}
Nickel	3 mgl^{-1}
Chromium	2 mgl^{-1}
Zinc	5 mgl^{-1}
Silver	3 mgl^{-1}
Other toxic metals individually	2.2 mgl^{-1}
Total toxic metals	10 mgl^{-1}
Cyanide	2 mgl^{-1}
Phenols	1 mgl^{-1}
Sulphide	10 mgl^{-1}
Sulphate	1000 mgl^{-1}
Total nitrogen	200 mgl^{-1}
Total phosphorus	50 mgl^{-1}
Surfactants (total)	150 mgl^{-1}

6.3.16 The quality of Group B first flush run-off depends upon the occurrence and degree of accidental spillage or accumulation of deposits and is thus difficult to predict.

Treatment Requirements

6.3.17 The uncertainties regarding quality and flow of the Group A contaminated waste water necessitate maximum flexibility of design and operation of the treatment plant. The need to achieve considerable reductions in BOD and oil and grease concentrations suggests that aerobic biological treatment will be required. The treatment system should incorporate a skimming device for the removal of floating oil and grease, balancing facilities to cope with fluctuating hydraulic load and a biological oxidation stage with considerable flexibility in terms of hydraulic and BOD loadings. Such flexibility might be achieved by running two or more units in parallel, for example.

6.3.18 One appropriate process is a sequencing batch reactor, operated in "fill and draw" mode. This is a variant of the activated sludge process in which settlement of the activated sludge is achieved in the aeration tank after the mixed liquid is fully stabilised and the aeration interrupted to provide quiescent conditions. The system is flexible because it is limited by its total volumetric capacity, but not by its design loadings, as in other systems. Hydraulic and organic loadings can vary considerably without affecting the efficiency or stability of the system.

6.3.19 By using aerobic treatment on Group A waste water, effluent quality standards required for discharge to foul sewer could be achieved. The most significant problem is likely to be oil and grease, especially if emulsification takes place. Emulsion breaking should be considered to avoid excessive carry over of oil and grease to the effluent.

6.3.20 Wasted sludges generated from waste water treatment should be dewatered on site and disposed of at the landfill together with the waste from the transfer station.

6.3.21 Pre-treatment of Group B first flush run-off might be required, depending on the degree of contamination. As mentioned in Section 6.3.7, this water may be contaminated with spills or accumulated deposits. Thus, oil interceptors may be required to trap oil contaminants.

WENT Landfill Reception Area

6.3.22 Waste will arrive in sealed containers, be transferred to the tipping face, emptied, resealed, and returned to the reception area for return to the NLRTS. This activity will not allow waste or leachate to be deposited in the reception area, except in the event of a container being ruptured. This reception area should be connected to falls which drain to interceptors.

6.3.23 Waste water generated at the WENT Landfill by operators in the reception area will be collected and transported off-site for treatment. An allowance of 5 m^3 has been made for transfer to the WENT Landfill Treatment Work operated by the WENT Landfill operator.

6.3.24 Vehicles returning from the tipping face will pass through a wheel wash provided by the WENT Landfill operator prior to entry into the reception area.

6.3.25 Any refuelling areas within the reception area should be bunded and provided with oil interceptors, which must be regularly maintained if they are to be efficient in preventing contaminated discharge.

6.4 Areas for Further Assessment

6.4.1 Tenderers should provide designs of silt traps and interceptors for both NLRTS and WENT Landfill marine reception area to ensure, as far as practicable, that surface drainage will be uncontaminated. Provisions for their maintenance and evaluation of their effectiveness, sufficient to ensure compliance with WPCO licence requirements,

should be included in the tender submissions.

6.4.2 Tenderers should provide methods of collecting and discharging sewage generated from the construction site.

6.4.3 Tenderers should make independent assessments of waste water flows and loads for the purposes of waste water treatment plant design. An assessment of the predicted treatment efficiency of the treatment process and its ability to meet effluent standards should be included in the tender submissions.

6.4.4 Tenderers should include a description of the site areas generating Group B waste water and how it is segregated. Methods to deal with spills should be described.

6.4.5 Tenderers should show how the Group B first flush storm water, which could be potentially contaminated, will be collected/diverted to avoid overloading the sewer system. Tankering this storm water, recommended in Section 6.3.8, is only one possible solution. The tenderers can adopt other designs, providing environmental performance requirements are met. If necessary, the tenderers may also be required to demonstrate the arrangement for pre-treatment prior to discharge to the foul sewer.

6.4.6 Tenderers should include details of the designs of washing facilities for body decontamination, such as hot water showers, and lockers to separate work clothes from street clothes.

6.4.7 Tenderers should provide detailed design of a waste water collection system connected to the WENT Landfill Treatment Work. Daily flow should not exceed 5 m^3.

7 VISUAL IMPACTS

7 VISUAL IMPACTS

7.1 Context

7.1.1 The present character of the area is dictated by its present relative inaccessibility. North Lantau offers a unique combination of the mountain peaks and skyline, upland slopes and ridges, stream courses, coastal edges and vegetation. The NLRTS site will be located on new reclamation along the coastal edge. Development along North Lantau will result in the loss of the original, rocky and irregular coastline through reclamation and a new encroaching development of new towns, transport corridors and other uses on the lower sections of the hillsides. Immediately south of the NLRTS reclamation are the slopes of the Lantau hills which rise steeply from sea level to an elevation of 378 metres (Lau Fa Tung).

7.1.2 By the time the NLRTS is operational the shoreline landscape in the immediate area will have changed dramatically with reclamation and construction of road / rail transport corridors and, in addition to the NLRTS, other significant infrastructure facilities including a Water Treatment Works and Sewage Treatment Works to the south west and a rail depot to the west.

7.1.3 During the operating phase of the NLRTS the closest fixed sensitive uses are the proposed residential areas at Tai Ho new town, over 2 km to the west. Users of the NLE and the Airport Railway (AR) would occupy a significant view corridor running from Hong Kong to the new airport. Eastbound users of the Expressway will have views towards the NLRTS as they approach from the west. The views of westbound users towards the NLRTS may be partially shielded by roadway structure.

7.1.4 Other distant viewpoints include development in the New Territories between Tuen Mun and Tai Lam, to the North, overviews from aircraft landing and taking off from Chek Lap Kok and recreational walkers on and within the ridge lines of the Lantau Country Park to the south.

7.1.5 The NLDS recommended generous earth mounding and dense, continuous landscape planting alongside the NLE and AR to screen views of utility developments. The NLDS also recommended bold and generous structure planting between and within individual lots to reduce visual impact and scale of the built form.

7.1.6 The visual envelope will extend from Chek Lap Kok, in the west, across to Tuen Mun and the southern NT up to Tai Lam and then across to the north ridgeline on Lantau. The key viewpoints are indicated in Figure 7.1.

7.1.7 Programmes for the phasing of the works in adjacent areas suggest that initial activities in the immediate area will include construction and commissioning of the NLRTS site, Water Treatment Works and Rail Depot around 1997 with development of other industrial areas between the NLRTS and Tai Ho continuing up to 2011. Tai Ho new town would be constructed during this period.

7.2 Design of the NLRTS and NLRTS site

7.2.1 The general functional requirement of the transfer station building is that it must be a two-storey structure enclosing compactors on the ground floor and a tipping operation on the first floor. The structure will therefore be approximately 16 - 20 m high (i.e. up to 26 mPD), the exact height will depend on a number of factors including physical dimensions of plant and roof design (whether pitched or flat).

7.2.2 In addition to the NLRTS building the site also includes a parking and waiting area, container stacking area, vehicle wash facility, sewage treatment facility and administration building as described in Section 3.1.1. There will be day time vehicle movements of RCVs to and from the site, internal movement of containers between stacking area and barge berth by fork lift trucks and loading and unloading of barges. The compound will operate security/safety lighting at night.

7.2.3 The proposed stacking height is approximately fourteen meters. A container handling unit can stack upto five full containers or nine empty containers. It is estimated that 200 containers will be in the NLRTS under normal conditions. In emergency situations when it is not possible to send containers to WENT, there may be additional containers in the compound.

7.2.4 The detailed design of the transfer station building will be provided by the successful tenderer. The Tender Documents for other RTS in the Territory have specified a building of "clean" appearance, with smooth external lines and a "high-tech" character. Architectural features of the building are normally determined more by functional requirements than by purely aesthetic considerations.

7.2.5 The existing RTS in Hong Kong are sited in predominantly industrial areas where this style of building is deemed to be appropriate. The NLRTS is currently under the Government Reservation 'G' zone, and will ultimately be sited in a similar industrial zone within an area of high landscape value. Adjacent activities include a Water Treatment Works, Sewage Treatment Works and other light industrial and storage areas. The site is also adjacent to the North Lantau Transport Corridor, which includes NLE and AR.

