HONG KONG GOVERNMENT

HIGHWAYS DEPARTMENT

PWP Item 454TH: Lung Cheung Road Flyover

Focussed Environmental Impact Assessment

Volume I

REPORT

by

Peter Fraenkel BMT (Asia) Ltd.

in association with

Enpac Ltd.

Urbis Travers Morgan Ltd.

February 1993

Highways Department
Highways (Kowloon) Region
Farm Road Government Offices
11 Farm Road, Kowloon

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AGREEMENT NO. CE 42/91

LUNG CHEUNG ROAD FLYOVER
FROM HAMMER HILL ROAD TO NEW CLEARWATER BAY ROAD
(PWP Item No. 454TH)

FOCUSED ENVIRONMENTAL IMPACT ASSESSMENT

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PREFACE TO FINAL REPORT

The Draft Final Report was circulated to Steering Group on 23 October 1992, with a request for written comments by 9 November 1992.

The report was discussed at a meeting of the Steering Group on 12 November 1992 and was generally accepted with agreed amendments based on written comments received at that time.

Substantial amendments were however requested by EPD at the meeting. The amendments were requested because:

. EPD disagreed with the traffic speeds used by the consultants in assessing road traffic noise in the Draft Report. For the purposes of allowing completion of the Final Report the Consultant and EPD agreed that CTS-2 traffic flows and speeds would remain as shown in the Draft Final Report, with the exception of very low speeds along westbound Clearwater Bay Road, which were increased from 10 kph to 20 kph to ensure strict compliance with the noise assessment procedure. This change has minimal implications for the predicted traffic noise levels presented earlier, and does not affect the conclusions and recommendations presented in the Draft Final Report.

. Additional assessment criteria were submitted by EPD subsequent to the final Steering Group Meeting. These additional criteria were formulated to assess the eligibility of sensitive receivers in the Study Area for "indirect technical remedies" such as window glazing and air conditioning. The issue of indirect technical remedies has taken on greater significance since the decision by Exco to provide such remedies for sensitive receivers exposed to increased traffic noise from the planned Western Harbour Crossing. As a result of these new criteria, the mitigation measures proposed for the Lung Cheung Road Flyover have been expanded to include a heightened noise barrier near St. Joseph's Home for the Aged, and the use of pervious macadam paving material (which decreases the noise from moving traffic) on those portions of the flyover not enclosed. With the resulting package of mitigation measures, it is not expected that sensitive receivers in the Study Area will require additional mitigation in the form of glazing and air-conditioning.

The EPD comments have now been addressed to their satisfaction.

This Final Report now includes at Appendix G a summary of the Comments on the Draft Final Report and the Consultants Responses.

Where significant changes to the text of the Draft Final Report have been made (ie changes other than corrections of typographical errors) *the changes are presented in italics*.

The revised draft was circulated to the Steering Group on 25 February 1993 and as a result further minor amendments were made. These revisions occur on pages 4.3, 9.2 and 9.9. As a result of the revision to page 9.2, pages 9.3, 9.4 are also amended. For clarity these pages now bear the suffix (R).

1. INTRODUCTION

1.1 Background to the Study

1.1.1 The Second HK Government Comprehensive Traffic Study completed in May 1989 recommended inter alia the construction of a flyover linking Lung Cheung Road with the New Clearwater Bay Road in Kowloon.

1.1.2 In February 1992 a Project Steering Group (PSG), convened to assist in planning the flyover, identified 3 possible alignments referred to in this Report as Options A, B & C. The Environmental Protection Department recommended that a focused environmental impact assessment be carried out for each alignment to assist the PSG in reaching a conclusion on the optimum alignment.

1.1.3 In June 1992 Highways Department appointed Peter Fraenkel BMT (Asia) Ltd. to carry out the focused EIA. The start date was July 1, 1992. The Study objectives, the duties of the Consultants and the Study Output required as defined in the Brief are at Appendix A. The Study Area is shown in Figure 1.

1.2 Structure of the Study

1.2.1 The Study was separated into 6 Phases each of which was further sub-divided.

1.2.2 In the first phase all previous reports were studied, and all relevant planning and landuse data was collected. The site was studied and likely environmentally sensitive receivers were identified. From this a program of baseline monitoring was suggested and agreed with EPD. Impact criteria were established.

1.2.3 The second phase identified current environmental impacts and then suitable projection factors were agreed which allowed assessment of likely impacts in the design year, 2011, in the "do nothing situation" with no new flyover constructed. These values were required as a base against which to compare the environmental impacts arising from construction and operation of the flyover.

Phase 2 also involved engineering consideration of the options so that construction methods could be assessed together with their likely impacts during construction.

1.2.4 In phase 3 of the study period, detailed assessments were made of the environmental impacts of each option, both during construction and operational phases. The impacts were compared against design criteria and the need for mitigation measures was established.

1.2.5 Phase 4 involved the costing of Options and of any recommended amelioration measures.

1.2.6 At Phase 5 the progress of the Study was described to the Traffic and Transport Committees of the Wong Tai Sin and Kwun Tong District Boards, to advise them of the issues and to receive any comments made.

1.2.7 In the final phase the Options were compared on the basis of environmental impact, with and without amelioration measures, and construction cost. This allowed the conclusion to the report to be prepared taking account of all the issues identified and of comments received during the consultation.

1.3 Purpose and Structure of the Report

The purpose of this Report is to summarise the work done and to present the findings and recommendations as required by the Brief. The report is in two volumes, Volume 1 Text and Appendices and Volume 2 Report Drawings.

2. APPROACH TO COMPARATIVE ASSESSMENT

2.1 Introduction

In this Section of the Report the Study methodology is described. First, there is a description of the Comparative Assessment Methodology. This is followed by identification of those issues which will have a bearing on the environmental assessment of each Option and thus lead to a decision as to which Option is to be recommended on environmental grounds. These are the Decision Issues. Engineering implications and costs are discussed separately in later sections.

