Highways Department
Western Harbour Link Office
路政署

Agreement No. CE 27/92

ROUTE 3 三號幹線
COUNTRY PARK SECTION 郊野公園段
AND TING KAU BRIDGE 及汀九橋

PRELIMINARY DESIGN STAGE 2
第二期初步設計

Country Park Section - Ting Kau Bridge
郊野公園段——汀九橋

Environmental Assessment - Executive Summary
環境評估——摘要

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Ting Kau Bridge Environmental Impact Assessment

Executive Summary

June 1994

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1. INTRODUCTION

1.1 Background

Route 3 Country Park Section (CPS) comprises approximately 15.5 km of roadway connecting north west Tsing Yi in the south to Yuen Long and the New Territories Circular Road in the North. Ting Kau Bridge (TKB) is the major southern component of Route 3 CPS and together with the Tai Lam Tunnel and Yuen Long Approach Road (TLT & YLA) (which extends from Ting Kau in the south to Au Tau in the north), will become a major element in Hong Kong's land transport infrastructure. Route 3 will be a vital link to serve the growing traffic demand from China, the north west New Territories, west Kowloon and the expanding ports at both Kwai Chung and on Lantau.

A Feasibility Study and first stage of the Preliminary Design for the Project were completed in October 1989 and July 1992 respectively. A second stage Preliminary Design was undertaken in 1993. These studies considered the prospective alignments of Route 3 CPS and culminated in the selection of a preferred scheme. In addition, the Tuen Mun Road Improvement Works contract (TMRW) identified the need for a haul/access road (HAR) in the Ting Kau area to remove spoil and to provide access for site vehicles to the works areas. The proposed HAR will not only be used by the TMRW project but also the TKB and TLT & YLA projects, as the construction works for these projects will overlap in time.

In December 1993 and March 1994, the respective Environmental Impact Assessments (EIAs) were completed for the TKB and TLT & YLA Sections of Route 3 CPS. The findings of these environmental studies have been consolidated into two separate EIA Reports. This document comprises the Executive Summary of the TKB Section including supplementary papers (Haul Road and WAHMO Modelling) and provides a non technical appreciation of the project and summarizes the key findings of the EIA.

1.2 Purpose and Objectives of this Environmental Impact Assessment

This EIA has been undertaken to provide a comprehensive assessment of the potential impacts arising from the construction and operation of the TKB Section of Route 3 CPS, and has four main objectives:

- To provide a comprehensive description of the characteristics of the proposed developments which have environmental implications.
- To identify, predict and evaluate the net potential environmental impacts and cumulative effects resulting from the construction and operation of the developments.
- To identify and specify methods, measures and standards for the inclusion into the design which are necessary to effectively mitigate these impacts to an acceptable level.
- To recommend environmental monitoring and audit requirements in order to ensure potential impacts are maintained at an acceptable level.

1.3 Approach

This EIA has been based on the Stage 1 Preliminary Design and with assumptions regarding construction methods and equipment. However, the TKB Section of Route 3 CPS will be developed on a Design and Build basis, which will provide the Contractor with a high degree of autonomy in terms of the detailed design and construction. It is therefore important that the findings and recommendations of the EIA are appropriately developed and eventually translated into the final scheme.

1.4 Legislation and Assessment Criteria Used in the Assessment

Assessment criteria used in the EIA are derived from the Air Pollution, Noise and Water Pollution Control Ordinances. In addition, appropriate guidelines and methodologies have been used including the Hong Kong Planning Standards and Guidelines.

2. PROJECT OVERVIEW

2.1 Route Description

The TKB Section extends from North West Tsing Yi across the northern Rambler Channel via Ting Kau Bridge (Figure 1). At its northern landfall the bridge connects to the Ting Kau Interchange and the alignment crosses both Castle Peak and Tuen Mun Roads. From Ting Kau Interchange (above Tuen Mun Road), the road then proceeds northwards in the TLT & YLA Road section towards the southern Tai Lam Tunnel portal.

The HAR runs from the proposed reclamation west of the headland between Lido Beach and Ting Kau Beach, northwards on a bridge structure across Castle Peak Road. A sliproad from Castle Peak Road links with the HAR, originally proposed to be used by the TMRW project. The route then runs on a steep slope north towards the Tuen Mun Road, where it divides into two branches (see Figure 2) to the west of the alignment.

2.2 Structural Components

The main features of the TKB development considered for this EIA include:

- Ting Kau Bridge approach from the North West Tsing Yi Interchange which facilitates the link to Ma Wan Island, the North Lantau Expressway and Chek Lap Kok Airport.
- The Ting Kau Bridge, a dual three lane cable stayed structure, crossing the northern Rambler Channel from Tsing Yi to Ting Kau on the main land.
- A mid channel bridge support which includes a breakwater and rock island.
- Ting Kau Interchange, comprising four sliproads of which two are to be constructed as part of the TLT & YLA Road Section of Route 3 CPS.

The assumed main features of the HAR include:

- Large areas of cut and fill which will be associated with the HAR. Two temporary steel bridges will be required for the crossing of Castle Peak Road. In the north the road will bridge the associated stream course three times. There will be major areas of cut and fill and supporting embankment works on the western side of the stream and its associated valley. Embankment works to support the road will infringe upon portions of the stream bed and bank.

- A reclamation/seawall which will be constructed off the Lido Beach headland and will be used as a works area. It is anticipated that it will be constructed using a block wall on a dredged foundation producing 110,000m^3 of dredged spoil which will require disposal. A large area of cut will occur east of Lido Beach, immediately north of the proposed reclamation;

- A concrete batching plant covering an area of approximately 2,500m^2 will be located on the reclamation. There will be a need for one barge loading point located on the reclamation for the supply of aggregate to the concrete batching plant and a second barge loading point to facilitate the disposal of spoil.

2.3 Construction

Construction will take place over approximately three years, and award of Tender is scheduled for September 1994. With an earlier date of mid 1994, for the start of construction of the HAR. The construction activities include excavation and foundation works as well as superstructure works for the bridge and road construction. The HAR will be surfaced and the construction traffic will comprise of heavy dump trucks, heavy trucks and concrete mixers for the transportation of spoil, fill and construction materials such as steel and concrete.

It is envisaged that the work areas for the two interchanges will be located near the north and south landfalls of the bridge. The route itself will form a linear works site, and there will be major concentrations of activity at intersections where embankments, sliproads and flyovers are to be constructed. In addition the reclamation at Penny's Bay on Lantau Island has been proposed as a works area for this project and the reclamation at the Ting Kau landfall will be used as a barge loading facility for spoil arising from the excavation operations.

3. STUDY AREA AND ENVIRONMENTAL BASELINE

3.1 Environmental Baseline

In order to determine the existing environmental conditions in the Study Area as a baseline against which to assess potential impacts, information has been drawn from landuse surveys, existing data, ecological/vegetation surveys and environmental monitoring.

The Study Area of the EIA comprises the route corridor of the Alignment and adjacent areas including Ting Kau, northwest Tsing Yi and the northern Rambler Channel. The southern component of this area (north west Tsing Yi Island), comprises steeply sloping, sparsely vegetated hillsides rising abruptly from the coastline. The majority of development in this area comprises light industry located along the coastal margin to the west and north of Tsing Yi reclamation.

The mainland at Ting Kau encompasses the hillsides and coastal areas between Tuen Mun Road in the north and the southern coast line. The area between Castle Peak Road and Tuen Mun Road is undeveloped comprising a range of gently rising hills. From Tuen Mun Road the hills and natural countryside rise northwards towards the Tai Lam Country Park reaching a peak at approximately 260m. Vegetation in the areas that are not developed consist primarily of scrub and stands of mature trees which create a green view of the hillside. The settlement pattern in the surrounding areas is dispersed, and consists of low-rise development along the coast.

Air Quality

The main impact source on existing air quality in the Study Area comprises existing traffic, notably on Tuen Mun Road and emissions from industry located on north west Tsing Yi. Baseline air quality monitoring established that existing pollution levels did not exceed the Hong Kong Air Quality Objectives. However, construction of nearby developments such as the proposed Lantau Fixed Crossing and the Tuen Mun Road improvement project may contribute to air pollution in terms of dust and vehicle emissions.

