EIA EXECUTIVE SUMMARY

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. BACKGROUND

Route 10 will enhance the transport network between the SAR Boundary, the north-west New Territories, North Lantau and Hong Kong Island. It is divided into two parts; the section between Hong Kong and Lantau, Route 10 (HKLL); and the section between North Lantau and the Yuen Long Highway, Route 10 (NLYLH). These sections are illustrated on *Figure 1.1*.

Route 10 (NLYLH) has three essential functions:

- it is a major element in the new strategic highway between Hong Kong and the Guangdong Province via the Shenzhen-Hong Kong Western Corridor and Lingdingyang Bridge;

- it provides an upgraded route for the increasing traffic emanating from strategic new developments in the North West New Territories (NWNT) and on Lantau; and

- it provides the vital security of a second crossing to the new airport and other developments on Lantau.

Each of these aspects is vital to the continued development of Hong Kong. It is therefore essential that Route 10 (NLYLH), and in particular the section providing the second access to Lantau, is commissioned by the 2007 date pledged by the Chief Executive in his 1997 and 1998 Policy Addresses.

It is forecast that a large number of trips will be generated between NWNT and Lantau associated with the Airport, Tung Chung New Town and possible new tourist areas or a new port. If Route 10 (NLYLH) were to be delayed, the existing highway networks would not be able to handle the number of new traffic trips generated in the catchment area. Consequently, severe traffic congestion, air pollution and noise nuisance would result in the North Lantau, Tuen Mun, So Kwun Wat and Yuen Long areas.

The alignment to the north of So Kwun Wat was dependent on the findings of the Crosslinks Further Study. In order to meet the Pledged Date the Project has therefore been sub-divided into a Northern and a Southern Section, allowing work to proceed on the Southern Section. The cumulative impacts of constructing and operating the whole Route 10 (NLYLH) will be addressed in the Northern Section EIA. It is also pertinent to note that no construction work will commence on the Southern Section until the EIA for the Northern Section has been completed

The purpose of this Environmental Impact Assessment (EIA) is to provide information on the nature and extent of environmental impacts arising from the construction and operation of Route 10 (NLYLH). This will provide information for public consultation and provide a basis for project acceptance assessment by the Environmental Protection Department (EPD) and relevant authorities.

2. PROJECT DESCRIPTION

2.1 Development of Route 10 (NLYLH) Alignment

The Feasibility Study Alignment (FSA) of Route 10 was endorsed as part of the Sham Tseng Link Feasibility Study. The review of the FSA identified a number of key issues which had an adverse impact on construction and future development, including:

- the North Lantau Highway (NLH) would place excessive constraints on the construction of the FSA;
- stringent site safety procedures together with lane closures on the NLH would be required for the excavation and construction of the North Lantau tunnel;
- difficult ground conditions where the FSA crossed over the Airport Railway would constrain construction;
- resumption of the Tso Wan and Fa Peng villages would be required;
- the toll plaza at Tso Wan would require a substantial retained fill structure, which would visually dominate the landscape and be expensive; and
- the route conflicted with the Towngas pipeline at Tai Lam Chung, which cannot be shut down to facilitate a diversion.

The Brief for this Assignment requires an examination of the possible variations to the FSA alignment.

A re-examination of the FSA was carried out, and a Preferred Alternative Alignment (PAA) has been endorsed. The main differences, from an environmental perspective, between the FSA and PAA are presented in *Table 2.1* below:

Table 2.1 Main Differences Between PAA and FSA

	Alternative Alignments (PAA)	**Feasibility Study Alignment (FSA)**
Noise	**North Lantau** Noise levels up to 80 dB(A) is expected at the receivers. The village houses are low rise and a noise barriers would be required.	On Lantau Island, the villages at Fa Peng and Tso Wan were resumed and no sensitive receivers were identified.
	Tsing Lung Bridge Vehicles using bridge will cause noise impacts at sensitive receivers including Hong Kong Garden.	Alignment caused greater impact on Hong Kong Gardens.
	Tai Lam Chung to So Kwun Wat Higher elevation of alignment improves noise shadow zone.	Noise problems as alignment is lower and barriers proposed.