Next, there follows a discussion on each of the Decision Issues, which comprises:-

* a description of the Assessment or measurement of the relevant parameters.
* identification of standards or criteria with which the measured or assessed parameters can be compared.
* a decision framework by which any Option can be compared to another with regard to the particular issue.

2.2 Comparative Assessment Methodology

Each of the Decision Issues has been evaluated for each route (Option) and for each receiver or group of receivers (Receivers are defined and described later in Section 3.2). For each receiver or group of receivers the environmental effect in both construction and operation phases is assessed as low, moderate or severe and given a corresponding rating 1, 2 or 3 respectively. The parameters considered in arriving at an assessment for each issue are described below.

Following this an overall assessment 1, 2 or 3 can be given against each of the issues for each route (Option). Where the Impact created by any of the decision issues exceeds a limit described, then a suitable measure to mitigate the impact is added to the Assessment. This approach allows comparison of two sets of values to illustrate the effects of proposed mitigation measures. The various calculations and comparisons are described in Sections 6 to 9 of the Report.

In Section 10 of the Report the costs of Option A, B & C with and without environmental impact amelioration measures are evaluated.

Section 11 summarises the findings of the earlier Sections and having regard to the assessments therein presents the preferred Option.

The assessment methodology is illustrated in Figure 39.

2.3 The Decision Issues

From consideration of the requirements of the brief the Decision Issues are:

Noise

Air Quality
Vibration
Landuse
Visual
Landscape

These are now described fully below.

2.4 Noise

2.4.1 Assessment

2.4.1.1 Construction noise has been calculated in accordance with the **Technical Memorandum on Noise from Construction Work other than Percussive Piling**. Because the construction site is linear, the notional position of powered mechanical equipment has been assumed to be the nearest point along the alignment for each Option.

2.4.1.2 Road traffic noise has been calculated in accordance with the 1988 UK Department of Transport procedures in *Calculation of Road Traffic Noise (CRTN). Predictions have been made for the facades of first-floor and top-floor sensitive receivers. The assessment has been based on CTS-2 predictions of peak-hour road traffic flows and speeds. Corresponding CTS-2 speed predictions have also been used; on two links where the predicted speeds were under 20 kph, this minimum speed was substituted for noise predictions in accordance with CRTN limitations. Though CTS-2 predictions are intended for strategic planning studies, they have been adopted as the most reliable available estimates of future conditions.*

2.4.2 Criteria

2.4.2.1 As construction work is not expected to extend into the evening or nighttime, the assessment criterion against which non-piling construction noise is evaluated as 75 dB(A) Leq (30 min).

2.4.2.2 Noise from road traffic has been assessed with reference to the **Hong Kong Planning Standards and Guidelines (HKPSG)**. Relevant L_{10} (peak hour) maximums are shown in Table 2.1:

TABLE 2.1 - HKPSG MAXIMUM FACADE NOISE LEVELS

Land Use	L_{10} Noise Level dB(A)
All domestic premises	70
Educational institutions (including kindergartens)	65
Homes for the aged	55

NOTES:
- Shows maximum permissible noise levels at the external facade of a sensitive receiver.
- Peak hour L_{10} road traffic noise

2.4.2.3 The need for measures to mitigate noise from the flyover has been determined in accordance with new criteria supplied by EPD after submission of the Draft Final version of this Report.

The new criteria result from the Exco decision in early 1992 to provide indirect technical remedies to residents exposed to traffic noise from the proposed Western Harbour Crossing. This decision has reinforced the desirability of reducing traffic noise at its source thus obviating the need for measures to be taken at the receiver. EPD has therefore supplied new criteria for the receivers in the study area, where noise from traffic already exceeds HKPSG standards at most exposed facades. EPD now recommends that migitation measures should be provided at the new road unless the contribution of the new road to the overall noise level is less than 1.0 dB(A).

2.4.3 Decision Framework

2.4.3.1 The impact of each Option on each sensitive receiver has been evaluated with reference to three factors: the affected population at the receiver, the extent to which L_{10} facade noise level from the Option exceeds corresponding noise level anticipated from the Do-Nothing scenario, and the extent to which L_{10} facade noise level from the Option exceeds the HKPSG recommended maximum.

2.5 Air Quality

2.5.1 Assessment

2.5.1.1 Construction activities can be expected to produce airborne dust, particularly the extensive earthworks associated with the Option C cut and fill. Maximum hourly concentrations of dust at each receiver have been assessed using the ISCST model, and assuming a dust emission factor of 1.2 tons per acre of construction per month of activity (USEPA AP-42). Wind speed of 2 m/s and a worst case wind direction for each receiver have been assumed.

2.5.1.2 The main source of air pollution during the operation phase is expected to be vehicle emissions. Hourly concentrations of carbon monoxide (CO), nitrogen oxides (NO_x), and particulates have been predicted using the USEPA model CALINE4. As advised by EPD, nitrogen oxides have been taken as inertial gases, and concentrations of NO_2 have been assumed to be 20 percent of the total NO_x emitted. Vehicle emission factors have been based on fleet average particulates and NO_x emission factors of Hong Kong for 2001, supplied by the Environmental Protection Department. *These values are as follows, in units of g/km per vehicle:*

- *for NO_x:*
  1.040 for petrol cars
  0.901 for diesel cars
  10.368 for heavy goods vehicles
  7.972 for medium goods vehicles

- *for particulates:*
  0.032 for petrol cars
  0.261 for diesel cars
  1.157 for heavy goods vehicles
  1.154 for medium goods vehicles

Vehicle mixes vary according to the roadway under consideration. Total flows in 2011 are from CTS-2 model predictions, and are provided in Figure 10, along with the proportion of goods vehicles. The heavy/medium goods vehicle splits have been based on 1991 observations in the Annual Traffic Census. Current (1991) flows are based on traffic counts reported in

or near the study area in the 1991 Annual Traffic Census.