Noise

Background levels in the vicinity of the alignment are currently low (in the region of 50-55 dB(A)), reflecting the relatively quiet nature of the Study Area.

Water Quality

Receiving water bodies in the Study Area comprise the northern Rambler Channel and a stream draining to Lido Beach. The marine water quality in the northern Rambler Channel is generally poor. A major source of impact is the Pearl River, which delivers significant quantities of sediments and industrial effluent to local marine waters. In addition, the water in the area contains high levels of *E-coli* primarily due to the discharge from sewage and stormwater outfalls located on the mainland coast between Sham Tseng and Tsuen Wan.

Gazetted beaches in the Study Area are situated along the Rambler Channel (with one located on Ma Wan). These beaches have been graded by EPD:-

Beach	Status
Approach	Very Poor
Ting Kau	Very Poor
Casam	Poor
Lido	Poor
Gemini	Poor
Hoi Mei Wan	Poor
Anglers	Poor
Tung Wan	Fair

* Source : *(Bacteriological Water Quality of Bathing Beaches in Hong Kong, EPD 1992)*

Sediment Quality

The extent of the marine sediments in the Study Area were found to be extremely variable. In some locations they are seriously contaminated with heavy metals as well as other pollutants such as nitrogen, phosphorous and hydrocarbons. Results from four separate sediment analysis studies in the area have been reviewed. While the studies are not comprehensive their results indicate that some of the marine mud is contaminated by metals particularly at the surface and also at varying depths down to a depth of approximately 2.5m.

3.2 Key Existing and Committed Sensitive Receivers

Key existing sensitive receivers within, and adjacent to the Study Area have been identified in relation to their susceptibility to noise, air quality, industry, cultural, recreational, ecological, visual and livelihood aspects. These are shown in Figure 3 and include:

- The northern Rambler Channel;
- Residential development at Ting Kau;
- The gazetted beaches along Rambler Channel and on Ma Wan;
- The Fish Culture Zone on Ma Wan;
- The Temple on Lido Beach; and
- Aquatic life including fish species and the Chinese White Dolphin.

4. ENVIRONMENTAL IMPACTS

4.1 Introduction

The TKB impacts are discussed below according to the specialist subject areas. The HAR was assessed separately and a summary of the impacts is given at the end of this section. The HAR assessment includes cumulative impacts of nearby construction projects including the TMRW and TKB projects.

4.2 Air Quality Impacts

Construction

Construction dust is predicted to exceed the 1-hour and 24-hour desirable maximum concentrations. This is due to the large construction area and the number of concurrent construction activities assumed in the computer modelling which will not actually occur in practise. Practical mitigation measures have been proposed to reduce these high dust concentrations to an acceptable level. However, it should be noted that other construction projects operating simultaneously in the area are expected to contribute to the impacts on local air quality.

Operation

Results of the air quality assessment indicate that the level of Respirable Suspended Particulates will not exceed the assessment criteria for the years 2001 and 2011. Concentrations of nitrogen dioxide in close proximity to the alignment however, are likely to approach the Air Quality Objective standards along Tuen Mun Road in the year 2001, and along the bridge/viaduct in 2011.

Although pollution levels immediately adjacent to both Route 3 CPS and Tuen Mun Road are expected to be significant, pollutants are expected to disperse sufficiently over distance such that sensitive receivers in the Study Area should not experience pollution levels exceeding the Air Quality Objective maxima.

4.3 Noise Impacts

Potential noise impacts arising from both construction and operation were assessed under two scenarios; with and without mitigation.

Construction

Construction noise is predicted to significantly affect receivers in the Ting Kau area. With noise mitigation incorporated in the form of fixed solid barriers around significant noise sources, 10 residential dwellings would still be subject to noise levels exceeding the noise criteria. These are shown in Figure 4. It is recommended that these dwellings should be provided with noise insulation for the duration of the construction period.

Operation

Computer noise modelling has indicated that only one dwelling will be subject to noise levels slightly above the assessment criteria of 70dB(A). It would require extensive road side noise barrier(s) on the new or existing roads to mitigate this and it is therefore recommended that this one dwelling should be provided with noise insulation as this is considered to be a more cost effective and practical mitigation measure.

4.4 Water Quality Impacts

Construction

Key issues will be the prevention of soil, construction materials, chemicals, sewage etc., from entering the water course and thus the marine waters. Impacts on water quality may occur both as a result of surface water run-off and during dredging and disposal (as part of the breakwater and seawall construction), particularly in view of the likely contaminated nature of the marine sediments. To minimise potential impacts, strict mitigation measures should be adopted in relation to controlling run-off, in addition to which the selection of methods and equipment to be used for dredging (once decisions are made regarding location and extent of dredging) will be important factors in pollution control. Special handling and disposal arrangements will need to be made with respect to any contaminated material.

Operation

Potential impacts arising post construction are changes in the hydraulic regime (flows, currents etc.) and associated changes in water quality resulting from the development of the breakwater, reclamation and bridge piers in the northern Rambler Channel. In order to determine the extent and nature of potential effects, hydraulic and water quality computer modelling has been carried out and the findings were that the imposition of the TKB and its associated reclamations (as proposed in the Stage 1 Preliminary Design) should not cause significant long term water quality impacts.

4.5 Waste and Spoil Management

The main environmental issues to be addressed with regard to spoil management and fill requirements for the TKB are minimisation of the amount of spoil arisings, the desire to balance excavation and fill and also collection, handling and disposal arrangements.

A review of fill and excavation requirements has established three main areas of construction activity where surplus spoil will be generated: North West Tsing Yi, Ting Kau and at the Rambler Channel. Viable spoil disposal options comprise use of spoil within the project or reuse for fill in other projects. Potential environmental effects from spoil disposal activities can be considered to be essentially limited to construction related impacts, although further consideration will need to be given to end state impacts during detailed design.

It is proposed that excess material from the Ting Kau area will be brought by trucks down to the barge loading point at the reclamation.

At the site specific level, a range of environmental protection measures will be required including: measures ensuring transport and access routes bypass sensitive areas such as residential premises or areas of high ecological interest; and design and programming of site disposal activities to minimise long term impact and maximise environmental gain.

Stockpiling of spoil may result in adverse impacts however as details are unavailable, this is most appropriately covered during the detailed design.

4.6 Landscape and Visual Impacts

Landscape and Visual Impacts

Three elements of the TKB Section of Route 3 CPS were identified as being likely to create significant visual and landscape impacts:-

- the North West Tsing Yi Interchange;
- the TKB crossing; and
- the Ting Kau Interchange.

The most severe and permanent impact on landscape character will occur as a result of the Ting Kau Interchange. The potential impacts will be compounded when the subsequent TLT & YLA Road Section is constructed, adding a further two elevated sliproads to the north of the proposed route.

With regard to visual intrusion, the impacts of the Bridge itself will remain significant throughout its operational life. However the most significant post construction impact will be the introduction of the elevated structure, moving traffic and the resulting intrusion on receivers within the Ting Kau area.

Landscape Mitigation

Both temporary and permanent landscaping measures have been identified to reduce the landscape and visual impacts of the project during and post construction. Measures to be adopted during construction largely consist of good site practice and temporary screening.

Post construction, detailed landscape works will be required. In addition, permanent mitigation measures should include design considerations and in particular attention to the detailed alignment of the route and selection of appropriate colours and materials etc. The nature of landscape works follow broad guidelines previously described in the *Stage 1 Preliminary Design, Costing and Programme Report*, and should be discussed with the relevant implementation and maintenance authority at an early stage. These guidelines share a common theme with other landscape works proposed for the area outside of Route 3 CPS.

4.7 Community Issues

The project will affect the local community during construction and operation through severance (both perceived and actual), loss or disturbance of amenity and recreational resources, landtake, and general disruption and disturbance.