	Alternative Alignments (PAA)	Feasibility Study Alignment (FSA)
Air Quality	**North Lantau** Air sensitive receivers are located more than 100m from the alignment which should provide sufficient setback. **Tsing Lung Tau** Major improvements made especially with respect to lower gradients of road in tunnel and thus reduced vehicle emissions. **Tai Lam Chung to So Kwun Wat** Alignment on higher elevation than FS which was in the valley and better dispersion of pollution expected.	The villages of Fa Peng and Tso Wan were to be resumed and no sensitive receivers were identified. Air Quality Objectives (AQO's) expected to be exceeded due to vehicle flow, mix and tunnel gradients.
Water Quality	**North Lantau** Reclamation required for Toll Plaza. Occupies larger sea area but reduced level. **Tsing Lung Bridge** Reduction in cross sectional area of marine water <1.5%.	Reclamation required for Toll Plaza. Height of reclamation up to +40mPD. Reduction in cross sectional area of marine water 3.5%.
Ecology	**North Lantau** Coastal route has greater impact on habitat. **Tai Lam Chung to So Kwun Wat** Cutting at Siu Lam can affect larger area of habitat.	The alignment is tunnelled and the required land take would be minimized. The alignment is tunnelled and the required landtake would be minimal.
Hazard	Alignment passes through consultation zone of Tai Lam Chung Prechlorination House. However risks are identified as acceptable.	Risks identified as acceptable.
Fisheries	Minimal impact on fisheries	Minimal impact on fisheries.
Landscape and Visual	**North Lantau** The alignment between Fa Peng and Kwai Shek. Natural coastal landscape is disturbed and appearance transformed to allow the man-made structure. Significant visual and landscape impact.	Alignment in tunnel. Less visual and landscape impact on the natural coastal appearance.

	Alternative Alignments (PAA)	Feasibility Study Alignment (FSA)
	Tsing Lung Bridge No significant differences **Siu Lam** Major cutting at Siu Lam	Alignment in tunnel. Less visual and landscape impact.

Preliminary assessments surmised that the FSA was more acceptable in terms of hazards, ecology, landscape and visual; while the PAA performed better with respect to noise, air and water quality. These suppositions were confirmed during the detailed environmental impact assessment reported on herein.

2.2 Construction Activities

The Route 10 (NLYLH) (Southern Section) will be constructed in packages, and the construction works are expected to be undertaken between 2002 and 2007. The preliminary construction programme for the packages are summarized in *Table 2.2* below.

Table 2.2 Preliminary Construction Programme

Work Element	Work Elements	Approx Timescale
Advance Works	Advance Works for Tsing Lung Bridge which includes the excavation at Kwai Shek:	Q2 2001 - Q1 2002
Major Contract	(i) Tsing Lung Bridge Viaducts on Lantau Toll Plaza seawalls & reclamation	Q2 2002 - 2007
	(ii) Lantau Toll Plaza	Q1 2005 - 2007
	(iii) Tai Lam Chung Tunnel	Q2 2003 - 2007
	(iv) So Kwun Wat Interchange and Link Road	Q1 2004 - 2007
	(v) Siu Lam Link road	Q1 2005 - 2007

3. ENVIRONMENTAL IMPACT ASSESSMENT

The Environmental Impact Assessment (EIA) has identified Sensitive Receivers (SRs) within the Study Area, defined environmental parameters and features likely to be affected by the proposed project, and sets out the criteria and methodology on which impact assessments were based. Mitigation measures have been recommended for the environmental impacts arising from the proposed improvements exceeding the Hong Kong Planning Standards & Guidelines (HKPSG) and Technical Memorandum on Environmental Impact Assessment Process (TMEIA).

The environmental impact assessment has considered the impacts of the following aspects during construction and operation:

- air quality;
- noise;
- waste disposal and management;

- water quality;
- terrestrial and marine ecology;
- fisheries;
- hazards/risks;
- land contamination;
- landscape and visual; and
- archaeology and cultural heritage.

The findings of the impact assessments concerning the above are summarised in the Sections below.

4. AIR QUALITY

During construction dust levels could be high at some of the Air Sensitive Receivers (ASRs) due to activities such as: site clearance, earthworks, materials handling, blasting, concrete batching, truck haulage and other plant movements. In order to minimise dust levels the following suppression measures will be required: water spraying, covering of stockpiles, minimising construction vehicle movements and speeds and providing dust filters to any ventilation systems. The *Air Pollution Control (Construction Dust) Regulation* together with the notes on *Best Practical Means Requirements for Cement Works* and on *Best Practical Means Requirements for Stone Crushers* will be fully complied with. Provided these mitigation and control measures are implemented dust criteria will be complied with at all ASRs. The implementation will be checked through the EM&A procedures in the EM&A programme.