2.5.1.3 For the operational air quality assessment, worst-case meteorological conditions have been assumed:

Wind speed	2 m/s
Wind direction	(worst case for individual receiver)
Stability class	D
Mixing height	500 m
Standard deviation of wind direction	20 degrees
Temperature	25 degrees
Aerodynamic roughness	30 cm
Deposition velocity	0.7 cm/s (TSP only)
Settling velocity	3.5 cm/s (TSP only)

For operational air quality, calculations have been made at ground level, 20 m, and 40 m above ground in order to quantify the impacts at different elevations. For construction air quality, calculations have been performed only at ground level, since dust concentrations are generally greatest at this level.

2.5.2 Criteria

2.5.2.1 For construction-generated dust, EPD's maximum acceptable TSP concentration is 500 $\mu g/m^3$ over a one-hour period. There is currently no guideline for the hourly RSP during construction.

2.5.2.2 Operational air quality has been assessed with reference to the Hong Kong Air Quality Objectives (AQO), summarised in Table 2.2:

TABLE 2.2 - HONG KONG AIR QUALITY 0BJECTIVES

Pollutant	Concentration ($\mu g/m^3$)	
	1 hour[1]	24 hours[2]
Sulphur Dioxide (SO_2)	800	350
Total Suspended Particulates (TSP)		260
Respirable Suspended Particulates (RSP)		180
Nitrogen Dioxide (NO_2)	300	150
Carbon Monoxide (CO)	30,000	
Photochemical Oxidants (as ozone (O_3))	240	

NOTES:
- Concentrations measured at 298°K (25°C) and 101.325 kPa.
- [1] One-hour criteria not to be exceeded more than three times per year.
- [2] 24-hour criteria not to be exceeded more than once per year.

2.5.3 Decision Framework

2.5.3.1 The impact of each Option on each sensitive receiver has been evaluated, based on three factors: the affected population at the receiver, the extent to which the NO_2 concentration from the Option exceeds the corresponding NO_2 concentration anticipated from the Do-Nothing scenario, and the extent to which the NO_2 concentration from the Option exceeds the AQO maximum.

2.5.3.2 The concentration of NO_2 is adopted as a surrogate for vehicle-related pollutant concentrations because AQO standards for NO_2 are the most stringent.

2.6 Vibration

2.6.1 Assessment

a) It has been agreed by the Study Working Group that the effects of vibration need be considered only during the construction stage. The vibration considered is that transmitted through the ground to the foundations of adjacent buildings or structures. Vibrations can be induced by two operations.

b) Blasting may be necessary to remove rock in bulk in earthworks cuttings, or in confined areas such as structural foundations or cast in place piles. Pile driving operations for displacement piles may induce ground vibrations through dissipation of the pile hammer energy.

2.6.2 Criteria

a) Blasting
Vibrations from blasting have been the subject of considerable investigation over many

years and evidence of the advances made are seen in the development of explosive products and blasting techniques designed to minimise ground vibrations from blasting. The criteria investigated have been related to the amplitude, velocity or acceleration of the ground movement. However, recent investigations tend to support velocity as the most appropriate criterion. Particle velocity takes into account both frequency and amplitude giving an indication of the level of hazard and a fairly accurate indication of the "nuisance" value of the movement.

The most reliable predictions of the peak particle velocity of a vibration are given by empirical relationships developed as a result of field observations of the actual blasts carried out on site.

Typical specifications today provide for a limiting peak particle velocity (PPV). This is measured in mm/sec, and limiting values vary between 50 and 7.5. This wide range is not acceptable without some qualifications being made concerning the type of property at risk. Broadly speaking; PPV of 50 mm/sec will give adequate protection to welded steel gas mains, sound sewers, and engineering structures, 25 mm/sec will be in order for good residential/commercial and industrial property; 13 mm/sec will be sufficient for housing in poor repair; 7.5 mm/sec will give protection for ancient and historic monuments. These are the normal engineering criteria adopted worldwide for limiting blasting levels.

In Hong Kong, the limits on ground vibrations for blasting commonly specified are shown at Table 2.3:

TABLE 2.3 - LIMITS OF GROUND VIBRATIONS FOR BLASTING

Location	Peak Particle Velocity (mm/sec)	Amplitude of Ground Motion (μm)
Under any existing reinforced concrete structures	50	
Under any reinforced concrete structures that have been cast between 1 and 7 days previously	25	
Under any reinforced concrete structures that have been cast less than 24 hours previously, and at any proposed or existing cut or fill slopes in rock or soil	15	
Along WSD water mains	25	203
Mass Transit Railway Corp.	25	
At WSD reservoir structures, and along water pipelines	13	102

The expression commonly used in Hong Kong for relating charge per delay Q (kg), distance from the blast R(m) and peak particle velocity V(mm/s) when assessing the likelihood of damage due to blasting is shown below:

$$V = K \frac{Q}{R^B}$$

Where K and B are constants which have to be determined by field measurements on each particular blasting site.

For the purpose of estimating vibrations for this report, coefficients of K = 80 and B = 1.5 have been assumed.

b) Pile Driving
Considerable vibration energy is emitted from the driving of piles and is transmitted to the adjacent ground during the course of execution. Such transmission of energy may result in settlement of poorly compacted soil. Vibrations and their effects on buildings or structures may be considered similar to those induced by blasting operations.

From Langley M.S. & Ellis P.C. "Noise and Vibration during Piling, Proceedings of Conference on Recent Development in the Design and Construction of Piles, 1979 ICE London", the peak particle velocity, v in mm/sec, predicted due to the driving of piles is

$v = 1.5*w^{½}/r$, where
r is the distance from the source, metres
w is the source of energy, Joules

Mass Transit Railway Corporation proscribe any piling adjacent to their structures which will induce ground vibrations in excess of 15 mm/sec PPV.