7.2.6 Working Paper 2 of this study illustrated a number of completed RTS designs incorporating a high standard of architectural finish. This may be appropriate for NLRTS though the cumulative visual impact of the variety of industrial uses in the area needs to be addressed to ensure that a cluttered mix of styles does not evolve. This assessment assumes that a conventional, modern industrial building will be proposed by tenderers.

7.2.7 Firm requirements for a colour scheme will not be made in this report, since a degree of flexibility may be required to accommodate tenderers' corporate image requirements. However, guidance on the choice of colours and vehicle livery will be included in the Tender Documents. Colours should be of medium to dark tone, muted and should blend with the hillside or water backdrops. Very light or very bright colours are unlikely to be acceptable. The dedicated containers used for transfer between the NLRTS and WENT Landfill should be of a standard colour scheme complementing the RTS. The use of a variety of colours for containers would dramatically increase their visual impact and should not be encouraged.

7.2.8 The site's boundary with a wall of approximately 2 - 2.5 m height has been rigidly defined by the shape of the reclamation, transport corridors and other uses. Most of the site will be used for the NLRTS building, waiting areas, stacking areas and support facilities. A 6 metre wide landscaped area will be provided on the SW boundary to screen SR to the west, at other boundaries only a narrow strip of land is available which will allow minimal landscape treatment. This precludes the use of landscaping bunds, which require a significant "footprint" if they are to screen visual impact of the NLRTS while not appearing "artificial". Without screening bunds the NLRTS, and its backup areas, will have to provide their own visual impact mitigation by blending with their surroundings and by sympathetic arrangement of the site and style of building and planting programmes.

7.3 Methodology

7.3.1 The assessment is broken down into the impact on SRs within Visual Zones. A number of zones have been identified:

- **Zone 1** - intermediate views from future residents of the Lantau New Town at Tai Ho
- **Zone 2** - mobile receivers on the North Lantau Transport Corridor, including vehicles on the north Lantau Expressway and trains on AR
- **Zone 3** - elevated viewpoints of travellers arriving or departing by air
- **Zone 4** - Distant long views from population centres in the NT between Tuen Mun and Tai Lam
- **Zone 5** - Intermediate elevated views from the Lantau Country Park
- **Zone 6** - Distant long views from uplands in the NT.

7.3.2 Visual sensitivity is the degree to which new elements in the landscape alter the essential character of the North Lantau Development Area. Visual impact analysis for this assessment is defined as the effect that the NLRTS has on a particular visual zone. If the view is significantly altered the impact is defined as detrimental. If the view is partially altered the impact is deemed to be reduced.

7.4 Impact Assessment

NLRTS Site

7.4.1 In this section the significance of visual impact will be assessed for each zone. If significant impact is anticipated mitigation will be identified to reduce this impact. The assessment assumes all adjacent areas are fully developed. Where there could be significant impact in an intermediate phase, this is noted in the text.

7.4.2 **Zone 1** - The new commercial residential complex identified on the north side of the North Lantau Transport Corridor is identified as a sensitive use susceptible to visual impact from the NLRTS. At this point the sensitive uses are over 2.4 km from the NLRTS site. The area between the SR and the NLRTS is scheduled for business park/industrial estate development which should be fully developed by the time SRs occupy the blocks. A rail depot will be situated between Tai Ho and the NLRTS and a transport corridor lies to the south. To minimise noise impact the buildings may be orientated to face north and west with no view towards the NLRTS. However to assess a possible worst case this assessment assumes there will be views to the east.

7.4.3 It is believed that distance and the character that will have evolved in the intervening area will minimise visual impact of the NLRTS. When rated against the assessment criteria the NLRTS will not significantly alter the view and impact is therefore minimised. At this distance height, shape and colour of the station will be of minimal significance.

7.4.4 **Zone 2** - This represents the mobile receivers in vehicles travelling on NLE and AR. The rail depot, to the west, and the NLRTS will be the only development north of the Transport Corridor during the early stages of Lantau Development. Over the intervening years other commercial/industrial developments will be established on new reclamation areas between NLRTS and Tai Ho. The NLDS recommended that edge and median strip planting to shield utility areas from NLE and AR. Highways Department is currently considering the landscaping of the NLE.

7.4.5 Impact experienced by passengers in railcars will be limited to a fleeting view at a point close to the NLRTS. However, the NLRTS will block the view at this point. This impact will be more significant in the early stages of North Lantau Development when the NLRTS will be one of the few developments north of the Transport Corridor and planting programmes will not be established. Impact will be reduced as the area between Tai Ho and the NLRTS is developed.

7.4.6 For road travellers the impact is potentially more severe since all receivers are likely to be looking towards the NLRTS at some point in their journey. The most severe impacts will be experienced during the early stages of development of North Lantau. During this period the NLRTS will be an isolated development to the north of the Expressway. Eastbound traffic will have views to the NT partially obscured for a distance of 1 km between the rail depot and NLRTS. Roadway edge structures, walls and barriers may remove these low level views though the container stacks and NLRTS structure are likely to be visible. Similar impact is likely for westbound traffic though the central barriers and will reduce the impact. The impact will reduce as the areas to the east and west are reclaimed and developed for commercial/industrial activity.

7.4.7 There is little opportunity to mitigate this impact since there is no space available for screening bunds. Tree planting may encourage birds to roost and will replace walls of container stacks with an obvious "wall" of trees. The best mitigation for the NLRTS building is through good design. The container stacks are more problematic and it may be appropriate to limit container stack heights to reduce the wall effect. Basic requirements that all containers should be of a similar style and muted colour should be identified in contract documentation. The planting programmes for median strips and edge strips of transport corridors identified in the NLDS will go some way to reducing any visual impact.

7.4.8 **Zone 3** - This zone has been included to account for passengers in commercial aircraft arriving and departing from the airport. The elevated, distant, viewpoint and the fact that Aircraft are not designed to offer views to significant numbers of passengers suggests minimal impact.

7.4.9 **Zone 4** - Viewpoints in the NT will be over 5 km from the NLRTS. At this distance the structure will begin to blend with the backdrop and significant impact is not anticipated.

7.4.10 **Zone 5** - Hill walkers within the ridgeline which runs from Tai Chi Tung and Lau Fa Tung, between Siu Ho Wan and Discovery Bay are closest to the site and therefore most susceptible to impact. At this point receivers will be approximately 1.5 Km from the NLRTS site. The elevation, distance and industrial character of the surrounding area will not result in significant impact.

7.4.11 **Zone 6** - Similar to the zone 4 assessment. The limited number of SR, increased distance and the elevated viewpoint will further reduce impact.

7.4.12 At night the site compound will be illuminated by safety and security lighting. The effects of glare from the illumination system could give rise to impact on sensitive uses to the west and on NLE. The distance, in excess of 2 km, between SRs and source will adequately mitigate impact and sites closer to the SR will have a more detrimental effect. To avoid impact on NLE, which runs in an east - west direction, it is proposed that lighting towers are aimed in a south - north direction to minimise direct glare. In all cases lighting should be directed into the site and be of the minimum intensity required for safety. The tenderers should carry out a glare assessment for the proposed station layout. Glare ratings in excess of 30 are classed as "noticeable". Highways Department consider that glare ratings in excess of 34 are unacceptable.