Construction

Impacts will primarily affect sensitive receivers at Ting Kau, surrounding properties, and users of recreational areas along the coast and in the wooded hillside to the north. These will generally be temporary in nature (severance, disturbance etc.) but are however considered significant as they may last for up to 4 years.

Impacts on recreational/amenity value are of concern in relation to the beaches and the mainland woodland. The most significant impact will be to the east end of Lido Beach where the proposed reclamation for the bridge pier and construction area for the bridge piers are located. Movement of construction materials and vehicles along access roads, noise and dust nuisance, and disruption of accessibility will contribute to deterioration of this recreational resource, and may result in closure of the beach during construction works.

Operation

The main issues include community severance, landtake, noise, air quality and visual impacts which in turn create impacts in relation to development potential and land values.

Residual impacts from construction activities will largely depend on the effectiveness and efficiency of mitigation measures adopted in earlier stages. The permanent loss of amenity will be significant with respect to Lido Beach and to a lesser extent for Casam Beach. Although there will be significant visual impacts and reduced access resulting from the development over the hillside, the importance of this in terms of recreation is less and therefore potential impacts will be limited.

4.8 Ecology

Terrestrial Ecology

The primary residual impact on terrestrial ecology will be the loss of land area and associated habitat on the Ting Kau side. Although these habitats are mixed with suburban residential and recreational land uses, they are somewhat protected due to the general remoteness of the areas affected. As a result, they harbour mature, closed canopy forest cover near a small freshwater stream. In the absence of wild fire, the woodland canopy could progressively extend uphill from the stream valley (above Castle Peak Road) and could provide a productive, stable, and unusual habitat in this area.

Although it is not certain that all of this woodland and riparian habitat will be removed during the construction phase, it is assumed that much of the existing vegetative cover will be lost. It would require several decades for the existing mature woodland areas to be revegetated from bare ground. Restoration of the existing species diversity would require a similar timespan, during which much of the value of the area for birds and invertebrate wildlife will be lost.

Marine Ecology

Some mobilization of toxic materials in sediments from the construction and reclamation areas will be a residual impact of the construction phase. However, the impact will be short-term and given the poor baseline condition of the local flora and fauna, the effects are not likely to be severe.

The breakwater and other marine structures may give rise to some residual impacts, due to its effect on current patterns and water flows. However a modelling study has indicated that the design structure would not cause significant water quality impacts. The marine ecology impacts are therefore likely to be limited to direct loss in the 'foot print' area of the reclamations and possibly longer term cumulative impacts.

4.9 Risk Assessment

The risk assessment has enabled a preliminary estimate of the probability that a ship will collide with TKB, with sufficient force to cause significant damage. For this to occur, it is estimated that the vessel must be >5,000 dwt.

The risk assessment predicted that for ships of this size the overall chance of collision is 1 in 100 per year. For vessels >15,000 dwt, the chances of collision would be reduced to about 1 in 200 per year, and for vessels >30,000 dwt, the chances would be about 1 in 400 per year.

The risk of collision (and damage to the bridge) can only be reduced by the provision of further physical protection around the bridge supports. The nature and extent of these measures will necessarily depend upon the design criteria for the bridge. It is possible that different criteria and design principles will be appropriate where there are risks to people (due to an incident involving dangerous goods or partial collapse of the roadway). It is therefore recommended that further consideration should be given to the need for more detailed technical studies, to determine the extent and nature of any necessary design measures.

4.10 Haul Road Impacts

Construction

The HAR will be constructed simultaneously with some works for nearby projects and due to the steep topography of the area will require significant cut and fill activities. The main potential environmental impacts are predicted to be the cumulative impacts arising through elevated dust and noise emissions affecting nearby sensitive receivers. Mitigation measures have been recommended to reduce the potential impacts, however with regard to dust emissions, the mitigation measures proposed may be inadequate to bring dust levels within acceptable limits when particularly dry and windy conditions prevail. Consequently, stringent dust control measures must be strictly enforced.

Water quality impacts are predicted as a result of construction site run-off into fresh water receiving bodies, and loss of material in the form of suspended solids to the marine environment during the construction and reclamation process. Mitigation measures have been identified and should be included in contract documentation to ensure the implementation of such measures.

The cutting activities will result in spoil arisings, however these arisings are not anticipated to be problematic in terms of their effect on the environment. Quantities in excess of the fill requirements are recommended to be used for the proposed reclamation at Ting Kau Headland, and good site practice should ensure that potential impacts from fugitive emissions are maintained at an acceptable level.

The visual impact is predicted to be severe for those receivers with direct views, including residential properties north of Tuen Mun Road and Castle Peak Road. The HAR is a short duration project and therefore these impacts will be relatively short term in nature. Careful attention to restoration once the construction phase is completed is therefore essential. In order to minimise the long term impact on terrestrial ecology, a habitat restoration programme should be implemented. It is proposed that the programme should focus on replanting rather than natural recolonisation due to the long timescale required for the latter, and the desire to establish a habitat suitable for recolonisation by birds and invertebrate species.

Operation

The main environmental impacts resulting through the operation of the HAR are predicted to be a result of elevated noise levels at a limited number of sensitive receivers for which mitigation at the receiver has been recommended. In addition dust emissions associated with traffic are expected to be significant, and similarly appropriate mitigation has been recommended.

Potential impacts associated with the transportation and handling of spoil and wastes, including the movement of concrete and materials, and aggregate deliveries by barge, comprise adverse effects on aquatic ecology. Impacts associated with the transport of materials can effectively be mitigated and appropriate measures have been identified. Residual impacts on aquatic ecological resources however, are anticipated to be severe and mitigation can be achieved following project completion. However, the necessary measures would require attention over many years due to the time required for regrowth of mature riparian vegetation.

5. ENVIRONMENTAL MONITORING AND AUDIT

Environmental monitoring and audit requirements for the construction and operation of the TKB Section have been identified and outline monitoring schedules and action plans defined with respect to air quality, water quality and noise. The effective implementation of a comprehensive monitoring and audit programme is essential in order to:

- ensure that any environmental impacts resulting from the construction and operation of the TKB section of Route 3 CPS are minimised or kept to 'acceptable' levels at all times;
- establish procedures for checking that mitigation measures have been applied and are effective, and that the appropriate corrective action is undertaken if and when required; and
- provide a means of checking compliance with environmental objectives, recording anomalies and documenting corrective action.

In order to ensure that these objectives are achieved, monitoring and audit requirements should be incorporated into the contract documents for the project for implementation during both construction and operation of TKB.

As the timing of the construction and operation of the HAR will coincide with the two much larger scale construction activities of the Tuen Mun Road Improvement Project and TKB, environmental monitoring requirements of the HAR may co-incide in many cases with monitoring for these projects. As such, monitoring in many cases should not be duplicated, but the data used for overall assessment of cumulative impacts.