Thus for example if a 1DH35 Hammer, which can generate energy of 103kJ per blow, is employed, a predicted peak particle velocity of 15 mm/sec will be experienced at a distance.

$$r = 1.5* 103000^{½}/15 = 32 \text{ metres}$$

2.6.3 Decision Framework

Although vibration has been determined as a Decision Issue, it is not considered that it needs to be considered further in the assessment of options. This is because:

a) MTRC works
All options are adjacent to MTRC structures and therefore the MTR criteria of 25 mm/sec PPV for blasting and 15 mm/sec PPV for pile driving maximum will have to be adopted in the detailed design and construction specification stage for which ever option is chosen.

b) No buildings susceptible to PPV less than 15 mm/sec have been identified in the study area.

c) The difference in cost of adopting piling/blasting methods to meet MTR criteria throughout any scheme option is not considered significant.

2.7 Land Use

2.7.1 Assessment

The intention of the land use assessment has been to ascertain and compare the impact of the three route options on existing and planned land uses within the Study Area. The three options have been assessed in comparison to the "Do Nothing" scenario, whereby there would be a gradual change in the existing land use pattern resulting from the implementation of planning policy. The starting point of the assessment has been to identify the existing land uses within the study area and the broad planning policy for future development. Reference documents have include the Ngau Chi Wan Outline Zoning Plan (OZP) No. S/K 12/4, the Ngau Tau Kok and Kowloon Bay OZP No. S/K 13/6, the Ngau Chi Wan Outline Development Plan (ODP) No. D/K 12/2C, the Ngau Chi Wan Village Layout Plan No. L/K 12/2A and Metroplan. The two OZPs are the only planning documents with the statutory power to specify land use within the Study Area. Desk top study has been supported by consultation with relevant Government Departments and site visits.

2.7.2 Criteria

The impact the three flyover options has been assessed for each group of sensitive receivers within the Study Area. Land use impact has been assessed as a combination of direct impact whereby existing land uses fall within the construction corridor of the road, (generally resulting in clearance and a permanent change of use), and indirect impact where the flyover would result in incompatibility with adjoining uses which has been assessed against the following criteria;

a) land use compatibility : the compatibility of the various land use types with the proposed flyover.

b) proximity : the proximity of the flyover to each group of sensitive receivers.

c) population : the size of affected populations (these have been quantified for residential and school populations).

d) Planning prognosis : the likely permanence of the affected population as identified in the planning framework documents.

e) Land ownership : the extent of private land affected and thereby the level of land resumption.

These evaluation criteria are described more fully below.

(a) Land use compatibility : Different land uses display differing degrees of sensitivity to an adjoining road corridor. Residential areas have been considered as very sensitive to roads as a result of the permanence of impact on residential populations. Government, Institutional and Community(G/IC) uses exhibit varying degrees of sensitivity eg., uses such as the Home for the Aged, schools and libraries would be more sensitive than markets, indoor and outdoor recreation areas etc..

(b) Proximity : The proximity of group of receivers to the route.

(c) Population : The approximate size of each group of affected receivers has been considered. In the case of residential and school populations the approximate

numbers of people affected are estimated. Government, Institutional and Community (G/IC) uses generally accommodate temporary and fluctuating populations and therefore the scale of the affected uses are assessed only in general terms. The size of residential populations has been estimated on the basis of information provided by the relevant housing estate managers in the case of the public housing estates and on the basis of applying a rate of 3.5 persons per household for private dwellings. In a number of cases the assumed population represents only a portion of a complete housing estate in order to reflect the actual number of people affected.

(d) Planning prognosis : The level of impact has taken into account the degree of permanence of each affected group as suggested by the planning framework documents. In order to clarify a number of discrepancies between the various planning documents the following assumptions have been made;

1) On the advice of the Steering Group it has been assumed that Choi Hung Estate (Sensitive Receivers 1 and 2) and Ping Shek Estate (Sensitive Receiver 4) will remain in use and will not be cleared and rezoned as indicated by Metroplan.

2) Similarly on the advice of BLD, USD and HD, Ping Shek Temporary Housing Area will be cleared between the years of 1994 to 1996 and redeveloped as an open space by USD.

3) It is assumed that the proposed MTRC redevelopment of the Ping Shek estate transport terminus, the two residential development application to the south east of Bayview Gardens, the development of the UC Hammer Hill Leisure Pool Complex and the development of the FSD residential quarters in the northern section of Ngau Chi Wan will proceed.

(e) Land Ownership : The resumption of private land is time consuming and costly and would therefore have an influence on the cost of proceeding with each of the route options. The extent of private land within the corridor of each road corridor has been estimated and illustrated in Figure 7.

Land use impact has been considered at the constructional and operational phases and has taken into account the ability to mitigate impact by the adoption of mitigative measures derived from changes of planning policy or from abatement measures proposed to mitigate related environmental impacts described elsewhere in this report.

2.7.3 Decision Framework

The impact of the three route options on existing land usage and future planning policy are represented graphically by superimposing the three flyover corridors onto the key land-use planning documents. These are shown at Figures 3, 4 & 5. The findings of the assessment have been presented in a tabular form at Appendix E (Tables E1, E2 and E3) giving an overall ranking for each option.

2.8 Visual

2.8.1 Assessment

The intention of the visual assessment has been to ascertain and compare the visual impact of the three route options on the population of the study area. The three options

have been compared to the "Do Nothing" scenario whereby the existing visual environment of the study area will change as a result of future planned development.

The starting point of the assessment has been to identify the Zone of Visual Influence (ZVI) for each route option. The ZVI is the area within which the road structure would be visible. The ZVI is visually defined by a mixture of land form and building elevations. Beyond the ZVI, the road structure is either not visible, or views are so distant as to be considered insignificant. The ZVI's have been determined by a mixture of desk top study and site visits and are shown at Figures 32 and 33. Panoramic photographs have been taken throughout the study area to identify the extent of the ZVI.