NLRTS WENT Reception Area

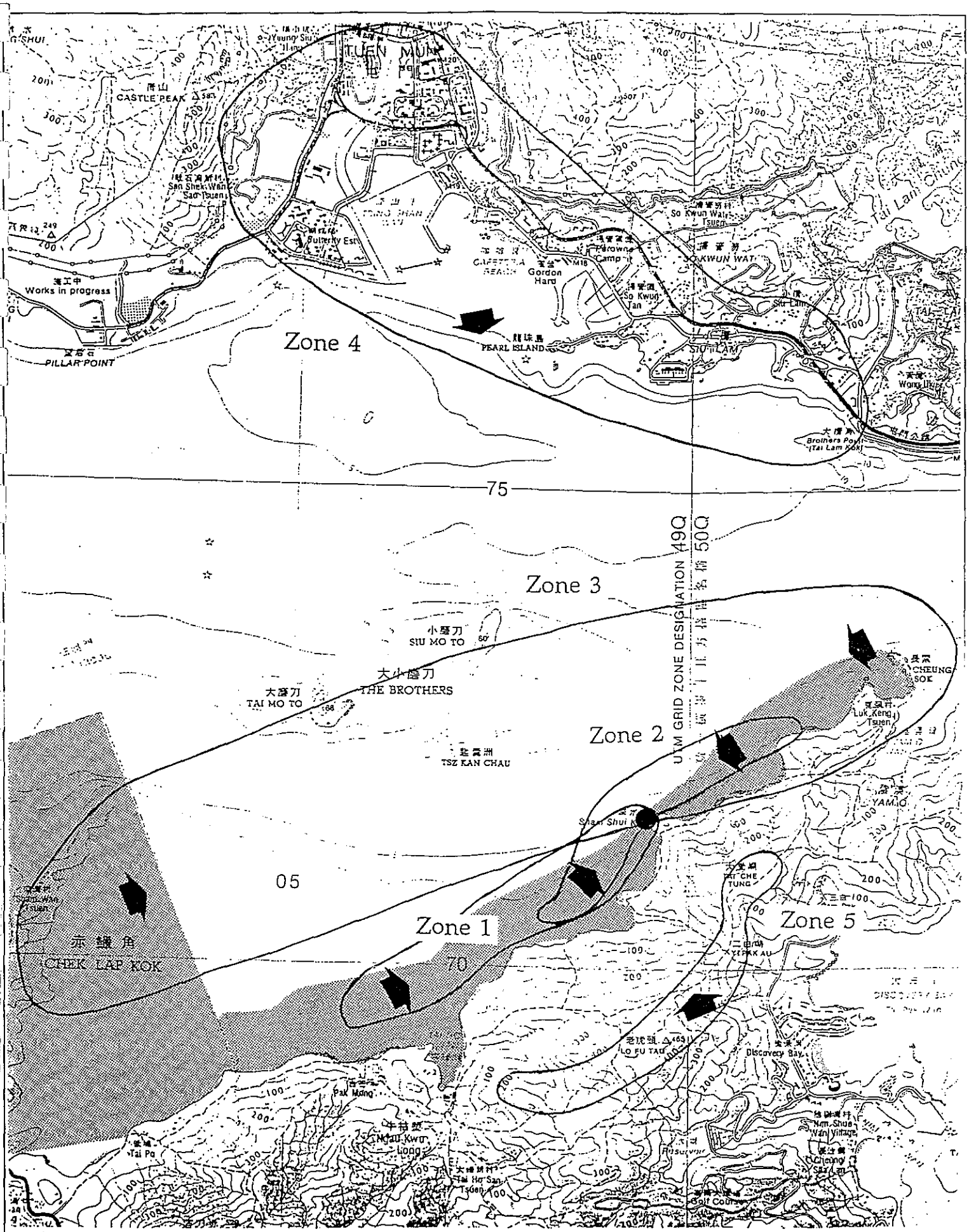
7.4.13 The NLRTS WENT reception area will include a barge berthing area, temporary container stacking and hardstanding, for container transfer and overnight parking of transfer vehicles. Evening work is anticipated and this will require illumination of the reception area. This WENT reception area also includes reception facilities for other RTS operating in the Territory, a sewage treatment works and landfill support activities. The closest sensitive uses are village houses approximately 350 metres from the site (Figure 2.6 shows the site layout and SR). The activities in the NLRTS reception area have potential to visually impact on the SR to the east but the opportunity for individual operators to minimise impact is small and an overall approach to mitigation of visual impact is more appropriate. A suitable mitigation would be screening bunds and landscaping between SR and landfill activities. These bunds would also provide noise attenuation. Minimising stacking heights to keep below the level of screening bunds may be appropriate. Glare impact should, similarly, be treated as a cumulative impact with appropriate mitigation. Individual sites, including the NLRTS reception area should use minimum illumination for safe operation and direct lighting towers into their own site and away from SR.

7.5 Areas for Further Assessment

7.5.1 Tenderers will be required to submit details of architectural features and colour schemes for the NLRTS building and details of landscaping and planting, mechanical plant and container types and colours.

7.5.2 A visual impact assessment of the site for vehicles passing to and from the airport, particularly for the early stages of development, should be carried out. In particular, the visual impact of container stacks should be assessed.

7.5.3 A glare assessment for the proposed safety/security lighting set up should be carried out. The tenderers should be made aware that Highways Department will need to be satisfied that lighting arrangements will not produce excessive impact on NLE.



Visual Zones
(Scale - 1: 50,000)

Figure 7.1

8 BIRD, RODENT AND INSECT CONTROL

8 BIRD, RODENT AND INSECT CONTROL

8.1 Bird Control

8.1.1 Bird nesting can be discouraged through building design. At the Kowloon Bay and Island East transfer stations, smooth rounded corners on the buildings, corrugated roofing and rainwater guttering protected with 45° inclined plates have been incorporated into the design. It is recommended that these features also be adopted at North Lantau for all site buildings. In addition, ventilation inlets and outlets should be covered with 20 mm diameter mesh to prevent access. It will not be possible to cover or enclose the main RCV entrance, but birds are unlikely to fly into the tipping hall.

8.1.2 A negative pressure ventilation system with odour scrubbing will also ensure that birds are not attracted by odours.

8.1.3 The above measures are designed to prevent birds from entering the operational areas of the facility, thereby causing nuisance. Avoidance of general attraction of birds to the external areas of the site is critical given the proximity to the flight path of the new airport at Chek Lap Kok where a potential bird strike problem may be located. The extensive use of trees in landscaping the site or the buffer space is unlikely to be appropriate.

8.1.4 Operational procedures that should be adopted to prevent excessive bird attraction to potentially nuisance levels include:

- Prevention of refuse accumulation in accessible areas
- Maintenance of a clean, odour-free site
- Regular cleaning of all vehicles to ensure that no refuse or refuse liquors adheres to vehicle bodies
- Rapid clean-up and washing of any refuse spillage
- Exclusion of rodent populations
- Exclusion of birds from the transfer station building;
- Regular inspection of the transfer station building for nests.

8.2 Rodent Control

8.2.1 At the KBTS, it has been found that rodents enter the site in the RCVs. It does not appear that they have been attracted by the refuse held on the site. Therefore, although the building should be designed to be rodent-proof as far as possible, poisonous baits and traps will be required. Design features to be incorporated include sealing around

pipes, and use of 20 mm diameter mesh on vents. Regular inspection of the building and removal of rodent carcasses will be a specific operational requirement.

8.2.2 Operational procedures listed in Section 8.1 for bird control will also reduce rodent attraction to the site.

8.3 Insect Control

8.3.1 Given the operational nature of the transfer station, with rapid throughput and no exposure of refuse, other than in the push-pits, insect nuisance is not considered to represent a large problem. Nevertheless, a programme of site spraying to eliminate cockroaches will be required. The details of such a programme would have to be considered at the detailed design stage. The design of the site and the intended cleansing operations should not give rise to standing pools of water which could attract mosquitos. Regular inspection of the building for insect nests should be undertaken.

9 ENVIRONMENTAL PERFORMANCE, MONITORING AND AUDIT

9 ENVIRONMENTAL PERFORMANCE, MONITORING AND AUDIT

9.1 General

9.1.1 Environmental monitoring for air, noise and water will be required. The monitoring will primarily consist of baseline and compliance. Detailed requirements for each set of parameter are discussed below. Table 9.1 provides a summary of these requirements in terms of parameters, locations, time, frequency and durations.

9.2 Baseline Monitoring

Requirements

9.2.1 Baseline monitoring of environmental quality is generally required for two reasons:

- To establish a background against which the magnitude of predicted impacts can be assessed
- To establish a basis for fixing quality objectives where these are determined by or calculated in reference to background conditions.

In order to be useful for these purposes the monitoring must be done at an early stage in the assessment process.

Baseline Dust Monitoring

9.2.2 Baseline monitoring should be undertaken on completion of site formation and after handover of the site to the successful tenderer as the site formation will not be part of NLRTS contract. The monitoring should be carried out daily for two weeks prior to the commencement of construction within site boundary.

Baseline Noise Monitoring

9.2.3 Baseline noise monitoring at the nearest SR with line of sight to the transfer station will be required for the purposes of confirming the planning guideline noise level for operational impacts (i.e. 5 dB(A) below the ANL, or background noise level). This monitoring needs to be undertaken on one day only, and should be done when no construction work is in progress, but before the site becomes operational.

9.3 Compliance - Construction Impact Monitoring

Construction Dust

9.3.1 TSP and RSP should be monitored during construction at the downwind site boundary, and possibly at the upwind site boundary on weekly basis, as shown in Table 9.1.