6. CONCLUSIONS AND RECOMMENDATIONS

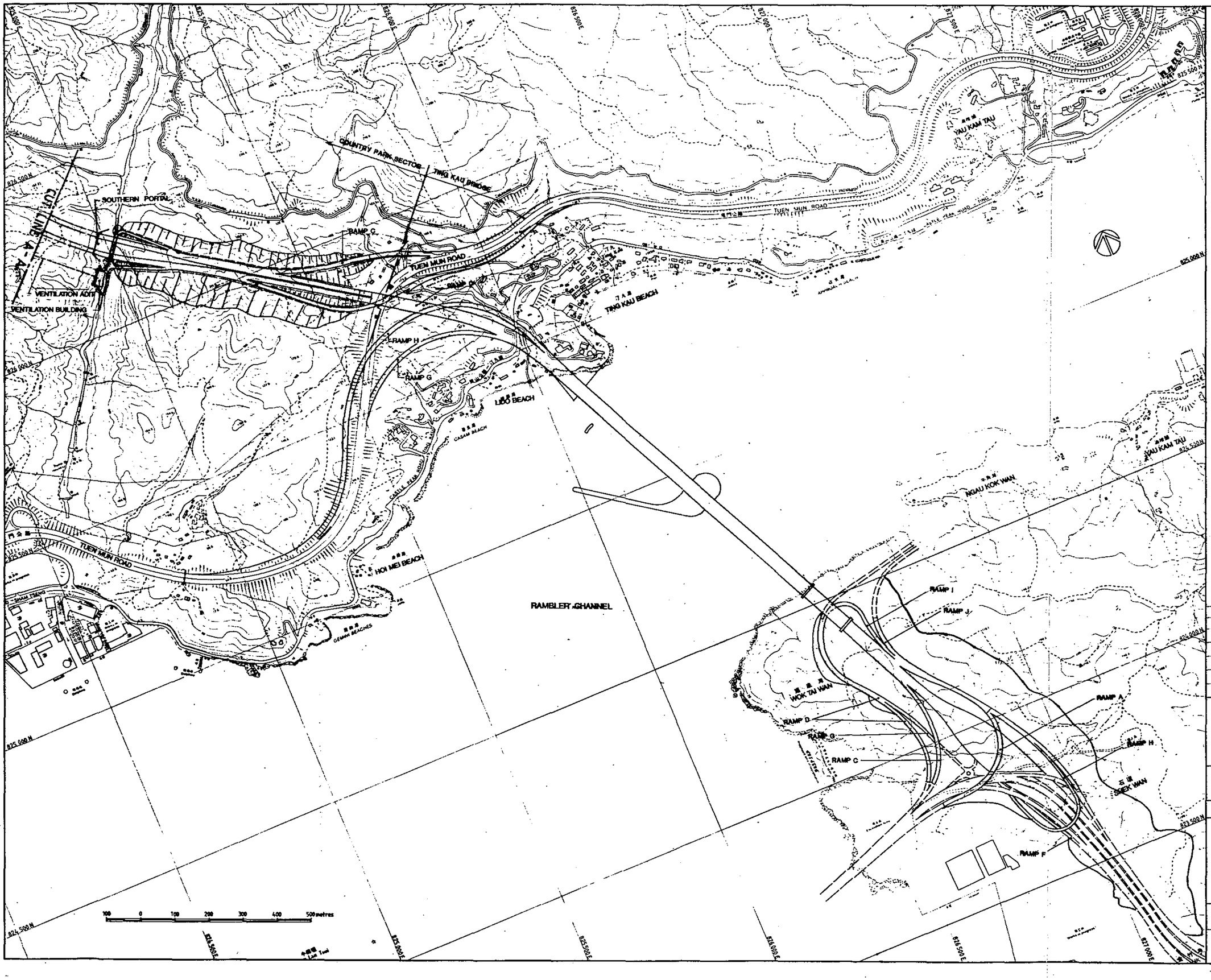
6.1 Ting Kau Bridge

The EIA has been based on the Stage 1 Preliminary Design. The findings of the assessment will be addressed through both the Tender process and during detailed design when further detailed environmental evaluation is recommended. Given the Design and Build nature of the project it will be essential to update this assessment in accordance with the actual proposed construction details, any new data such as confirmed traffic flow predictions as well as assessment of all significant changes to the design.

Practical mitigation measures have been proposed to minimize environmental impacts and environmental monitoring and audit requirements identified to ensure impacts are maintained at an acceptable level.

6.2 Haul Road Impacts

The most significant environmental impacts associated with the HAR are anticipated to be a result of construction activities, and associated noise and air quality impacts. Mitigation has been identified and must be strictly enforced, particularly during dry and windy conditions when dust impacts could be significant. Operational impacts will affect a limited number of sensitive receivers in terms of noise for which mitigation at the receiver is recommended. Adverse impacts on the limited aquatic ecology in the study area is predicted to be significant. This will be difficult to mitigate without implementation of a project to re-create the streams course or an acceptable alternative.



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Revision			
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Approved For Issue		Date Of Issue	
Date		© Copyright Reserved	
Scale			