2.8.2 Criteria

Having established the ZVI for each option, the next stage has been to assess the visual impact on each group of 'receivers' within the study area, ie. the population which may be affected by views of the road structure. The assessment has been carried out on the basis of the full list of receivers described in Section 3 and shown in the Table of Receivers at Table 3.1. Impact on each group of visual receivers has been assessed with reference to the following criteria:

a) Extent and Proximity : The extent and proximity of the view of the flyover has been assessed from each viewpoint. In some cases panoramic photographs taken from representative viewpoints have been included to show the alignment of the road superimposed on the existing outlook (See Figure 21).

b) Type of receiver : the sensitivity of each type of receivers has been considered, eg. residential populations have been considered more sensitive than eg. industrial workers.

c) Population : the size of each group of receivers (residential or schools) has been identified.

d) Planning prognosis : the degree of 'permanence' of each group of receivers, eg. permanent residential populations have been considered more sensitive than temporary ones.

e) Context : An assessment of the context of the view in which in the road would be seen, at present and in the future. The existing visual character of the study area is described at Figure 8.

2.8.3 Decision Framework

The impact on each group of receivers has been considered at the constructional and operational stage and has taken into account the ability to mitigate visual impact on each group of receivers for each road option. The findings of the assessment have also been presented in a tabular form in Appendix F (Tables F1, F2 and F3) giving an overall ranking for each option.

2.9 Landscape

2.9.1 Assessment

The intention of the assessment has been to ascertain and compare the impact of the three route options on the 'landscape' of the study area. The three options have been compared to the 'Do Nothing' scenario in which planned development of the area also implies disruption, or impact on the existing 'landscape'.

The starting point of the assessment has been to identify the type and extent of landscape elements within the study area and to assess their importance in the context of planning guidelines. The 'landscape' of the study area has been taken to mean :

a) Areas of hillside
b) Open spaces
c) Existing trees

The extent of existing landscape component is shown at Figure 9.

2.9.2 Criteria

Reference documents have included the relevant ODP, OZP, the Ngau Chi Wan Village Layout Plans, the Metro Plan Landscape Strategy for the Urban Fringe and the Hong Kong Planning Standards and Guidelines. Desk top studies have been supported by site visits.

The impact of the three route options has been assessed on the basis of the following criteria :

a) The degree of disruption eg. the area of hillside or open space, or the number of trees affected.

b) The relative value of each affected landscape component with reference to established planning policy.

c) The degree of permanence of the landscape element ie. would the open space or existing trees be affected in the 'Do Nothing' scenario as a result of the implementation of planning policy.

d) The ability to mitigate against impact on the landscape, eg. the transplanting of trees, re-provisioning of open space or replanting of hillside.

2.9.3 Decision Framework

The assessment has considered the constructional and operational phases of the work. The findings of the assessment have been presented in a tabular form, at Table 6.4, giving an overall ranking for each option.

3. THE SITE

3.1 Introduction

The Study Area as defined in the Brief is shown in Figure 1. It comprises an Urban Area within the Wong Tai Sin District of East Kowloon, and contains a major traffic intersection of Lung Cheung Road with Clearwater Bay Road and a significant public transport interchange between surface modes and the MTRC Choi Hung Station. It is described more fully within the context of this study below.

3.2 Identification of Sensitive Receivers

3.2.1 28 sensitive receivers have been considered for the impact assessment:

R1 & R2 **Choi Hung Estate:** Kam Hon House (R1) and **Tan Fung House (R2)** have sensitive facades facing Lung Cheung Road and the *proposed* flyover. Neither block has a podium, and thus neither is protected from traffic noise. There are no plans for redevelopment of Choi Hung Estate at the time of this report.

R3 **UC Ngau Chi Wan Complex:** The market building has an open-air children's play area at podium level that is sensitive to air quality. The Indoor Games Hall is air-conditioned, and is thus not considered a sensitive receiver *for noise*.

R4 **Ping Shek Estate: Tsuen Shek House** has a sensitive facade facing Clearwater Bay Road and the *proposed* flyover. This midrise block has no podium, and is thus exposed at all levels to traffic noise. There are no plans for redevelopment of Ping Shek Estate at the time of this report.

R5 **Ping Shek Estate Catholic Primary School** is a six-storey building with air conditioners in all windows facing Clearwater Bay Road and the *proposed* flyover. The school is assessed for air quality impacts.

R6 **Yan Kau School** is a six-storey school facing Clearwater Bay Road and the *proposed* flyover. Air conditioning has recently been installed in windows facing these roads. The school is assessed for air quality impacts.

R7 **St John's Primary School** is also a six-storey school facing Clearwater Bay Road and the *proposed* flyover. Air conditioning has recently been installed in windows facing these roads. The school is assessed for air quality impacts.

R8 & R9 **Ping Shek Temporary Housing Area:** This temporary housing facility is expected to be cleared prior to the operation of the *proposed* Lung Cheung Road Flyover. The area will revert to open space, and is thus considered sensitive to air quality.

R10 & R28 Choi Wan Estate: **Sau Man House (R10)** has a sensitive facade facing the eastern end of the *proposed* flyover and the junction of Clearwater Bay Road and New Clearwater Bay Road. This highrise block has no podium, and thus is exposed to traffic noise. **Pak Fung House (R28)** is also a highrise block

without podium.

R11 **Choi Wan St Joseph's Primary School** is a seven-storey school with air conditioners in all windows facing Clearwater Bay Road and the *proposed* flyover. The school is assessed for air quality impacts.

R12 - R16 **St Joseph's Home for the Aged** is a non-subverted institution housing approximately 170 elderly residents as well as staff. All dwellings are low-rise, restricted by lease conditions to 2 storeys. As a residential facility, the Home is sensitive to air quality and noise impacts.

R17 - R19 **Bayview Garden** is a recently-constructed residential development of three high-rise towers. All blocks have windows on all facades.

R20 **Hung Sean Chow Memorial College** on Ping Ting Road would be affected by Alignment C.

R21 - R22 **USD Hammer Hill Active Recreational Area** includes existing outdoor recreation facilities, a football pitch, and a **planned pool complex (R22)** with a tentative completion date in 1995. It is particularly sensitive to air quality impacts.

R23 **Lung Chi Path** in Ngau Chi Wan Village lies entirely under the *proposed* alignment of Option A. A facade in the path has been chosen to represent low-rise village receivers for air quality and noise impacts.