Monitoring frequency and duration may change subject to approval by EPD after review of monitoring data. The requirement for monitoring of dust during construction should be formulated with regard to the predicted impacts of construction on dust levels and activities in adjacent areas.

Construction Noise

9.3.2 Monitoring of construction noise at the facades of the nearest SR at NLRTS is not recommended because they are located at considerable distances from the site, and the noise environment will be dominated by construction and operation of the NLE. Determining the contribution of the transfer station site to the noise environment will be problematic, and if monitoring is deemed to be necessary, it will need to be coordinated. An arrangement similar to that presently conducted on the West Kowloon Reclamation may be appropriate. Here, data is collected by consultants who formally relay information on exceedence to EPD. EPD can then inform the relevant Government Department, in this case TDD, who will contact the Engineer who will take action with the Contractor.

9.3.3 Monitoring of construction noise at the nearest SR at the WENT reception area is similarly problematic due to the presence of different contractors, and an environment which will be dominated by WENT landfill activities. Any monitoring would need to be coordinated by an overseeing body.

9.3.4 The above recommendation does not free the successful tenderer from any obligations or legal requirements under the NCO in respect of works undertaken during the evening, at night, and on Public Holidays.

9.4 Compliance - Operational Impact Monitoring

Operational Air Quality

9.4.1 Monitoring for all parameters with specified limits will be required, with regard to the potential magnitude of anticipated impacts. The parameters to be monitored during operation are TSP and RSP, odour, NO_2 and CO. Locations and frequencies are shown in Table 9.1.

Operational Noise

9.4.2 In view of the distance to NSRs and the general noise environment in the area which will be dominated by noise from the NLE, noise measurements at NSRs will be of limited use. Operational noise monitoring should be conducted primarily with a view to determining sound pressure levels at, or near to, sources and at the site boundary, with occasional measurements at sensitive facades for confirmatory purposes. Details of proposed monitoring are included in Table 9.1.

9.4.3 A similar noise monitoring programme should be conducted at the WENT reception area.

9.4.4 The above recommendation does not free the successful tenderer from obligations under any legal requirements of the NCO in respect of operational noise impacts.

Water Quality

9.4.5 All discharges from the site will require monitoring in order to check compliance with the provisions of the WPCO. Monitoring requirements are shown in Table 9.1 and discussed in section 6.

9.5 Audit Requirements

9.5.1 The purpose of an environmental audit is to:

- Establish the degree of compliance of the facility with statutory limits and guidelines for environmental quality objectives
- Review changes in measured parameters since commissioning of the operation to detect deterioration in performance or to record improvements
- Examine management practice and its efficacy in achieving environmental protection
- Recommend improvements to the system and its operation in the event that performance is unsatisfactory.

9.5.2 The first audit shall be carried out at commissioning. Data obtained from the environmental performance tests shall form part of the audit. The second audit shall take place six months after the first one. Subsequent audit frequency for this facility should be determined based on findings of the first two audits. Certain elements of the audit may require repetition in future years (e.g. those related to plant wear and tear), whereas other elements may not require repetition if their impacts are found to be insignificant.

9.5.3 The audit should be carried out by an independent team approved by the contractor and Government. An appropriate arrangement for the commissioning and management of an independent consultant to undertake the audit would be similar to that used for the appointment of consultants to undertake EIAs of previous transfer station projects in Hong Kong. The Contractor would be responsible for employing the consultant and for related contractual issues, but the work would be undertaken in accordance with Terms of Reference agreed by Government and reports considered and approved by a Government Working or Steering Group chaired by DEP's representative. The Contractor's management, operations and maintenance staff will, however, be expected to provide input to the audit process and this requirement should be written into their job descriptions.

9.5.4 The framework for the audit is relatively straightforward in this case. In the case of all measured parameters it will take the form of a review of monitoring data, using the environmental performance requirements as a basis for assessment. The regulatory

review should provide an update on all statutory, planning and advisory limits and their impact on operations. The review of management practice would depend in part on the management structures proposed.

9.5.5 Reports should contain indications of rates of compliance, recommendations for mitigation measures, summary and interpretation of monitoring data, and results of any additional monitoring undertaken by the audit team.

9.6 Environmental Performance Requirements

9.6.1 The performance requirements specified in this section will be included in the Tender Documents. They are derived from statutory limits and planning guidelines, occupational health criteria and derived limits based on the assessments included in this IEIA. Compliance with these limits should ensure no adverse environmental impacts of construction or operation of the facility. The limits are summarised in Table 9.2

Table 9.1 Environmental Monitoring Requirements at the NLRTS Site

Monitoring Requirement	Parameter	Location	Period	Monitoring Frequency[a]	Notes
Air	TSP & RSP	On NLRTS site	Baseline - prior to the commencement of construction work	Daily x 2 weeks	Should be carried out after site formation
		Downwind site boundary (at least); possibly upwind site boundary	Compliance - construction phase	Once every 6 days	-
		Inside tipping hall, next to wall opposite push-pit Downwind site boundary	Compliance - operational phase	Once every 6 days	-
	NO_2 & CO	Inside tipping hall	Compliance - operational phase	Weekly	-
	Odour: * patrol * panel	Patrol of entire site boundary At identified position	Compliance - operational phase	Daily Once each time upon detection of refuse-derived odour by patrol	-
Noise	L_{eq} 30 min	Nearest SRs	Baseline - prior to commencement of operation	Once	Undertaken when no construction work in progress, but before the site becomes operational
	L_{eq} 5 min	Nearest SRs	Compliance - Construction	-	No formal monitoring recommended
	L_{eq} 30 min	Nearest SR At site boundary	Compliance - operational phase	Once prior to operation to confirm planning ANL. Then monthly for 3 months Monthly	Apply to both NLRTS and WENT Landfill reception sites
Water	Effluent (Group A water)	Point of discharge	Compliance - operational phase	To be determined by the Authority in granting licence to discharge under WPCO	-
	Storm Water (Group B and C waters)	Point of discharge	Compliance - operational phase	When discharged (maximum biweekly for first 3 months of operation)	Uncontaminated storm water does not require monitoring or licensing under WPCO. Monitoring recommended only for confirmation of quality

a *Unless specified, otherwise compliance monitoring frequencies during operational phase listed in the table will only apply for the first year of operation, and should be subject to changes as recommended by the environmental audit*

Table 9.2 Summary of Environmental Performance Requirements at the NLRTS Site

Monitoring Requirement	Period	Parameter	Location	Limit	Notes
Air	Construction phase	TSP	Site boundary	0.5 mgm^{-3} (1h av.)	Limit applied to construction sites
		TSP RSP		0.26 mgm^{-3} (24h av.) 0.18 mgm^{-3} (24h av.)	Ambient AQO. Tenderers required to show adequacy of dust control
	Operational phase	TSP RSP	Site boundary	0.26 mgm^{-3} (24h av.) 0.18 mgm^{-3} (24h av.)	Ambient AQO. Tenderers required to show adequacy of dust control
		TSP	Tipping hall	1 mgm^{-3} (24h av.)	Adopted by Island East RTS
		NO_2 CO		5.0 mgm^{-3} (8h av.) 55 mgm^{-3} (8h av.)	Occupational health objectives
		Odour	Entire site boundary	2 odour units (100% compliance requirement)	Odour has nuisance value at exposure durations of down to a few seconds. No detectable odour due to refuse at site boundary is an acceptable alternative target performance. Tenderers to demonstrate adequacy of odour control unit
Noise	Operational phase	L_{eq} 30 min	Nearest SR Site boundary	60[a] dB(A) day and evening 45[a] dB(A) night 90 dB(A) day and evening 70 dB(A) night	Limits only apply to NLRTS site. ANLs for NLRTS WENT reception area to be determined after findings of the on-going Supplementary EIA by the WENT Landfill contractor
Water	Operational phase	Effluent quality	Point of discharge	Limits as shown in Table 6.2	Parameters and frequency to be determined by the Licensing Authority
		Stormwater BOD_5, COD, grease and oil	Point of discharge		Parameters to be confirmed with EPD

a *Taking HKPSG into consideration*

10 CONCLUSIONS AND RECOMMENDATIONS

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

10.1.1 The IEIA has considered all potential impacts of the transfer station and has provided sufficient quantitative assessment of these to determine their significance in relation to adjacent land uses and SRs. Where appropriate, mitigation measures and monitoring requirements have been recommended. A summary of the impact assessment including recommended mitigation measures and further work is given in Table 10.1.

10.1.2 While the transfer station has the potential to cause adverse air quality impacts such as dust and odour, it is considered sufficiently remote from SRs that these can be adequately mitigated by good engineering practice and in the design of the facility such as ventilation and odour scrubbing systems. Adherence to design and performance requirements will ensure adequate mitigation.