HIGHWAYS DEPARTMENT

WESTERN HARBOUR LINK OFFICE

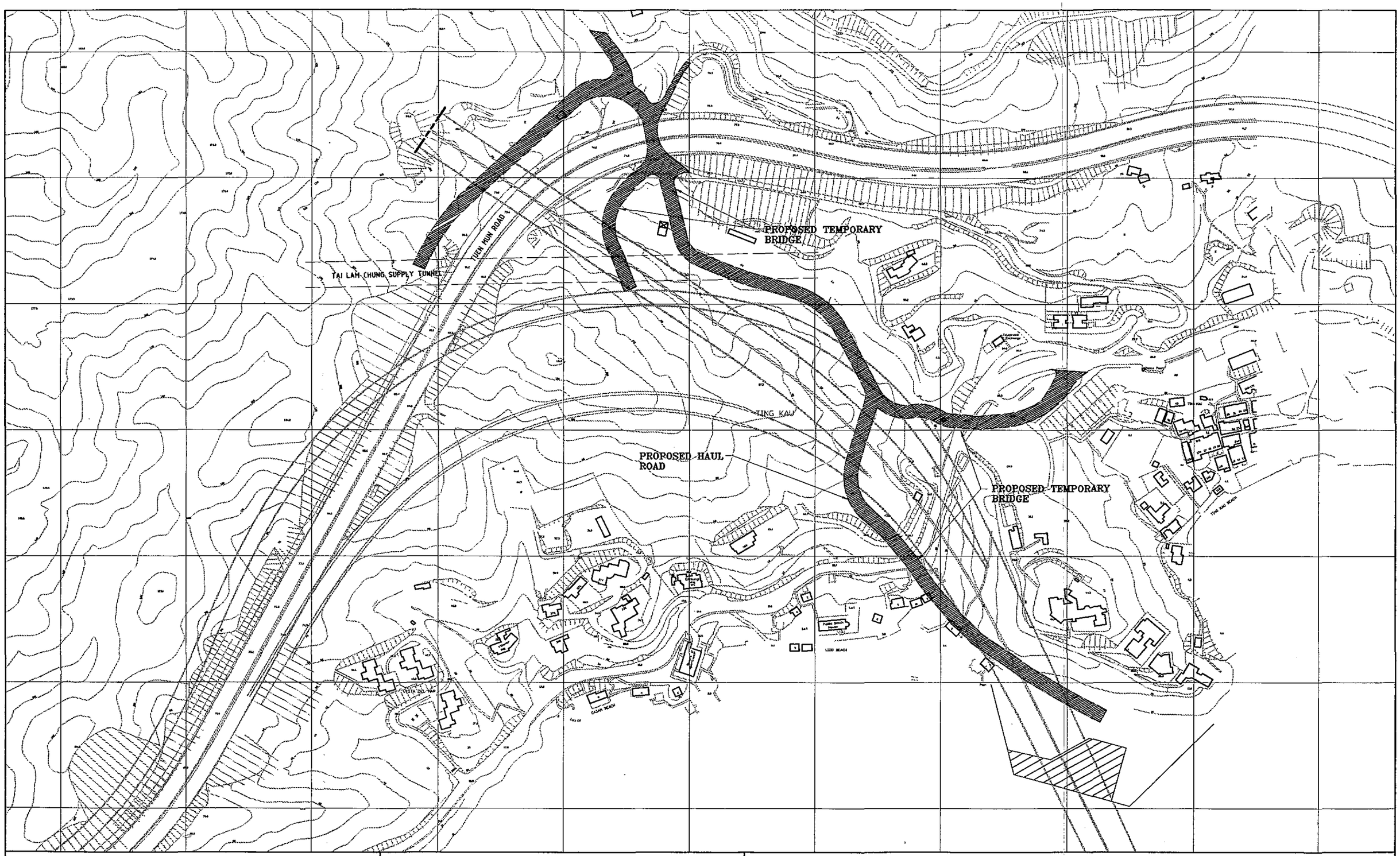
ROUTE 3 COUNTRY PARK SECTION AND TING KAU BRIDGE PRELIMINARY DESIGN STAGE 2

FIGURE 1

TING KAU BRIDGE NORTH WEST TSING YI AND TING KAU INTERCHANGE

Drg. No. 92393/01/30

FREEMAN FOX MAUNSELL



FREEMAN FOX MAUNSELL

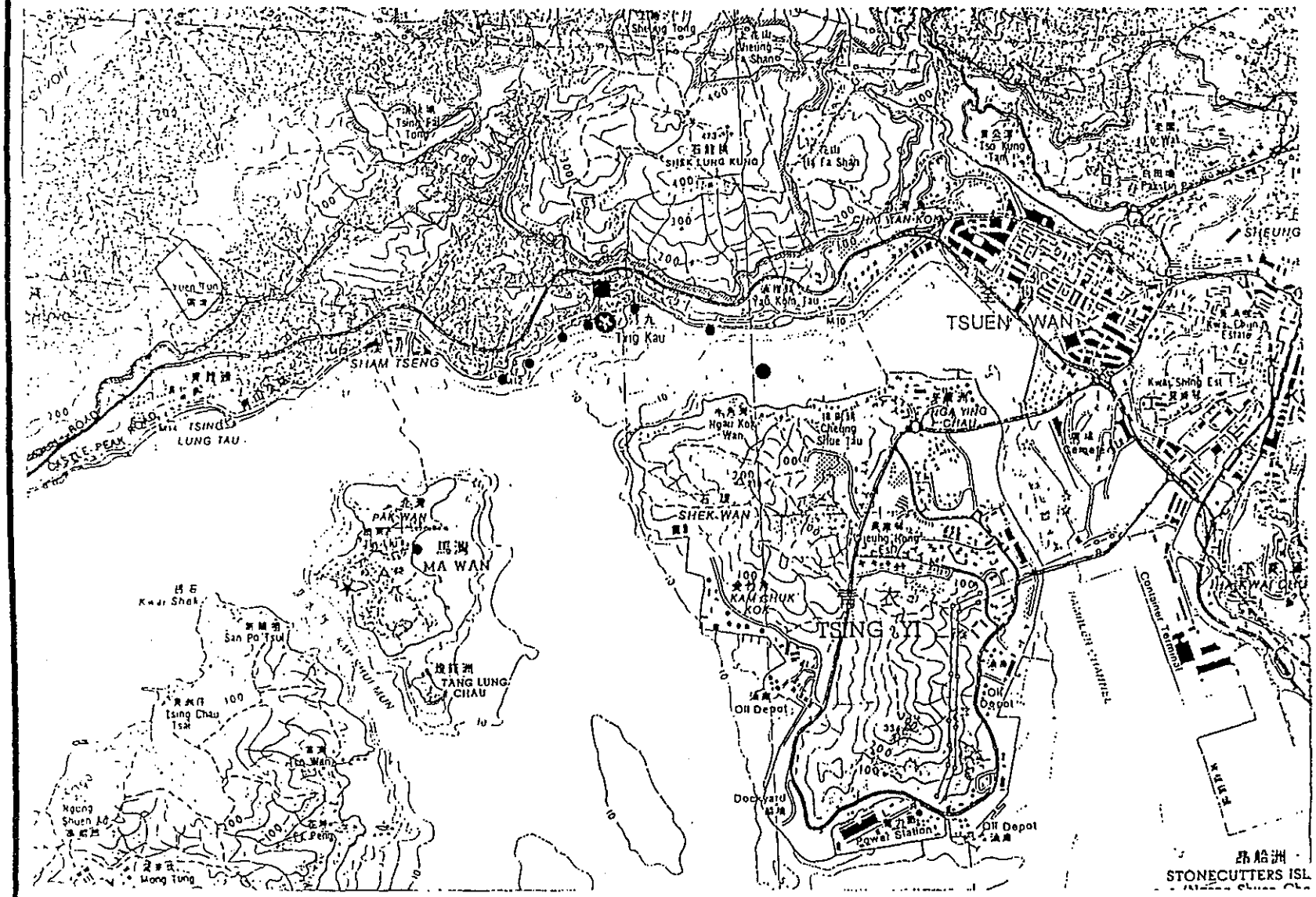
Drg. Title :

MAIN FEATURES OF THE HAUL/ACCESS ROAD AT TING KAU

Job Title :

ROUTE 3 – TING KAU BRIDGE EIA

Scale :	N.T.S.	Job No.	Fig No.
Date	Nov. 93	058 007	2



FREEMAN FOX MAUNSELL

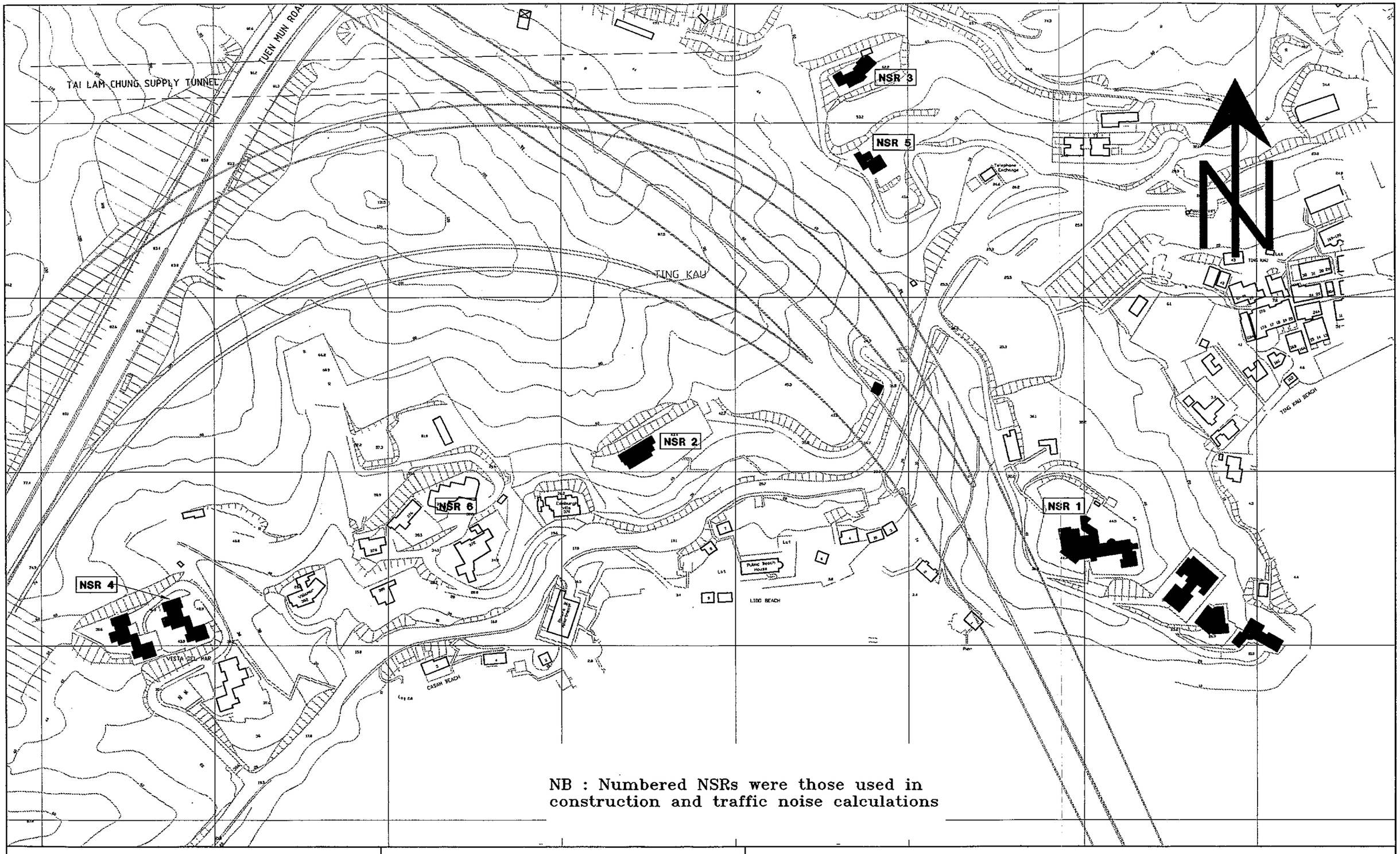
Drg. Title :