R24 - R26 **Ngau Chi Wan Village** is a low-rise area of one- to three-storey buildings. Though is it predominantly residential, small-scale industries are scattered throughout the older part of the village north of Lung Chi Path.

R27 **Hammer Hill**

R29 **Proposed FSD Quarters Development**

In addition, the **MTR** is vulnerable to vibration during construction.

3.2.2 These sensitive receivers have been summarised in Table 3.1 and their locations are shown in Figure 2.

TABLE 3.1 - SENSITIVE RECEIVERS

No.	Identification	Number of Storeys	Sensitivity to Assessment Criteria				
			Landuse	Noise	Air Quality	Visual	Landscape
R1	Kam Hon House (Choi Hung Estate)	8	S	S	S	S	S
R2	Tan Fung House (Choi Hung Estate)	20	S	S	S	S	S
R3	UC Ngau Chi Wan Complex	5	S		S	S	
R4	Tsuen Shek House (Ping Shek Estate)	8	S	S	S	S	S
R5	Ping Shek Estate Catholic Primary School	5	S		S	S	
R6	Yan Kau School	5	S		S	S	
R7	St John's Primary School	5	S		S	S	
R8	Ping Shek Temporary Housing Area	2	S		S	S	S
R9	Ping Shek Temporary Housing Area	2	S		S	S	S
R10	Sau Man House (Choi Wan Estate)	15	S	S	S	S	S
R11	Choi Wan St Joseph's Primary School	5	S		S	S	
R12	St Joseph's Home for the Aged (South)	2	S	S	S	S	S
R13	St Joseph's Home for the Aged (Mid)	2	S	S	S	S	S
R14	St Joseph's Home for the Aged (East)	2	S	S	S	S	S
R15	St Joseph's Home for the Aged (North)	2	S	S	S	S	S
R16	St Joseph's Home for the Aged (West)	2	S	S	S	S	S
R17	Bayview Gardens (West)	31	S	S	S	S	S
R18	Bayview Gardens (East)	31	S	S	S	S	S
R19	Bayview Gardens (North)	31	S	S	S	S	S
R20	Hung Sean Chow Memorial College	5	S	S	S	S	
R21	Hammer Hill Recreation Area		S		S	S	
R22	Leisure Pools Complex		S		S	S	
R23	Lung Chi Path		S			S	S
R24	Ngau Chi Wan Village (South)	3	S	S	S	S	S
R25	Ngau Chi Wan Village (West)	3	S	S	S	S	S
R26	Ngau Chi Wan Village (North)	3	S	S	S	S	S
R27	Hammer Hill		S			S	S
R28	Pak Fun House (Choi Wan Estate)	27	S	S	S	S	S

NOTE: "S" indicates that the receiver is sensitive to the given assessment criteria. If column is blank, the receiver is not considered sensitive.

3.3 Present Noise and Air Quality

3.3.1 Peak Hour Noise Monitoring

Noise measurements were carried out at several locations in the study area during morning peak traffic conditions (8.30 to 10.00 a.m.). Full results are contained in Appendix B, and are summarised in Table 3.2.

TABLE 3.2 - MORNING PEAK NOISE MEASUREMENTS

Site and Time Period	Measured Noise Level (dB(A))		
	L_{eq}	L_{10}	L_{90}
Tsuen Shek House (Ping Shek Estate)[1]			
8.30 to 9.00 a.m.	80.2	80.9	73.4
9.00 to 9.30 a.m.	76.4	78.4	73.9
9.30 to 10.00 a.m.	76.6	78.4	73.9
Pak Shuet House (Choi Hung Estate)[2]			
8.30 to 9.00 a.m.	79.2	80.8	76.8
9.00 to 9.30 a.m.	79.0	80.8	76.8
9.30 to 10.00 a.m.	78.4	80.3	75.8
Bayview Gardens[3]			
8.30 to 9.00 a.m.	55.0	56.3	53.3
9.00 to 9.30 a.m.	56.1	57.8	54.3
U.C. Ngau Chi Wan Complex[4]			
8.30 to 9.00 a.m.	70.7	72.3	68.8
9.00 to 9.30 a.m.	70.8	72.3	69.3
9.30 to 10.00 a.m.	70.6	72.3	68.8
Rear of St Josephs Home for the Aged[5]			
8.30 to 9.00 a.m.	59.3	60.5	58.0
9.00 to 9.30 a.m.	61.6	62.5	60.5
9.30 to 10.00 a.m.	60.6	61.5	59.5
Yan Kau School (Clearwater Bay Road)[6]			
8.30 to 9.00 a.m.	75.0	77.5	71.5
9.00 to 9.30 a.m.	74.7	77.0	71.0

1 Measurements taken 5 August 1992 at 8th floor facade facing Clearwater Bay Road.

2 Measurements taken 6 August 1992 at 8th floor facade facing Clearwater Bay Road. Pak Shuet House is located next to Kam Hon House, which was not accessible for monitoring.

3 Measurements taken 7 August 1992 from the roof (31st floor) of Bayview Gardens under free-field conditions. Technical problems prevented measurements from being taken from 9.30 to 10.00 a.m.

4 Measurements taken 10 August 1992 at the 3rd floor facade of the Complex, facing Kam Chi Path. Noise levels reflect market activities; contribution from traffic is minor.

5 Measurements taken 13 August 1992 in the open area north of the Home for the Aged (outside the complex) under free-field conditions.

6 Measurements taken 14 August 1992 at the 8th floor facade of Yan Kau School, facing Clearwater Bay Road.

3.3.2 24-Hour Noise Monitoring

3.3.2.1 Monitoring over a 24-hour period was carried out from a rooftop at the St Joseph's Home for the Aged on 15 September 1992. Four parameters were recorded for each hour: L_{eq}, L_{10}, L_{50}, and L_{90}. Results are shown in Appendix B.

3.3.2.2 The monitoring indicates that background noise levels at the site are 56 to 59 dB(A) during the daytime and evening (7.00 a.m. to 11.00 p.m.), and 49 to 56 dB(A) during the nighttime (11.00 p.m. to 7.00 a.m.).