10.1.3 Operational and construction noise assessments have concluded that no adverse impacts are likely at SRs at the NLRTS site.

10.1.4 Noise mitigation measures should be adopted if evening container unloading operation is required at the WENT Landfill marine reception area. No night time work should be carried out. Mitigation for day time operation may also have to be adopted, subject to the recommendations of the on-going Supplementary EIA carried out by the WENT Landfill contractor.

10.1.5 Traffic impact in terms of noise and air pollution would not cause significant effects on the SRs due to small numbers of RCV movements in comparison with local high traffic flows. These receivers would be more directly affected by the traffic, railway and aircraft noises.

10.1.6 The pre-treated waste water will be discharged via public sewer to the Siu Ho Wan Sewage Treatment Works. Compliance with the stringent requirements of the WPCO will ensure no adverse water quality impacts. Compliance is the responsibility of the station operator.

10.1.7 Reasonable attention to architectural design will ensure that the transfer station blends with its surroundings and is not excessively visually intrusive. The site is bounded by NLE and is within an area zoned for industrial use. A transfer station is not out of context with adjacent land uses, therefore.

10.1.8 Bird, insect and rodent controls should be included in the transfer station design. These issues will be addressed at preliminary and detailed design stages.

10.1.9 A programme of monitoring designed to check compliance with performance requirements and to assess the magnitude of environmental impacts has been recommended.

10.1.10 All requirements identified as necessary for environmental protection are to be incorporated into the Tender Documents for this project. The tenderers should be asked to indicate in their tenders the means they propose for compliance with these requirements.

10.2 Recommendations

10.2.1 It is recommended that tenderers be required to indicate the means by which compliance with specific environmental performance limits is to be achieved. Subject to approval of the tender submissions in this respect no further or subsequent quantitative assessment of impacts will be necessary.

10.2.2 It is recommended that no formal detailed environmental impact assessment be carried out. The acceptability of the outline design and the intended operational mode will be reviewed in depth at tender stage and a report will be produced on this. This would in any case be required prior to award of contract and commencement of design and construction and represents approval, in principle, of the contractor's proposals.

10.2.3 In the absence of any formal assessment by or on behalf of the contractor it is recommended that the environmental performance testing upon commissioning and subsequent environmental auditing be undertaken by an independent consultant or appropriate agency. Several possible arrangements for the appointment of a consultant exist; employment of the consultant by the contractor to work to Government-approved Terms of Reference and Reporting to a Government Working Group would be acceptable. The environmental performance testing data themselves should be subject to and form part of an audit conducted shortly after commissioning. Second audit should be undertaken 6 months after the first one and audits thereafter based on the recommendations of the first two audits.

Table 10.1 Summary of Environmental Impacts

Parameter		Sensitive Receiver	Potential Impact	Mitigation	Assessment	Further Work
Air	Construction Phase	Future residential areas in the New Town located in Tai Ho Wan, some 2.4 km west from NLRTS	Dust impact from general construction activity	Good site practise: * Damping down, coverage, speed controls, wheel/vehicle body wash and paving etc.	Acceptable impact if good site practise adopted	None
	Operational Phase	As above Future industrial area	Odour impact within tipping hall Odour emitted from container storage area	Installation of ventilation and air filter/scrubbing systems Waste should not be stored more than 3 days at RTS site	Acceptable if appropriate ventilation and air scrubbing/filter systems are incorporated, and good site practise adopted	Evaluation of the efficacy of the proposed ventilation and scrubbing systems
			Dust impact within tipping hall Dust impact outside transfer building	Installation of a dual ventilation system Good site practise: * Using misting spray within the tipping hall * Regular cleaning of the site outside	Acceptable if appropriate ventilation is incorporated, and good site practise adopted	Evaluation of the efficacy of the tenderers' proposed ventilation system
		On-site staff	Particulate emissions (NO_2 & CO) from RCVs within the tipping hall	Installation of ventilation system	Acceptable if appropriate ventilation system designed and adopted	Evaluation of the efficacy of the tenderers' proposed ventilation system
		SRs along RCVs routes	No significant particulate emissions from RCVs	None	None	None
Noise	Construction Phase	<u>NLRTS Site</u> Future residential areas in the New Town located in Tai Ho Wan, some 2.4 km west from NLRTS <u>Marine Reception Area at the WENT Landfill</u> Residents in Ha Pak Nai and Pak Nai, some 400 m from the noise sources	General construction activities. Predicted noise level of 50 dB(A) at NSRs within day time and evening limits of 75 and 60 dB(A) respectively. But over night time limit of 45 dB(A) Predicted noise level of 62 dB(A) within the respective day time and evening limits of 75 dB(A) and 65 dB(A), but over night time limit of 50 dB(A)	Good site practise: * Silenced equipment * Reduce numbers of plant in use at one time * Careful scheduling of construction programme Good site practise: as above	No significant impact anticipated due to absence of NSRs in the vicinity. Good work practise required when necessary Noise mitigation required if night time take place	Evaluation of efficacy of tenderers' proposed method of working Evaluation of efficacy of tenderers' proposed method of working and mitigation measures

Table 10.1 Summary of Environmental Impacts (Cont'd)

Parameter		Sensitive Receiver	Potential Impact	Mitigation	Assessment	Further Work
	Operational Phase	NLRTS Site As above	No significant impact. Predicted operational noise level of 46 dB(A) at NSRs within the HKPSG day time criteria of 60 dB(A). Noise levels of 34-40 dB(A) from RCV movements on site acceptable	Noise levels at site boundary should be controlled with 90 dB(A) during day time and evening operation, and 70 dB(A) at night	No significant impact anticipated due to absence of NSRs in close proximity	Evaluation of adequacy of tenderers' mitigation proposals
		WENT Landfill Marine Reception Site As above	Predicted noise level of 65 dB(A) just comply with day time ANL limit of 65 dB(A)	During day time operation, mitigation measures may be required. During evening operation, container trucks should not be used after 1900 hours and equipment should be restricted to container handling units only. No night time work should be undertaken	Noise impact is controllable if mitigation measures adopted	Evaluation of adequacy of tenderers' mitigation proposals
		Residents along NLE, USR at Tai Ho and Yam O areas	Road traffic noise from RCVs	None	No impact anticipated due to small number of RCVs' movements	None
Water	Construction Phase	-	General construction site run-off	Good site practise: * Silt traps * Reuse/recycle process water where appropriate	No significant impact anticipated if good site practise adopted	None
			Sewage generated from construction site	Septic tank, soakaways or tankering away by sea		Evaluation of tenderers' design of temporary sewage collection and disposal methods
	Operational Phase	-	Drainage from RCV, waste compaction, and washdown from the tipping hall	Pre-treatment required prior to discharged via a public sewer to Siu Ho Wan Sewage Treatment Works	An acceptable effluent discharge anticipated	Assessment of efficiency of tenderers' proposed waste water treatment facilities
		-	Contaminated drainage from area subject to occasional spillage or accumulation of deposits	Intercept the first flush from these areas during storm events and discharge it to sewer. On-site pre-treatment might be required	No impact anticipated if mitigation adopted	Evaluation efficiency of tenderers' designs of contaminated water segregation system
		-	Group C - uncontaminated surface water drainage	None. Can discharge to storm water drain directly	An acceptable storm water discharge anticipated	None
		-	Group D - domestic sewage from site office, staff canteen or toilet etc	None. Can discharge to a foul sewer directly	An acceptable effluent discharge anticipated	None

Table 10.1 Summary of Environmental Impacts (Cont'd)

Parameter	Sensitive Receiver	Potential Impact	Mitigation	Assessment	Further Work
Visual Impact	Residential area at Tai Ho New Town, some 2.4 km from the site	Moderate impact	Receptors may not face the RTS. At this distance, over 2.4 km, and the intermediate views of rail depot and industrial activity impact minimal. Barriers alongside NLE and will screen impact	No significant impact anticipated	Tenderers are required to submit details of architectural features and colour schemes for the NLRTS building, details of landscaping and planting, mechanical plant and container types and colours
	Receptors on NLE	More significant impact expected in the early stages of North Lantau Development, due to the isolated NLRTS to the north of NLE	Sympathetic compound design and building finishes and colour scheme. Limit stacking heights of containers. Screen planting along NLE and AR will reduce impact	No significant impact anticipated	Visual impact assessment should be carried out
Glare	Residential area at Tai Ho New Town		Distance attenuation and intervening activity will minimise impact	No significant impact anticipated	Glare assessment in tenderers' proposal
	Receptors on NLE		Lighting directed into compound, minimum illumination to achieve safety/security requirements. Direct lights on south-north rather than west-east or east-west axis	Acceptable impact if good design adopted	
Bird, Rodent & Insect Control			<u>Bird Control</u> * Good building design * Negative pressure ventilation system with odour scrubbing * Cover ventilation inlets and outlets * Good site practise: maintenance of a clean, odour-free site, prevention of refuse accumulation, clean vehicle and refuse spillage and excluding birds from RTS building <u>Rodent Control</u> * Good building design along the pipes * Good site practise as for bird control <u>Insect Control</u> * Site spraying	No significant impact anticipated if good site practise and building design adopted	Programme for site spraying to be included in tenderers' proposal.