During operation the AQOs will be satisfied at all existing and planned ASRs. This will include the effects of, inter alia, vehicular emissions, emissions from the tunnel portals and noise enclosures, and emissions associated with the Toll Plaza.

5. NOISE

Construction Phase

An assessment of the impacts arising from the construction of the Project has been undertaken using conservative construction equipment schedules. The predictions indicate that during the daytime some activities would cause an exceedance of the noise criteria ($L_{Aeq,\,(30min)}$ 75 dB) at some of the Noise Sensitive Receivers (NSRs).

In order to reduce the impacts on the sensitive receivers, and to demonstrate compliance with the noise criteria, various mitigation measures have been examined (eg. re-phasing of the works, use of super-silenced plant and equipment and the installation mobile barriers). With the application of such measures the results from the modelling carried out indicate that the daytime construction noise levels will not exceed the given criteria.

Twenty-four hour working will be required for the construction of Tsing Lung Bridge if the committed commissioning date in 2007 is to be achieved. The noise predictions indicate that during the restricted hours (1900-0700hrs) with the proposed mitigation

measures, both evening and night-time construction noise levels will not exceed the given criteria at all NSRs.

The modelling carried out indicates that the predicted noise levels at Hong Kong Garden will just achieve the noise criteria for restricted hours working. A construction noise permit (CNP) is required before work can commence during restricted hours. There is no guarantee that a CNP will be issued. If a permit is issued, EPD will include any condition it thinks fit and such conditions are to be followed while the works covered by the permit are being carried out. Failure to comply with the permit conditions will lead to cancellation of the permit and prosecution under the NCO. It should be noted that despite any description or assessment made in the EIA Report, the EPD will be guided by the relevant Technical Memorandum (Memoranda) in assessing an application, once filed, for a CNP. It will consider all the factors when arriving at its decision taking contemporary situations/conditions into account. Nothing in this Report shall bind the EPD in making its decision.

In view of the marginal compliance with the noise criteria at Hong Kong Garden and the consequential programme and contractual risks should a CNP not be issued or be withdrawn, it is, in our view, essential that an application is made to ExCo for exemption for the construction of Tsing Lung Bridge. This would follow the procedure adopted for Tsing Ma Bridge which was granted an exemption by ExCo.

Operational Phase

Noise impacts arising from the operational stage of the Route 10 (NLYLH) (Southern Section) are mainly from the traffic noise from the open road sections. The potential road traffic noise impacts associated with the Route 10 (NLYLH) have been assessed for the worst case traffic flows for the year 2022. Noise predictions indicate that the unmitigated noise levels at some NSRs are above the Technical Memorandum on Environmental Impact Assessment Process (TMEIA) criterion and therefore the noise benefit from various direct mitigation measures have been investigated.

An effective package of direct mitigation measures are recommended to minimise the traffic noise impact from Route 10 (NLYLH). This includes low noise road surfaces (everywhere except the Tsing Lung Bridge because of minimising loads on the bridge, and the toll plaza because of maintenance due to 'stop-start' of vehicles), roadside barriers, semi-enclosures and full enclosures. By such mitigation measures, the majority of NSRs are protected from being adversely impacted by traffic noise from Route 10 (NLYLH).

However, as demonstrated by the noise modelling, it is not possible to reduce the overall traffic noise levels at certain NSRs to below the TMEIA criterion by mitigating the noise impact from Route 10 (NLYLH). It is predicted that about 260 dwellings are likely to be eligible for indirect technical remedies in the form of window insulation and air conditioning. This is, however, subject to final approval from ExCo . It is recommended a detailed noise insulation assessment be carried out to identify the exact extent of noise insulation at the detailed design stage.