3.3.3 Air Quality Monitoring

3.3.3.1 Ambient concentrations of oxides of nitrogen (NO/NO_2), total suspended particulate (TSP) and respirable suspended particulate (RSP) were measured at a rooftop in St Joseph's Home for the Aged. In addition, wind speed and wind direction were measured. The measurement period was 1 - 14 September 1992 for the gaseous pollutants, and 27 August - 13 September 1992 for dust concentrations (TSP and RSP).

3.3.3.2 Pollutant concentrations over the monitoring period have been averaged, and the results shown in the following table.

TABLE 3.3 - MEAN POLLUTANT CONCENTRATIONS

Pollutant	Arithmetic Mean ($\mu g/m^3$)	Geometric Mean ($\mu g/m^3$)	Standard Deviation
NO	30	/	36.4
NO_2	49	/	50.1
TSP	/	67.5	/
RSP	/	47.1	/

3.3.3.3 Meteorological conditions prevalent at the time of monitoring may have resulted in abnormal levels of pollutant concentrations. Tropical Storm Mark brought very calm conditions to Hong Kong prior to its arrival. The EPD monitoring station in Mongkok showed a significantly higher daily level of TSP at this time: almost 300 $\mu g/m^3$, well over the objective of 260 $\mu g/m^3$. NO_2 levels were also high at the EPD monitoring stations.

3.3.3.4 By Hong Kong Air Quality Objectives (AQO), the measured pollutant levels at the site were high. Table 3.4 compares the maximum 1-hr. and 24-hr. concentrations during the monitoring period with the Hong Kong AQO.

Table 3.4 shows that the measured values of pollutants are below the 1-hr and 24-hr standards, though the maximum level of NO2 is not far below the 1-hr standard. There is currently no guideline level for NO.

TABLE 3.4 - COMPARISON OF MAXIMUM MEASURED POLLUTANT CONCENTRATIONS WITH AIR QUALITY OBJECTIVES

Pollutant	Averaging Time	Air Quality Objective ($\mu g/m^3$)	Maximum Levels ($\mu g/m^3$)
NO	1 hr 24 hr	- -	194 70
NO_2	1 hr 24 hr	300 150	248 80
TSP	24 hr	260	149
RSP	24 hr	180	110

NOTES:
- Air Quality Objectives have not been established for nitrogen oxides other than NO_2.
- No comparison is possible with the annual Air Quality Objectives due to the two-week duration of the monitoring period.

3.4. Land Use

3.4.1 There are a wide range of land uses within the Study Area. To the south of the Lung Cheung /Clearwater Bay Road corridor the predominant land use is public housing represented by Choi Hung and Ping Shek Estates. The Ping Shek THA occupies an elevated plateau of land in the south east corner of the Study Area. To the north of the road corridor, in the western sector of the Study Area, the predominant land use is GIC represented by the East Kowloon Polyclinic, a secondary school, the UC Hammer Hill Sports Complex and a cleared site reserved for a future UC Leisure Pool Complex. At present this site is occupied by an open car park and car repair area.

3.4.2 The central section of the study area comprises a mix of uses, including a nunnery, temporary industrial structures, Ngau Chi Wan Village comprising a mixture of permanent and temporary residential structure with a component of commercial uses mainly in the centre of the village along Lung Chi Path. The central core of the village houses a number of other uses including an RCP, public latrine, open spaces and a small sitting out area centred around a shrine. A private R1 type residential development (Bayview Gardens) is located to the north of the village. St Joseph's Home for the Aged flanks the village on its east side, to the north of Lung Chi Path. A number of high rise developments are located to the south of Lung Chi Path, at the junction of Lung Cheung and Clearwater Bay Roads including the UC Ngau Chi Wan Complex, incorporating an entrance/exit from the MTRC's Choi Hung Station, and the existing Fire Station and Quarters. Green Belt occupies the majority of the land to the north of the Study Area. The Choi Wan estate is situated in the north east of the Study Area. The Study Area is served by the New Clear Water Bay Road and Lung Cheung Road which separate both Choi Hung and Ping Shek Estates from the rest of the area.

3.5 Visual

3.5.1 Introduction

This section describes the existing visual context of the Study Area against which the visual impact of the various route options is assessed. The wider context of the Study Area is illustrated by Figure 1, which highlights its location on the urban fringe of East Kowloon. To the north-east of the Study Area lies the Kowloon Hill range and the edge of the Ma On Shan Country Park.

3.5.2 Visual Character of Study Area

The Study Area itself can be subdivided into 8 broad zones of visual character surrounding a more complex central core as shown at Figure 8.

a) Hammer Hill

The undisturbed sections of Hammer Hill are characterized by steep natural hillside topography. The vegetation varies between dense mature trees predominantly on the lower hill slopes and valleys, shorter hillside grassland on the higher slopes, and exposed rock faces. The hillside provides a dramatic green backdrop to northward views from within the Study Area.

b) Cut Hill Slopes

The disturbed areas of Hammer Hill to the north-east of the Study Area are characterized by steep engineered cut slopes and platforms. Although the majority of the platforms are visually unobtrusive, the overall affect is that the natural hillside is visually scarred.

c) Choi Wan Estate

The high rise towers of Choi Wan Estate visually dominate eastern views from within the Study Area. The western most block is particularly dominant.

d) Ping Shek and Choi Hung Estates

These old style public housing estates consist mainly of 30 storey high tower blocks interspersed with some lower buildings. The extensive flat facades of these blocks produce a solid visual barrier along the south and south-western edges of the Study Area.

e) Lung Cheung Road/Clear Water Bay Road Corridor

This major road corridor bisects the Study Area in an east-west direction. The two roads have a visually disruptive impact an adjoining developments. The impact is accentuated by elevated road structures, lighting and signage. The impact is most significant on views from Ping Shek and Choi Hong Estates.

f) Hammer Hill Sports Complex

The complex consists predominantly of an athletics field surrounded by tiered open seating and a covered stand. The complex is well designed and maintained. The

tiered covered stand on the south side of the complex is the most visually prominent feature.