APPENDIX 1

TERMS OF REFERENCE

1 INTRODUCTION

1.1 Potential environmental issues related to this development have been addressed in the Initial Environmental Impact Assessment (IEIA) Report concerning matters such as air quality, noise, water quality, visual impact, as well as bird, rodent and insect control. It has been concluded that all predicted environmental impacts can either be considered negligible or can be mitigated to acceptable levels, based upon the outline design. Therefore, the IEIA has recommended that no formal detailed environmental impact assessment be undertaken. However, the following key environmental issues will require further assessment/investigation at a later stage to ensure environmental compliance.

2 KEY ISSUES

2.1 Air Quality

2.1.1 Dust is not envisaged to cause significant environmental problems. However, dust suppression measures should be incorporated into tenderers' submission to control dust emissions, and prevent significant deposition causing adverse visual impact.

2.1.2 Tenderers should ensure good design of ventilation and scrubbing systems, to maintain internal air quality requirements for transfer station, and prevent external emissions of pollutants. They should demonstrate efficiency of air exchange rate within the transfer station building to ensure that compliance of air quality requirements for CO, NO_2, and TSP are met. The required performance standards within tipping hall would be:

TSP	-	1 mgm^{-3} (24h av.)
NO_2	-	5 mgm^{-3} (8h av.)
CO	-	55 mgm^{-3} (8h av.)

2.1.3 Tenderers should explain means/measures to meet the following air quality requirements at the NLRTS site boundary:

odour	-	2 odour unit
TSP	-	0.26 mgm^{-3} (24h av.)
RSP	-	0.18 mgm^{-3} (24h av.)

2.2 Noise

2.2.1 If construction is confined to weekdays during day time only, it is not subject to statutory control. Notwithstanding this, tenderers should ensure that construction noise should be within appropriate limits, i.e. 75 dB(A), agreed by EPD.

2.2.2 If working during hours for which acceptable noise levels are specified under the Noise Control Ordinance, a construction noise permit (CNP) will be required. Tenderers should be encouraged to submit preliminary applications for CNP with their tenders so that the acceptability of the proposed method of working can be assessed. This should include their proposed working programme, plant list/schedule, manufacturer's specification for sound power levels of the equipment, together with mitigation measures where appropriate.

2.2.3 Noise impact, particularly for the operational phase, at WENT Landfill marine reception area should be re-assessed when noise limits are finalised by the currently on-going WENT Landfill EIA Study. Based upon the findings of this IEIA, design of practical mitigation measures will be crucial to ensure environmental compliance for day time and evening operation.

2.2.4 Night time work at WENT Landfill marine reception area is not recommended in the IEIA to avoid disrupting the quiet, rural environment. However, if such work is considered necessary by tenderers, they should demonstrate effective mitigation measures to comply with environmental requirements.

2.3 Water

2.3.1 Tenderers should provide designs of silt traps, interceptors, and contaminated storm water segregation system that ensure, as far as practicable, that surface drainage will not be contaminated. These include the provisions for their maintenance and evaluation of their effectiveness, sufficient to ensure compliance with environmental requirements.

2.3.2 Tenderers should make independent assessments of waste water flows and loads for the purposes of waste water treatment plant design. An assessment of the predicted treatment efficiency of the treatment process, and its ability to meet the requirements in the Technical Memorandum (TM) on Effluent Standards, should be included in the submission.

2.3.3 Tenderers should illustrate in their submissions that discharge of any effluent, i.e. contaminated storm water and sewage, to a foul sewer, will comply with the TM effluent standards. The submissions should include estimations of potential flow rates. If necessary, measures to prevent overload the sewer may have to be considered.

2.3.4 In their submissions, tenderers should include provisions of washing facilities for body decontamination, such as hot water showers.

2.3.5 Tenderers should include provisions of temporary sewage collection, and treatment facilities for the NLRTS site during construction period.

2.3.6 Tenderers should provide design of a waste water collection system connected to the WENT Landfill Treatment Work. Daily flow should not exceed 5 m^3.

2.4 Visual Impact

2.4.1 Tenderers will be required to submit details of architectural features, and colour schemes for the NLRTS building and containers used in transfer operation, details of landscaping and planting, mechanical plant, and container types and colours.

2.4.2 A visual impact assessment of the site for vehicles passing to and from the airport, particularly for the early stages of development, should be carried out. In particular, the visual impact of container stacks should be assessed.

2.4.3 A glare assessment for the proposed safety/security lighting set up should be carried out. The tenderers should be made aware that Highways Department will need to be satisfied that lighting arrangements will not produce excessive impact on NLE.

2.5 Bird, Rodent and Insect Control

2.5.1 Tenderers should provide a programme of site spraying to control insects.

APPENDIX 2

COMMENTS AND RESPONSES ON THE INITIAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

HONG KONG GOVERNMENT
ENVIRONMENTAL PROTECTION DEPARTMENT

NORTH LANTAU REFUSE TRANSFER STATION CONSULTANCY STUDY

Agreement No. CE 42/92

INITIAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Responses to Comments

December 1993

Balfours International (Asia)
Consulting Engineers Ltd

in association with

Black & Veatch International
Consultants in Environmental Sciences (Asia) Ltd

Comments	Responses
PLANNING DEPARTMENT HONG KONG LANTAU AND ISLANDS DISTRICT PLANNING OFFICE [Ref (18) in LI 1/13/58 II] Dated 26 November 1993	
Para. 7.2.2 Line 2 & Figure 3.1	
As the container stocking area in the NLRTS site may have significant visual impact, please specify the estimated number of containers stored on site and the proposed stacking height.	The proposed stacking height is 5 full containers (approximately 14 meters) under normal conditions. A container handling unit can stack upto 5 full containers or 9 empty containers. It is estimated that 200 containers will be in the NLRTS under normal conditions. In emergency situations when it is not possible to send containers to WENT there may be additional containers in the compound.
Para. 7.2.4 Line 2	
The present zoning of the NLRTS is Government Reservation 'G' on the Siu Ho Wan Layout Plan No.: L/I-SHW/C, please amended the context accordingly.	Comment noted. Text will be amended to include this information.
Para. 7.2.7 & Figure 3.1	
It is note that a 6 m landscaped area is reserved to the south-west of the site. Consideration should also be given to reserve a strip of land to the south-east of the site for landscaping in order to screen travellers views from the North Lantau Expressway.	Comment noted. We are advised that it is impossible to reserve a strip of land to the south-east of the site for landscaping due to space constraints. A boundary wall of approximately 2 - 2.5 m height will be provided though this will offer minimal screening to elevated receivers on the NLE. TDD have advised there would be no landscaping along the NLE/ARL corridor.
REGIONAL COUNCIL AND REGIONAL SERVICES DEPARTMENT [Ref (13)in RSD 6/HQ 410/92 III] Dated 24 November 1993	
Para. 6.3.10	
RSD drivers will discharge leachate from the RCV sump tanks only at designated points.	Comment noted, text will be amended to clarify discharge at designated points only.

DRAINAGE SERVICES DEPARTMENT
HONG KONG & ISLAND DIVISION [Ref 10/5/63]
Dated 29 November 1993

Section 6.3.7

For Group B wastewater, discharging the first flush of stormwater (17 m^3) in 5 minutes into the sewer might overload the sewerage system. Means of buffering for discharge to the sewerage system and only during off-peak periods would be required. Please define what constitutes first flush and how this interception system could cope with intermittent rainfalls. Notwithstanding this, it is recommended that the areas generating group B wastewater, i.e. the ramp to the tipping hall, RCV exit route and the vehicle wash area would be covered and roofed. Stormwater falling on the roofs could then be connected directly to the stormwater drains and the first flush system could be eliminated.