EXISTING SENSITIVE RECEIVERS

Job Title :

ROUTE 3 TING KAU BRIDGE EIA

Scale	1:50 000	Job No.	058000	Fig. No.	3
Date	July 1993				



NB : Numbered NSRs were those used in construction and traffic noise calculations

FREEMAN FOX MAUNSELL

Drg. Title : TEN NSRs AFFECTED BY CONSSTRUCTION NOISE (>75 d B(A)) – WITH MITIGATION

Job Title : ROUTE 3 – TING KAU BRIDGE EIA

Scale : N.T.S.	Job No. 058 000	Fig No. 4
Date Nov. 93		

汀九橋環境影響評估

摘要

一九九四年六月

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1. 引言

1.1 背景

三號幹線郊野公園段（三郊段）爲全長約15.5公里之公路。此段公路將南面之青衣西北部與北面之元朗和新界環迴公路連接。汀九橋爲三郊段南面之主要路段。汀九橋連同大欖隧道及元朗引道（其南接汀九，北達凹頭）將會成爲香港陸地交通基建設施的主要元素之一。第三號幹線將會成爲非常重要之交通環節，應付從中國、新界西北部、西九龍及位於葵涌和大嶼山擴展中港口所衍生的日益繁重之交通需求。

此工程之可行性研究及初步設計第一階段已於一九八九年十月及一九九二年七月分別完成。初步設計之第二階段亦於一九九三年進行。以上之研究曾經考慮過多個不同的路線，而現在三郊段之路線被視爲最佳選擇。另外，因爲屯門公路改善工程（屯改工程）合約的關係，在汀九區將需要一條工地運料路/交通便道（工運通道），使泥土可以被搬走及提供通道給工地車輛出入地盤。而且，由於屯改工程與汀九橋、大欖隧道及元朗引道等工程於時間上有部份重疊，擬建中之工運通道不單可供屯改工程應用，亦可給其他幾項工程所使用。

汀九橋、大欖隧道及元朗引道之有關環境影響評估（環評）於一九九三年十二月及一九九四年三月完成。而研究所得之結果已綜合於兩份環評報告書之內。此文件爲汀九橋及其補充文件（關於工地運料路和水質模型）之摘要，並提供對工程之非技術性評鑒。環評中之重要發現結果亦被撮寫而收於其內。

1.2 環境影響評估之研究目的

進行此環評是要替三郊段之汀九橋部份，對其施工及操作期內的潛在影響作一個全面性的評估。此環評主要有四大目的：

◎ 對此帶有環境影響之發展的特性作一個全面性的描述。
◎ 指出、預計及評估這些擬建發展於施工及操作期之環境影響及綜合作用。
◎ 指出及詳述各種必須的方法、措施及水準，令工程設計可以將之包括在內，使環境影響被緩減至一個可接受的水平。

◎ 推薦環境監管及審核要求，使潛在影響能保持在一個可接受之水平。

1.3 方法

此環評是以初步研究第一階段作爲基本，而且在施工方法及設備上作出了一定的假設。不過，三郊段之汀九橋部份是會以"設計及施工" 方法而發展，使承建商在詳細設計及施工上有高度的自主權。所以，這份環評內之結果和建議必須作適當的調整，使之可以被融入最終計劃方案裡面。

1.4 環評中所用之評估指標及法例

此環評中所用之評估指標是取自空氣、噪音及水質污染管制各項條例。另外，亦有採用其他適當的準則及方法，包括了"香港規劃標準及準則"。

2. 工程概覽

2.1 路線描述

汀九橋部份由青衣西北伸延而出，經汀九橋越過藍巴勒海峽北部（圖一），再橫過青山公路及屯門公路，在橋北之處與汀九交匯處相連。由汀九交匯處（位於屯門公路之上）起，三郊段一直向北伸展往大欖隧道之南面隧道口而進入了三郊段之大欖隧道及元朗引道部份。

工運通道是從麗都灣與汀九灣之間的海角以西的擬建中填海地開始，以橋樑架構形式跨過青山公路，向北而走。另外一條本來只爲屯改工程而設的連接路，會將青山公路與工運通道接駁起來。由此點起，工運通道順著陡峭的斜坡繼續向北屯門公路方向而行。於屯門公路路線以西，工運通道將分成兩條支線（看圖二）。

2.2 架構成份

此環評有考慮到以下汀九橋發展計劃的幾個主要特點：

◎ 青衣西北交匯處有助連接馬灣、北大嶼山高速公路和赤臘角機場之交通，而汀九橋則由以此交匯處作爲起點。

◎ 汀九橋爲雙程三線行車的張拉橋。此橋由青衣開始，橫跨藍巴勒海峽北部，連接汀九。

◎ 在海峽中央有大橋中部支撐，並包括一小石島及防波堤。

◎ 汀九橋交匯處包括了四條連接路，其中兩條爲三郊段大欖隧道及元朗引道工程之一部份。

工運通道之主要假設特點如下：

◎ 工運通道工程將需要大量土地挖土及填土。而且爲了越過青山公路，要建兩條臨時鋼橋。在北面，通道需用橋三次跨過附近的河流，因此，在河流西岸及其河谷會有大量的地方亦要挖土填土及建築河堤。另外，支撐道路所需之築堤工程亦會牽連到部份的河床及河岸。

◎ 填海/築海堤會在麗都灣對開之地方進行，該處且會被用作施工地區。預料中，填海工程的施工會使用在挖泥地基上築阻隔墻的方法，故此，估計要扔掉110,000立方米被挖出來的棄泥。另外，在貼近擬建填海地之北面地方，麗都灣之東面，亦有大量面積的土地要作挖土工程。

◎ 佔地約2500平方米之混凝土之拌合機裝置會設於填海地。填海地上亦需設置一個駁船裝貨點，使碎石可被運往拌合機處。另外，亦需有第二個的駁船裝貨點幫助運走棄泥。

2.3 施工期

施工期大約需時三年，建築工程預計在一九九四年九月批出。工運通道則會於一九九四年年中較早的日子施工。施工的活動包括了建築橋樑和道路所需之挖土、建地基及上部結構的工作。工運通道上會鋪設路面，而施工交通主要包含重型貨車，重型運輸車及混凝土攪拌車，用以運載棄泥、填土、鋼鐵和混凝土這些施工物料。

預料兩個交匯處的施工地區會設於大橋的南北近岸地。而道路路線本身亦會形成爲一個長線形施工地。施工活動亦主要集中於此施工地內的堤岸、連接路和天橋的交接點上進行。另外，有建議將大嶼山的竹篙灣填海地用作此項工程的施工地區，而在汀九近岸的填海地會被用作駁船裝貨設施，以運輸從挖泥工程所得的棄泥。

3. 研究地區及環境基線

3.1 環境基線

此研究以研究地區內的現存環境條件作爲環境基線，用以比較和衡量此工程之未來環境影響程度。所得資料是來自土地運用測量、現存資料數據、生態/植物測量及環境監測。

此環評之研究地區範圍包括了汀九橋的路線走廊及其毗鄰之地方，包括汀九，青衣西北部及藍巴勒海峽之北部。此研究地區之南邊部份（即青衣島西北）有著很多從海岸線奇峰突出的陡峭山坡，山坡上佈著零散植被。此研究地區的主要發展爲輕工業，位置是在西面的海岸線旁邊及青衣島填海地之北面。

在汀九的陸地包括了介乎北面的屯門公路及南面的海岸線之間的山坡及岸邊地。在青山公路及屯門公路之間的地方是未經發展的一列順勢緩升的山丘。這些山丘及自然郊野地從屯門公路開始，向北面大欖郊野公園的方向緩緩升高，直至高度約260米的山頂。在這些未經發展的地區上之植被主要爲灌木及成熟的喬木，令此處的山坡有著綠色的景貌。這附近四週的村落爲較低的建築物，沿著海岸線零散地分佈。