In Area 48 G/IC and R(B)2 residual impacts partially attributable to Route 10 (NLYLH) are predicted at three NSR's. For a further three separate NSR's, although residual impacts are not attributable to Route 10 (NLYLH), the predicted noise levels from Route 10 (NLYLH) alone exceed the TMEIA criteria. Therefore, development constraints such as self protective blocks, building setback and limiting the angle of view are recommended. During the detailed design stage for the development of these areas it will be necessary to test the effectiveness of adopting suitable building layouts in order to reduce the angle of exposure.

6. WASTE DISPOSAL AND MANAGEMENT

Waste arising from construction of the Project will be effectively handled, transported and disposed of through the application of appropriate mitigation measures. No potential insurmountable environmental impacts are identified. Operational impacts from the proposed route will be minimal.

7. WATER QUALITY

During the construction phase the key issue relating to water quality is the dredging of marine mud for the seawall at the Toll Plaza. Mitigation measures have been proposed to reduce these impacts and it is expected that these can be minimised to acceptable levels. Cumulative impacts of dredging and reclamation works between Tso Wan and Fa Peng have been assessed and measures recommended to reduce the impacts to acceptable levels.

In the operational phase two components of the Project could potentially affect water quality. These are the Toll Plaza between Tso Wan and Fa Peng and the reclamation to provide ship protection at the Tsing Lung Bridge (Northern) Tower. Both components have been designed to minimise the impacts on the receiving waters and both are located within existing embayments. They do not intrude into the main tidal flows and thus have limited potential to affect hydrodynamic regimes (except in the immediate area). No residual water quality impacts are expected.

8. TERRESTRIAL AND MARINE ECOLOGY

Terrestrial Ecology

The ecological resources within the Study Area comprises a variety of habitat types including shrubland, tall shrubland, grassland/shrubland mosaic, secondary woodland, fung-shui wood, wetland, freshwater stream, agricultural field and orchard. Field surveys conducted between July and December 1998 indicated that shrubland and grassland/shrubland mosaic, which are typical of similar habitat elsewhere in Hong Kong, are the main habitat type within the Study Area. Tall shrubland, wetland and coastal habitats were found to support a few rare/restricted/protected plant and *fung shui* wood at So Kwun Wat also support plants of ecological interest. Besides the *fung shui* woodland which possess high ecological value, the other habitat types are mostly disturbed with low ecological importance according to the criteria stated in TMEIA.

Mitigation measures for the road construction such as on-site planting, erecting fences along the boundary of construction sites before the commencement of works, and prohibiting and preventing open fires within the site boundary are recommended to avoid and minimise the potential impact to the fung shui woods as well as the rare/restricted/protected plant species. No residual impact is expected.

Marine Ecology

The Study Area supports intertidal hard surface assemblages and subtidal soft benthos and marine mammal *Sousa chinensis*.

Direct impacts will occur through habitat loss in the area that is to be dredged or reclaimed and will affect the soft benthos as well as hard surface assemblages along Tsing Lung Tau, Tso Wan and Fa Peng. However, these assemblages are of low to medium ecological value and the dredged or reclaimed areas are only approximately 8.1 hectares of subtidal soft-bottom habitat and 160m of natural coastline. Therefore, predicted direct impacts are considered to be localised and acceptable.

Indirect impacts during the construction phase, such as noise from underwater blasting, piling and marine traffic may cause some cetacean species to minimise their use of areas affected. Underwater blasting could affect the Chinese White Dolphin *Sousa chinensis* and mitigation measures, such as the installation of air-bubble curtain and surveillance for a 500 m radius of the blast site half an hour prior to blast detonation, are recommended.

An increase in suspended sediment concentrations and decrease in dissolved oxygen in the water column may affect filter feeders and soft corals living in the intertidal and subtidal habitats. However, these indirect impacts are anticipated to be localised and transient. In addition, any constraints on construction operations recommended to reduce impacts to water quality and noise to acceptable levels are expected to also mitigate for effects on marine ecology.

9. FISHERIES IMPACT

A review of existing information indicated that the Study Area supports fisheries resources. As impacts resulting from the Project will be confined to within local areas of dredging/reclamation, no adverse impacts to fisheries resources are expected. The size of impact due to underwater blasting is predicted to cover a maximum area of 1 km from the blast site. Generally the mitigation measures which are recommended to control water quality impacts to within acceptable levels, are also expected to control impacts to fisheries resources. Therefore, no fisheries-specific mitigation measures are required.