The "first flush" will include runoff from areas which may be contaminated with spills or accumulated deposits. It is envisaged that a tank would be provided to trap the first flush. This tank could be pumped out to the sewer system at a rate which would not overload the system. The objective is to collect contaminated first flush, particularly after a long dry period. A subsequent storm event occurring before the tank has been emptied would bypass the interception and drain in the stormwater drainage system without overloading of the sewer. Though roof coverage would remove rainwater there will be regular washdowns required under the contract which would need to be intercepted and directed to the sewer system.

Section 6.3.11

It appears that the 30 m^3 daily flow for group A wastewater would be inadequate since for vehicle washwater alone, 30 m^3 would only allow about 0.1 m^3 per vehicle (RCV), based on the maximum of about 330 RCV per day (Working Paper 1A). I learnt (Telephone conversation Patrick Ng/Roger Ng) that this vehicle washwater would be an independent recycle system. Please include in this report on how this washwater would be treated/recycled and the percentage to be discharged to the pre-treatment plant.

The washwater collected at the vehicle wash bay (outside the tipping hall) has a separate recycling system at the vehicle wash bay. The 30 m^3 daily flow refers to the liquors collected within the transfer building as described in section 6.3.11. The vehicle washwater will be settled and re-used, the recycled water does become contaminated and is replaced in a batch discharge approximately every seven days to the pre-treatment plant (It will be necessary to regulate the flow to the sewer system to avoid overloading).

Section 6.3.12

Last line "6.3.10" should read "6.3.11"

Noted and amended.

Section 6.4.3

Flow generated from Group C are not contaminated and could be discharged directly into stormwater drainage system. Segregation is not required.

Noted. The amended text will read as: "The tenderer should include a description of the site areas generating Group B waste water and how it is segregated. Methods to deal with spills should be described."

NEW AIRPORT PROJECTS CO-ORDINATION OFFICE
[NAP/T 3/3/24 Pt3]
Dated 29 November 1993

Para. 9.1.3

Normal practice of conducting a baseline study required 14 successive days. The report only recommends a 1 - day monitoring. This should be clarified with EPD.

The noise environment is unlikely to vary significantly through a particular week and a single day monitoring should be sufficient to define background levels.

ISLAND DISTRICT OFFICE
[Ref (15) in IS 111/3/65 Pt2]
Dated 29 November 1993

Para. 4.3.1

It is mentioned that the SRs are at substantial distance from the proposed NLRTS site. How far exactly are the SRs away from the site.

On the information available the SRs are in excess of 2.4 km from the site. Please refer to Section 2.3 of the IEIA Report.

Table 10.1

It is a good idea to have a summary of this kind as the necessary information can be seen at a glance. However, I think it will be useful to add a column, stating who will be the nearest SRs.

Noted and will be incorporated.

ENVIRONMENTAL PROTECTION DEPARTMENT
[Ref (13) in EP 2/N9/38 II]
Dated 29 November 1993

Para. 2.3.1

Although the surrounding uses are industrial, as far as air quality is concerned, they should still be considered as SRs, please amended. This is because most uses are sensitive to odours and hence EPD has specified a limit of 2 odour units at the site boundary to prevent nuisance to the surrounding environment.

Noted. An additional paragraph will be added to clarify the odour issues at the site boundary. A limit of 2 odour units at the site boundary was specified in Table 9.2 under the Section 9.5 - Environmental Performance Requirement of IEIA Report.

Para. 4.5.3

It is stated that it will be necessary to evaluate the efficacy of the proposed ventilation and scrubbing systems in preventing external emissions of pollutants. Therefore, please confirm that a consultant will be employed for this work during tender evaluation stage, i.e. future work given in Table 10.1). This consultant should be able to assess that the odour control equipment installed will be able to meet the requirements of 2 o.d. at the site boundary so as to prevent nuisance to the surrounding environment.

An independent consultant will normally be included in the tenderers team for the checking of the tenderers design to ensure that the proposal is able to meet the performance specification. This will need to be confirmed with the Project Proponent.

Para. 9.2.1

a) Table 10.1 should read 9.1. Also the frequency of dust monitoring in Table 9.1 should be stated. EPD's requirement is that dust monitoring at the site boundary during operation should be at least once every six days.

b) The baseline monitoring should be daily for a period of at least 2 weeks.

a) & b) noted. The EPD requirements will be incorporated. The biweekly requirement came from the Shatin RTS monitoring schedule.

Table 9.1

It is suggested the consultants should also recommend the remedial measures to be taken when the monitored results exceed the limit stated in Table 9.2.

This would form part of an Environmental Monitoring and Audit Manual. The consultants will identify appropriate target, action and trigger levels which will be set to initiate a mitigation response by the Contractor to prevent an exceedence.

Table 9.2

It is stated in the 'Notes' that the air quality parameters (TSP, RSP and odour) cannot be used to check compliance. It is not clear what it means. As given in the Limit column, quantitative values of these parameters are given and it is the responsibility of the contractor to meet, i.e. to comply with these limits. These standards will be specified in the tender documents and the tenderers will design their systems to meet such requirements. The purpose of monitoring is to check if the successful tenderer's system is performing in accordance with the specification. In fact, the similar set of parameters are given as compliance standards in a number of other RTS and landfill site contracts. Therefore, we do not agree with the Notes (for TSP, RSP and odour) in this table which should be deleted.

This *comment* was included to identify that this was an ambient air quality objective over a 24 hour period. This limit appears to be operating satisfactorily at existing RTS and the comments "cannot be used to check compliance" and "In practise, impossible to measure compliance" will be deleted.

For those air quality standards in the tipping hall (i.e. CO, NO_2, odour and dust), these are related to occupational health for which you may like to consult Labour Department.	Commissioner for Labour has commented that the levels stated that the stated limits should refer to personal exposure.
Para 6.1.1	
The effluent standards presented in the Technical Memorandum are not absolute - they provide a guide to the Authority in setting conditions for inclusion in a discharge licence issued in accordance with the WPCO.	Comment noted. The text will be amended accordingly.
Para 6.3.9	
Group D waste waters would probably not require pretreatment in order to meet the guideline effluent standards set down in the TM.	Noted.
Table 6.2	
The effluent standard for maximum temperature of discharge to foul sewer should be 43° rather than 34°.	Noted and amended.
Para. 6.4	
It would be useful to highlight the need for further consideration at the design stage of the means by which Group B 'first flush' storm water can be diverted for pretreatment and discharge to sewer.	Noted and agreed. An additional paragraph will be added. See also DSD comment on Section 6.3.7.
Para 6.4.1	
Please amend the paragraph as "The successful tenderer should provide silt traps,. interceptors and other containment and treatment facilities to ensure, as far as practicable, that surface drainage will be uncontaminated. Provisions for their maintenance and evaluation of their effectiveness, sufficient to ensure compliance with WPCO licence requirements, should be included in the tender submission."	Noted and amended.
Para 5.1.4	
Summary Offenses Ordinance(cap.228)" should read "NCO".	Noted and amended.

Para 5.1.7 The recommended noise limit of 5 dB(A) higher than the background noise level for daytime construction would allow creeping and has long been discarded by EPD, please delete.	Noted and amended.
Para 5.1.9 Please revise the statement "This limit (HKPSG road traffic noise standard) would apply to road traffic noise generated from RCVs and container vehicles" to reflect that the limit is for all traffic including the RCVs and container vehicles on the roads.	Comment noted and text will be amended.
Table 5.4 Based on the Noise Control (Air Compressors) Regulations and the Technical Memorandum on Noise from Construction Work other Percussive Piling, the SWL of air compressor, vibratory roller should be 104 dB(A) and 108 dB(A) respectively.	Comment noted. Recalculation still gives an Sound Pressure Level at NSR of 50 dB(A).
Para 5.4.2 It should be noted that facade effect at the receiver and air absorption (2400 m) have not been taken into account in the analysis.	The consultants were following methodology traditionally adopted in Hong Kong which does not identify atmospheric absorption in the calculation procedure. The Consultants agree that absorption will further reduce the noise impact on NSR, which is already at an acceptable level. Facade effect was omitted and will raise the predicted level but will still be within the Planning Criteria. As noted in the text there is no allowance for barriers, buildings or topographic features making the prediction an extreme worst case. A note on air absorption will be added to paragraph 5.4.2 and could also be applied to para 5.3.3 .
Table 5.5 The last row in this table is not in line with text contained in para 5.4.2. Amendment is necessary.	Comment noted. The table is correct and paragraph 5.4.2 has been amended.

Table 5.6 & Para. 5.4.4

The predicted noise level at NSRs under both options should be 46 dB(A) in stead of 47 dB(A).	Comment noted. Paragraph 5.4.4 has been amended.