空氣質素

在研究地區內現存的空氣質素影響是源自現有的交通，尤其是屯門公路，及西北青衣的工業廢氣。空氣質素監管的環境基線顯示出現有的污染水平仍未超過香港空氣質素指標。不過，附近地區發展的建築施工，例如青馬大橋及屯門公路改善工程，會帶來沙塵和車輛廢氣，可能會加重此處的空氣污染。

噪音

擬建中汀九橋的路線現時的背景噪音程度偏低（在50-55 分貝範圍以內）。顯示出研究地區是有著較寧靜的自然環境。

水質

在研究地區內的接收水體包括有藍巴勒海峽北部及一條流出麗都灣的河流。藍巴勒海峽北部的海洋水質普偏甚差。水質影響的主要是來自

珠江，它給本區海水帶來了大量的沉澱物及工業污水。而且此區之海水有高度的大腸桿菌，其來源主要是來自深井與荃灣之間岸沿線所排出的污水及雨水。

在研究地區內的公開海灘全是位於藍巴勒海峽的沿岸（其中之一位於馬灣）。環保署已將這些海灘分級：

海灘	級數
近水灣	非常差
汀九灣	非常差
更生灣	差
麗都灣	差
雙仙灣	差
海關灣	差
釣魚灣	差
東灣	普通

*資料來源：*香港泳灘細菌水質，一九九二年環保署*

沉殿物質素

在研究地區內有極多種不同海洋沉澱物。某些海域裡的海洋沉澱物，嚴重地染有重金屬及其他污染物，如氮、磷及碳氫化合物。此區的四個個別的沉澱物分析研究已被審核，雖然這幾個並非全面性的研究，但它們的發現結果都顯示出此區某部份的海洋泥土被多種金屬所污染，污染程度以泥土表面尤甚，而污染物亦直透泥土不同深度，最深爲2.5米。

3.2 現存的主要污染敏感接收物/地點

在研究地區之內及其毗鄰之污染敏感接收物是以其噪音、空氣質素、工業、文化、公娛、生態、視覺及生活狀況各方面對污染的敏感程度來定出。圖三展示出這些污染敏感接收物，包括有：

- 藍巴勒海峽之北部；
- 汀九之居住發展；

- 藍巴勒海峽岸及馬灣上之公開海灘；
- 馬灣上之海魚養殖區；
- 麗都灣上之廟宇；以及
- 海洋生物包括中國白海豚及各種魚類。

4. 環境影響

4.1 簡介

以下會跟據不同的專題去討論汀九橋的環境影響。工運通道的環境影響會分開來評估，而其總綱亦會在此節尾段附上。工運通道的環評包括了鄰近施工工程，如汀九橋及屯改工程所帶來之綜合影響。

4.2 空氣質素影響

施工期

預計施工塵埃濃度將會超過1小時及24小時的理想中最大限值，這是因爲電腦模型中假設了大量範圍的施工地及大量的施工活動同時進行，而實際上此情況是不會發生的。實際的緩減措施亦已被提議以減低這些塵埃濃度至可接受程度。可是，要注意的是在該地區亦有另一些工程將會同時施工，這點亦會帶來一些地區性的空氣污染。

操作期

評估結果顯示空氣中可吸入的懸浮粒子將不會超出2001年及2011 年的指標。而在2001年汀九橋附近的屯門公路及2011 年在高架大橋處之二氧化氮濃度將會達到"空氣質素指標"所定的標準。

雖然在三郊段及屯門公路旁地區的污染程度將會較爲顯著，但預計這些污染將會有足夠的距離擴散，以不致令研究範圍內的敏感地區受到超指標的空氣質素影響。

4.3 噪音影響

施工及操作期之潛在噪音影響分別按有及沒有緩減措施而進行評估；

施工期

施工噪音將顯著地影響汀九地區，若運用緩減措施如在主要噪音源建固定隔聲屏障，仍然會有十個住宅屋宇受超於標準的噪音影響。圖四說明了這些受影響的屋宇地點。建 議這些屋宇在施工期間應給予隔音設備。

操作期

從電腦模型結果顯示，於操作期間只有一座屋宇接收到超過指標(70 分貝)的噪音。若要減低這路段的噪音，需要設置大量的隔聲屏障。所以，建議中較有效的方法是於這屋宇裝上隔音設備，此方法是較實際和有較大的經濟效益。

4.4 水質影響

施工期

水質影響所需注意的主要事項就是防止泥土、施工物料、化學品、污水等排進水道然後流入海中。水質影響來自地面水徑流及（於興建防坡堤及海堤時）挖泥和棄置泥土活動，尤其是海洋沉澱物裡極可能帶有污染物。爲了盡量減低這些潛在影響，應採取嚴厲的緩減措施以控制徑流，而當挖泥地點及範圍確定以後，挖泥方法、機器的選擇亦是控制污染的重要要素。受污染的物質亦需要特別的處理及棄置。

操作期

操作期可能發生的影響是來自施工期後所產生的水力變化（如水流方向、流量等），這都是與在藍巴勒海峽北面所建造的海堤、填海及橋墩對海水水質影響變化有關。水力及水質電腦模型結果顯示了影響的範圍及性質，說明了汀九橋的建造及其填海工程（跟據第一期初期設計所建議的）應不會構成嚴重的長期水質影響。

4.5 廢物與棄土的管理

有關汀九橋棄土管理及填料要求的環境要點在於如何將產生之棄土減至最少，盡量令挖出泥土量與填料量相等，另外，亦需小心安排收集、處理及棄置的方法。

根據填土及挖泥要求的檢討，可認出三個主要施工地方會有特多的棄土產生，它們就是在西北青衣、汀九及藍巴勒海峽。 可行的棄置方法是將棄土用於工程的另一部份或用之作其他工程的填料。廢土棄置所帶來的潛在環境問題只會發生在施工期，可是，最終的影響應在詳細設計時再加考慮。

建議將汀九地區的多餘物料由貨車運到填海區的駁船裝貨點裡。

在地盤的特定水平，須要有一連串環保措施，如盡量避免運輸及通道走近敏感地區如住宅或有生態價值的區域。另外，在設計及安排棄置泥土活動時，應將長遠影響減至最低，令環境受益增至最大。

棄土推填將會帶來不利影響。可是因爲現今仍未有詳細資料，所以此問題將在詳細設計裡考慮。

4.6 景觀及視覺影響

景觀及視覺影響

三郊段的汀九橋將會有三處地方造成顯著的視覺及景觀影響：

◎ 西北面的青衣交匯處
◎ 汀九橋
◎ 汀九交匯處

汀九橋交匯處將會造成最嚴重及永久性的景觀影響。這潛在影響的嚴重性將會繼大欖隧道及元朗引道的落成而增加，因爲有兩條高架連接路將會加建在此段路的北面。

至於橋身落成後，視覺影響將繼續保持顯著。可是最重要的操作期影響是來自高架段、交通運作和它們對汀九敏感地區所帶來的視覺障礙。

景觀緩減措施

爲了減輕工程施工期及施工後的景觀及視覺影響，已定出一些暫時及永久的景觀措施。對施工期來說，這些措施大部份都是針對運用良好的施工工序及臨時屏障。

操作期將需要詳細的景觀設計。永久的舒緩措施應包括設計上的考慮，尤其是對於路線詳細位置、顏色及物料的選擇等。這些舒緩景觀工作的性質是參考*初步設計第一階段費用及計劃報告*中所描述的大綱指引，及應在早期與有關實行及維修部門磋商。報告中的指引與三郊段以外地區所建議的其他景觀工程有著相同的主旨。

4.7 社區影響

工程施工及操作期都將令到在該地區的社區分隔（觀感上及實際上）、干擾或佔用了附近的康樂資源與及休憩地、和帶來一般性的阻礙及干擾。

施工期

公路工程主要會影響到汀九及附近地區的敏感接收物、沿岸的康樂地區及北面的山邊樹林。這些影響一般都是暫時性的（如分隔、干擾等），可是，因施工期將長達四年，影響程度亦算顯著。