10. HAZARD

Provided the risk mitigation measures recommended in the Hazard Assessment Report (HAR) (STLFS) are implemented the risk from Tai Lam Chung PCH is considered acceptable.

11. LAND CONTAMINATION

An account of the present land uses, in accordance with Practise Note for Professional Persons *ProPECC PN3/94*, along the alignment did not indicate any contaminating uses of concern, Land use is primarily village type developments, agricultural, or it is undeveloped. Potential contamination and associated impacts are noted to be minimal based upon these land uses. Thus it is judged that no Contamination Assessment Plan (CAP) is required for this assignment.

However, if contamination is encountered, a contamination assessment should be performed in accordance with *ProPECC PN 3/94*, and a CAP will be required for submission and approval by the EPD prior to conducting the assessment.

12. LANDUSE, LANDSCAPE AND VISUAL

The Study Area comprises areas of hillside on North Lantau and Tsing Lung Tau together with the three valleys of Tai Lam Chung, Siu Lam and So Kwun Wat in the New Territories. They are primarily natural hillsides with a low levels of disturbance and with high landscape and visual quality. A number of areas, such as the knolls between the Siu Lam and So Kwun Wat valleys and the eastern end of the So Kwun Wat valley, have previously been disturbed. The steeply undulating nature of the study areas results in much of the alignment being enclosed within tunnel, elevated or requiring extensive earthworks or slope cuttings.

The alignment runs against the overall landform of the area, which results in many significant adverse visual and landscape impacts. There is limited opportunity to fully integrate the alignment with the existing natural landform, landscape and visual environment, with which it sharply contrasts.

The concepts for the mitigation measures described in this Report form the basis for the Landscape Proposal and Preliminary Design. The mitigation measures seek to alleviate the impacts and every effort has been made to provide measures which reduce these impacts as far as possible. The mitigation responds to the impacts caused by construction and are considered to result in many of the impacts being less unacceptable in the long term. However, they cannot alleviate all the impacts caused by the introduction of the large scale man made structures into the landscape. The more unacceptable landscape impacts are at:

- Village Areas of Fa Peng and Tso Wan due to the permanent loss of coastal context;
- North Lantau Natural Hillside and Coastline due to the permanent disturbance to the existing landform;
- Siu Lam Ridge due to the extensive cut across the natural ridge; and
- So Kwun Wat Valley due to the change in character and level of disturbance to the rural valley.

The more unacceptable visual impacts include:

- the local villages at Fa Peng and Tso Wan;
- East Lantau Planned Reclamation if developed with tourist and recreational facilities;
- Ma Wan Channel boat traffic;
- Ma Wan residents and Theme Park users;
- residents at Hong Kong garden to Sham Tseng, and residents in close proximity to the bridge;
- Tai Lam Chung Tsuen residents;
- Siu Lam Village residents;
- residential development and planned CDA area at Siu Lam;
- So Kwun Wat Tsuen main and satellite village;
- MacLehose Trail walkers;
- Planned development Areas 48A, 55 and 56; and
- rural houses adjacent to Tuen Mun Road.

The construction of the Route 10 (NLYLH) alignment will, however, create new features and landmarks across the North Lantau and New Territories area, particularly with respect to the proposed Tsing Lung Bridge between North Lantau and Tsing Lung Tau. This is proposed to be a suspension bridge reflecting the design of the adjacent Tsing Ma Bridge and will add to the family of bridges across to Lantau.