COMMISSIONER FOR LABOUR
[Ref (33) in L/M 2040/93 (S/I)]
Dated 1 December 1993

Para 4.4.7

It should be specified that the concentration of NO_2 and CO referring to personal exposures.	Noted and amended.
Washing facilities for body decontamination e.g. hot water showers and lockers to separate work clothing from street clothing should be provided.	Noted and a paragraph will be added to cover this item.

TDD - SOUTH WEST NT DEVELOPMENT OFFICE
[Ref (59) in SW 2/13/500 IV]
Dated 29 November 1993

Para. 2.3.1

The last sentence, stating that there are no SRs in the immediate vicinity of the development, is contradicted in Section 7, which identifies SRs on the adjacent NLE and airport railway.	Text will be clarified. The HKPSG defines the identified receivers as noise and air sensitive receivers. Road and Rail travellers are not defined as sensitive receivers. However, in terms of visual impact we have included road and rail travellers who could be affected by the NLRTS.

Para. 7.4.6 & Table 10.1

Although recommended in the North Lantau Development Study, there is no planting planned for the NLE central reserve or carriageway edges at this location.	Text will be amended. This is unfortunate since this screening offers the most effective screening for both NLRTS and the other industrial activities in the area for road and rail travellers.

Table 10.1 (Visual Impact Section)

I cannot agree that the RTS development will have "no significant impact" on travellers on the NLE/airport railway. Initially, the development will be very prominent, being the only development to the north of this stretch of the road/railway, and interrupting an otherwise unspoilt view of the sea. Further, adjacent industrial development will not mitigate this impact, but add to it.

As mentioned in the previous response it is unfortunate that median and edge planting have not been incorporated into the NLE which would have offered the most effective and appropriate mitigation of impact. We agree that there will be an impact on the travellers on the NLE/AR. The text in section 7 noted that impact on railway travellers will be 'fleeting', given the nature of seating, and for road travellers, based on the criteria of 'blocking the view' impact would be moderate. With the absence of median and edge screening we agree that the NLRTS will have a visual impact, particularly in the early stages of development on North Lantau and would propose that the impact is recorded as moderate. Due to space constraints there is no further opportunity to screen the subject site at the site boundary, indeed it would be more effective to have landscaping screening or planting closer to the sensitive use, i.e. along the NLE/AR to maximise effectiveness. However it is beyond the scope of the NLRTS project to provide this type of mitigation. We fully agree with the last statement and noted in para 7.2.5 that cumulative effect of the individual buildings need to be addressed to ensure that a cluttered mix of styles does not evolve.

Para. 10.1.5

The last sentence, making reference to other noise and air pollution sources, is not appropriate. Presumably with the adoption of suitable mitigation measures impacts from the airport and the railway developments have been predicted to be acceptable based on the EIA studies of these projects.

Comment noted. However, it should be remembered that this is a summary conclusion reflecting earlier discussion. The statement was included to set the context between the small numbers of NLRTS vehicles compared to the NLE other locate traffic and other activities.

ENVIRONMENTAL PROTECTION DEPARTMENT
[Ref ( ) in EP 20/03/205 E II]
Dated 6 December 1993

Para. 4.4.4

Please elaborate on the system being used at KBTS.

A dust control system was recommended in the EIA study for KBRTS. The system was developed with equal emphasis given to both preventative and arrestance measures, with the basic rationale being to minimise the volume and contamination level of air treated, whilst achieving acceptable air change rates within the transfer building as well as control dust below the stipulated level of 1 mgm^{-3}. The recommended dust control system included:

- Design/installation of a negative pressure ventilation system, drawing air in through the entrance/exit points to prevent fugitive emissions. All air drawn inside the building is forced to exit through the dust arrestor system;

- Using misting sprays to coalesce intense dust clouds as well as to relieve the challenge to the arrestor;

- Provision/installation of a dual ventilation system to deal separately with the first and ground floor. At first floor (tipping hall) an air change rate of 8/hr is adopted. Air was drawn across the building from North to South and exit through vents positioned over each of the six push-pits and through dust removal filters. At ground floor, where small quantities of dust should arise, an air change rate of 2.5/hr and similar design of system were adopted. Air was drawn in across the building, to exit through intake vents at high level above container vehicle tail pipe height. The air then passed through dust filter.

In addition, regular, scrupulous cleaning of the tipping hall floor was also recommended to further reduce dust levels within the transfer station.

Para. 5.1.8

Should Table 4.3 be Table 5.3?

Noted and agreed. The text has been amended.

Para. 5.3

Despite Section 9.2.3 construction noise at the reception area of WENT Landfill is not addressed.

Noted. There will be limited construction activities at the reception area, mainly involving construction of an office block and paving the reception area. The construction noise impact assessment for the site will be reported in the Final EIA Report, an interim noise calculation is included as follows:

Construction Noise Impact at WENT Reception Area

	SWL, dB(A)	No on Site	Total SWL, dB(A)
Air compressor, standard	104	1	104
Concrete lorry mixer	109	1	109
Excavator/loader	112	1	112
Lorry	112	1	112
Roller, vibratory	108	1	108
Vibrating poker	113	2	116
Combined sound power level			119.4
Distance to NSR			350 meters
Attenuation correction			- 58.9 dB(A)
Reflection correction			+ 3 dB(A)
Sound Pressure Level at NSRs			64 dB(A) (approximately)

The predicted noise level of 64 dB(A) would be within the day time limit of 75 dB(A), but exceed the respective evening and night time limits of 60 dB(A) and 45 dB(A). Noise mitigation will be required if evening and night time work takes place.

Para. 6.2

Sewage from construction workforce is not addressed.

Noted. Given the absence of disposal facilities in the area for the duration of the construction period on-site facilities or tankering away by sea are the only options available. The relatively small size of the construction team and short duration of the construction programme make septic tanks and soakaways the only practical site option. Tankering away by sea is an alternative which may need to be considered if a site discharge is unacceptable.

Para. 6.3

Sources of wastewater at the reception area at WENT Landfill, their treatment/ disposal requirements and the associated impacts and the mitigation measures are not discussed in this report.

Waste will arrive in sealed containers, be transferred to the tipping face, emptied, resealed and returned to the reception area for return to the NLRTS. This activity will not allow waste or leachate to be deposited in the reception area, except during accidents when a container is ruptured. The reception area should be laid to falls which drain to interceptors.

Wastewater generated at WENT Landfill NLRTS marine reception area will be collected. A total of $5m^3$ will be allowed to be transferred to the WENT landfill treatment system operated by the WENT landfill operator.

Vehicles returning from the tipping face will pass through a wheel wash provided by the WENT Landfill operator prior to entry into the reception area.

Any refuelling areas within the reception area should be bunded and provided with oil interceptors, which must be regularly maintained if they are to be efficient in preventing contaminated discharge.

Para. 9.1

Since the impacts of construction on dust level have been predicted and the activities in adjacent area could be reasonably envisaged, could the consultants now formulate the requirements for baseline dust monitoring?

To establish the air quality baseline the Consultants propose that monitoring be carried out for 2 weeks prior to the commencement of construction. The proposed frequency of monitoring is 6 times per week.

Is there any need to carry out baseline monitoring for water quality ?

Given the nature of construction activity for the NLRTS baseline water quality monitoring is unlikely to be appropriate.

Para. 9.2.2

Please elaborate the arrangement conducted on West Kowloon Reclamation.

This refers to the Environmental Protection Office (ENPO) for West Kowloon where a number of Contractors are working simultaneously. Data is collected by Consultants who formally relay information on exceedance to EPD. EPD can then inform the relevant Government Department, in this case TDD, who will in turn contact the Engineer who will take action with the Contractor.

Para. 10.2

EPD has reservation on the consultants' recommendations that no formal EIA is carried out. Our Strategy Assessment Group is gathering comments from other Working Group members and will review the consultants' recommendations in the light of these comments. Should an EIA be required, the consultants are requested to set out the key issues and Terms of Reference for the successful tenderer to undertake a detailed EIA in accordance with Section 6.2.2 (iii) (d) of the Brief.

The Summary of Environmental Impacts, Table 10.1 represents a starting point for the identification of Key Issues and Terms of Reference.

PLANNING ENVIRONMENT AND LANDS BRANCH
Dated 29 November 1993

You may wish to cover in the Report the ecological impact of the North Lantau RTS.

The NLRTS will be constructed on new reclamation designed and constructed by others immediately north of the North Lantau Transport Corridor. It is believed that in this case there will be negligible impact on the ecology of the area.

The following departments responded with no comment.

DO / Tsuen Wan
Sec. for Treasury
Electrical and Mechanical Services Department
TD
HyD
FSD
Marine Department