因爲附近有海灘及林木，所以工程對該區的康樂/休憩價值的影響被受關注。在麗都灣東面的橋墩地盤及其填海地一帶，所受的影響尤爲顯著。建築物料的搬運、通道上的交通、噪音及塵埃滋擾、和通道的阻礙都會令該區的康樂價值減低，在施工時海灘亦可能暫時封閉。

操作期

主要的問題包括社區分隔，土地佔用，噪音、空氣及視覺影響。這些影響亦會令將來的發展潛力及地價有一定程度的影響。

至於日後施工完成後的長期影響之大小，將視乎早期加入的緩減措施之效率。麗都灣的休憩損失將是永久和顯著的。而次要的就是更生灣。雖然，山坡上的發展會帶來顯著的視覺影響且令交通會較不方便，但以康樂角度來看，這點重要性較低，因此潛在的社區影響亦將不會很大。

4.8 生態

陸地生態

主要的陸地生態影響來自汀九地區的土地和生態環境的損失。雖然現時的動物棲息地都是與近郊住宅區及康樂用地混合。但這些地方是因爲疏遠關係而受到一定的保護而不致受影響。亦正因此原因,此處的樹林可靠近一條小河而生長茂盛而至樹葉蓋頂。而且因爲沒有山火，這些密蓋林木，可續漸沿山谷（青山道之上）水流向山上發展，而漸成一個有生產力、穩定及稀有的棲息地。

雖然這些木林及水濱棲息地是否因施工而被除去仍未能確定，但部份的樹木蓋頂都應會失去。而當這些木林失去之後，要到幾十年之後才可將平地再植至現在的老木樹林。到時要將鳥類種類的繁多性回復現狀，亦須幾十年時間。期間這地方對鳥類及無脊椎動物的價值將會消失。

海洋生態

施工期完成後的影響將來自施工及填海的有害沉澱物的遷移。但這些影響將是暫時性的，加上現時該地的動植物條件基線較差，所以影響應不會嚴重。

防浪堤及其他海洋建設因影響水流狀況而有可能會影響到海洋生態，可是模型研究顯示出現時的建設設計並不會對水質帶來顯著影響。所以，海洋生態影響很可能會只局限於填海地本身的地方及可能的長期綜合影響。

4.9 風險評估

風險評估是初步預計一首船撞向汀九橋以致嚴重損失的機會率。估計若發生此等嚴重撞擊力量，船身必重於5000總載容量公噸。

風險評估預計這種重量的船撞向汀九橋的機會是一百年一次。至於重於15,000總載容量公噸的船隻，撞橋機會會減至二百年一次。船隻重於30,000總載容量公噸的撞橋機會將是四百年一次。

減低撞橋風險（及對橋身的損毀）的唯一方法就是在橋柱加多一些保護。這保護的性質及範圍應視乎橋的設計標準。若果顧及人的安全時（如危險物品或部份路節下塌時），設計標準及宗旨應該隨之變化。所以應考慮作進一步的詳細技術研究，以確定必須措施的性質及範圍。

4.10 工運通道的影響

施工期

工運通道將會與附近的工程同時進行。另外，因爲此區地勢陡斜，所以需要大量的挖土填土工作。預計的主要環境潛在影響是指升揚的塵埃及噪音對附近敏感接收物的綜合影響。已建議緩減措施減少潛在影響，不過，對塵埃影響來說，尤其是當天氣乾燥及大風的時候，已建議的緩減措施可能不足以將之降至到可接受水平之內。所以，嚴格的塵埃管制一定要密切執行。

預計中之水質影響是因施工地之水徑流流往本爲清淨的新鮮水源。另一影響來源，則是在填海及施工過程中，物料以懸浮固體的狀態流失至海洋環境裡。適當的緩減措施已被定出來，這些措施應被列入合約文件之內，以確保妥善執行。

挖土活動會帶來棄土，不過，預計這些棄土對環境的影響將不會造成問題。若果有過多的棄土而不能全用作填土，過剩的可以供給汀九填海之用。而且，良好的地盤運作亦可確保因棄土流失而帶來的潛在影響會被保持在一個可接受的水平。

預料中，直接面向工運通道的敏感接收物，包括青山公路及屯門公路以北的居住物業，將會有嚴重的視覺影響。不過，工運通道是一個只維持短時期的工程，所以這些視覺影響在性質上亦只是短暫的。故此，在施工期完成後的還原措施是非常重要而需特別小心著意。爲了盡量減低對自然生態的長期影響，應該要推行生態地復原計劃。建議中，此計劃應著重於移植樹木而非讓它們天然重生，因爲後者需要很長時間，而前者可以製造一個生態環境適合給鳥類和無脊椎動物作棲身地。

操作期

預料中，工運通道操作期所帶來的主要環境影響，是指有限數目的敏感接收物因聲音升揚所感受到的噪音影響。所以，建議在這些接收物設置緩減措施。另外，因爲交通產生的塵埃影響亦頗爲顯著，故此亦建議利用適當緩減措施來減輕塵埃影響。

運輸及處理棄泥及廢物，包括了搬運混凝土及物料和用駁船大批送運碎石，都會帶來潛在影響而且對海洋生態有不良作用。爲使運輸物料產生的影響能夠有效地緩和，已提出了適當的緩減措施。不過，對水生生態資源的長遠影響，預計會較嚴重，其緩減措施可以在工程完成後推行。但是，所需的緩減設施需要經年打理，因爲岸邊植物之重長成熟亦需多年時間。

5. 環境監察及審核

汀九橋部份之施工及操作所需之環境監察及審核要求已被定出。而且有關空氣質素、水質及噪音的監察大綱進度表及行動計劃已明確定下來。

有效地執行一個全面性的監察及審核計劃是很重要，目的爲：

- 確保三郊段之汀九橋部份因施工和操作而帶來的環境影響可被減至最低或能夠在任何時間都保持在"可接受的水平"之內。
- 定立程序去檢查緩減設施是否有被執行，確保這些設施仍然有效。當有需要時可以進行適當的修正行動。
- 提供一個方法去確保措施依然符合環境目的，記錄反常情況及其修正行動。

爲了達到這些目的，監察及審核的要求應該包括在工程合約文件之內，以便在汀九橋工程之施工期及操作期時執行。。

因爲工運通道施工及操作期與另外兩個施工活動大得多的工程（屯門改善及汀九橋工程），在時間上有所重疊，所以工運通道的環境監察要求可能會與這兩個工程相同。若有這情形，不應該作重復的監察行動，但有關的資料應該納入綜合影響的總評估。

6. 總結及建議

6.1 汀九橋

此環評是以初步設計第一階段作爲基本。環評的發現結果應該在投標過程及詳細設計中被認眞的考慮。而且，當進行詳細設計時，亦應有進一步的詳細環境評審。因爲此工程將會以"設計與施工"方法進行，所以此評估要隨著實際擬建施工細則、最新數據如確實的交通流量預測、與及因此環評而作出重大設計改動而不斷修正，以配合最新的實際情況。

爲減少環境影響，已建議實際的緩減措施。而確定的環境監測及審核則是爲要確保影響維持在可接受的水平內。

6.2 工運通道之影響

預料中工運通道最重大的環境影響，是來自施工活動及其所帶來的噪音及空氣質素影響。已定出的緩減措施必須密切執行，尤其是在乾燥大風季節的時候，因爲此時的塵埃影響可能會更爲顯著。操作期的影響會爲有限數的敏感接收物帶來噪音問題，而環評亦提出設置緩減設施於接收物處的建議。在研究地區內的有限水生生態，預料會受到不良的打擊。若不執行河道重造計劃或其他可接受的辦法，這影響將難以被緩和。

圖一： 汀九橋，西北青衣及汀九交匯處
（三號幹線郊野公園段及汀九橋初步設計第二階段）

圖二： 地圖題目：汀九之工地運料路/交通便道
工程名稱：三號幹線 - 工地運料路/交通便道補充文件

圖三： 地圖題目：現有的敏感接收物
工程名稱：三號幹線汀九橋之環境評估

圖四： 地圖題目：受施工噪音影響之十個噪音敏感接收物（>75分貝）- 有緩減措施
工程名稱：三號幹線汀九橋之環境評估