13. CULTURAL HERITAGE

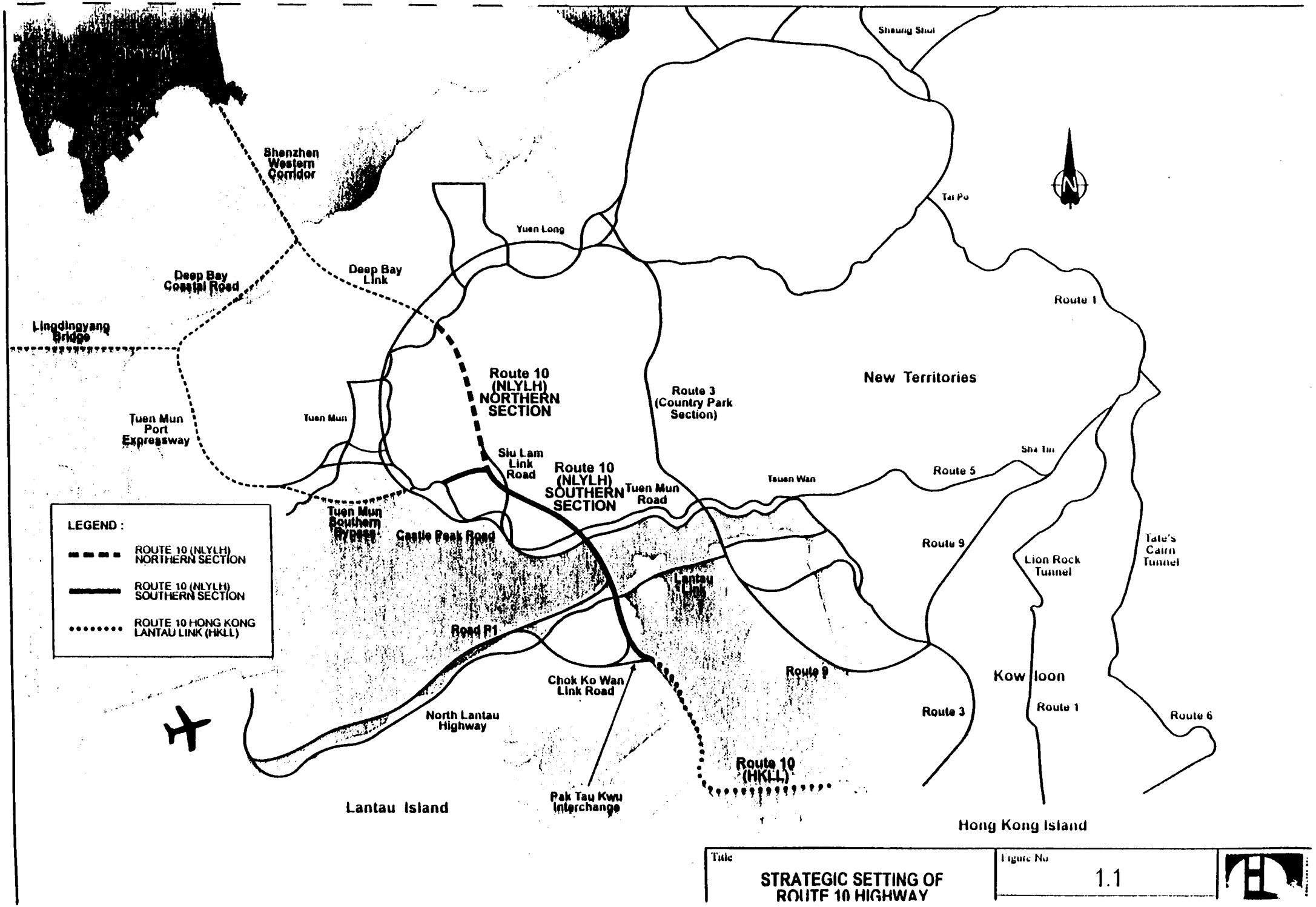
On the basis of the existing information no historical monuments will be affected by the construction or operation of the Project. Archaeological finds such as the Tang Dynasty Kiln deposits at Siu Lam have been salvaged under the Castle Peak Road Widening Project. However, if the alignment of the proposed road is shifted northwards then a salvage operation may be required under this Project. The Antiquities and Monuments Office (AMO) would provide definitive advice under such circumstances. The pre-war graves are being recorded as part of this Project and have been included in the environmental monitoring and audit report.

14. ENVIRONMENTAL MONITORING AND AUDIT

A comprehensive environmental monitoring and audit (EM&A) programme is recommended during the construction and operation of the Route 10 (NLYLH). The EM&A will cover air quality, noise, water quality, waste management, ecology and landscape and visual issues.

15. CONCLUSIONS

The EIA Final Assessment Report for Route 10 (NLYLH) (Southern Section) provides an assessment of the potential impacts associated with the construction and operation phase of the Project, based on the latest information available. From the assessments undertaken it is predicted that the Route 10 (NLYLH) (Southern Section) will comply with all environmental standards and legislation, provided that the recommended environmental control measures are implemented.



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STRATEGIC SETTING OF ROUTE 10 HIGHWAY

Figure No

1.1