g) Bay View Gardens

This newly completed residential development consist of three 30 storey cruciform tower blocks on a landscaped podium deck. The blocks are visually dominant against the backdrop of hills to the north and rises high above the Ngau Chi Wan Village to the south.

h) Home For The Aged

The Home for The Aged consists of a number of colonial style low rise buildings set within a mature landscaped estate. The buildings do not exert a strong visual influence on the Study Area, not being generally visible other than from elevated viewpoints. From such locations views of the home consist of a tiled roofscape set within a dense canopy of mature trees. As a result, the home exerts a positive visual influence on the study area.

i) Central Core Area

The central section of the study Area has been further sub-divided into areas of distinct visual character :

1) To the south of Lung Chi Path, the village has an ordered character comprising terraced 3, 4 storey village houses. Although the visual form of the terraces is softened by existing trees, the consistent height and regular form of the buildings exert a more formal visual character than the rest of the village. The area is provided with several open spaces and pedestrian precincts which are heavily planted with small trees.

2) To the north of Lung Chi Path the village comprises of a mixture of permanent and temporary structures interspersed with existing mature trees, significant concentrations of which are located on both the eastern and western outskirts. This part of the village is more sprawling in character and is enclosed on its northern side by the lower slopes of Hammer Hill.

3) The western section of the village consists predominantly of squatter type development comprising predominantly of timber and steel structures.

4) To the west of the squatter development and immediately to the south of the Hammer Hill Sports Complex is an area of open land. At present, this area is used as a public car park and for open storage which results in it being visually intrusive.

5) the eastern side of the village is enclosed by an area of more modern high rise development including a USD market and recreational complex. These buildings provide a strong visual buffer between the village and Ping Shek Estate to the south.

3.6 Landscape

3.6.1 Introduction

This section describes the existing landscape components of the Study Area as shown at Figure 9. The impact on these components is assessed in later sections in the context of current landscape planning policy, a brief analysis of which is given below for reference.

3.6.2 Existing Landscape Components

a) Areas of Hillside : The main area of hillside within the Study Area consists of the lower hill slopes of Hammer Hill to the north of Ngau Chi Wan Village. A significant proportion of the hill slopes comprise natural vegetation, being disturbed only by a network of footpaths. A stream and associated vegetation add to the diversity and richness of the landscape to the east of Bayview Gardens. The eastern sections of Hammer Hill have been significantly disturbed by land formation and are as a result unnatural in appearance. Concrete and grass have been used to treat the cut slopes and there is little in the way of natural vegetation. A further, smaller section of hillside is located to the south of Clear Water Bay Road. The hillside is heavily vegetated with large stands of mature trees. The lower slopes of the hillside, adjacent to Clear Water Bay Road, have been developed as a nursery. The top of the hill has been graded to form a platform currently used for temporary housing.

b) Open Spaces : The lower slopes of Hammer Hill give way to an area of open space immediately to the north of Ngau Chi Wan Village. Some of the natural vegetation in this area has been cleared for new development, however a number of existing mature trees still remain. In terms of formal open spaces, there are a series of small public areas in the various parts of the village. These are predominantly hard landscaped areas with associated planting. A small sitting out area on Lung Chi Path has been developed around an old shrine. Another sitting seating area, in the east of the village, includes a stand of mature trees. The most extensive area of formal open space is represented by the Hammer Hill Sports Ground.

c) Private Open space : The only major area of private open space is located in the grounds of St Josephs Home for the Aged which contain significant areas of formal lawns and mature tree planting.

d) Existing Trees : The majority of the existing trees within the Study Area are located on the existing hillside areas as described above and within Ngau Chi Wan mostly at the western and northern ends of Lung hi Path.

e) Existing Trees within Ngau Chi Wan Village : A significant number of mature trees are located within the village area. Within the central section of the village area, these are largely individual very mature trees planted in close proximity to existing buildings. Concentrations of trees are located at the eastern and western sections of the village area. In the western section, these are concentrated along the course of the existing stream running through the village. Formal tree planting is largely confined to the pedestrian precincts and open spaces of the more established sections of the village. A large stand of trees are located in a small seating area adjacent to the Home For The Aged.

f) Existing Trees Within The Home For The Aged : These consist predominantly of a formal avenue planting at the entrance to the home, planting along the southern site boundary and ornamental stands of mature trees along the south-eastern boundary bordering Clear Water Bay Road.

g) Existing Trees Adjacent To The Clear Water Bay Road : A number of trees have been planted within the grounds of the three schools fronting the Clear Water Bay Road.

3.6.3 Landscape Planning Policy Documents

Hong Kong Planning Standards and Guidelines (HKPSG)

This document sets out standards and guidelines for development both in rural and urban areas. The Study Area is located on the Urban Fringe and therefore both rural and urban guidelines have been considered.

a) Development In Rural Areas

Guidelines for development in rural areas generally concentrate on areas specially designated for protection from development such as Green Belt Areas, Country Parks and Sites of Special Scientific Interest (SSSI). The general principle of the guidelines is the maintenance of a scenic backdrop to urban areas and is therefore of particular significance to Hammer Hill.

Further points of relevance include :

- the need for strict development control in areas vulnerable to development pressure on the periphery of urban areas;
- the consideration of new developments with regard to their impact on the scenery;
- the principle of retaining existing woodland and trees of amenity value wherever possible.

b) Development In Urban Areas

Guidelines with respect to the urban landscape relate to improving the environment through the design of proposed development rather than to preservation of existing features. However it is recognized that areas of significant landscape value should be assessed for possible conservation with regard to any proposed development.

Four general principles are identified :

- Maximizing the impact of vegetation in urban areas;
- Creating a landscape framework within the urban environment;
- Providing for function in the use/ design of urban spaces;
- Conserving valuable landscape and cultural features.

3.6.4 Metroplan

Metroplan provides a 'broad brush' strategic plan for the metropolitan area. Metroplan's landscape strategy (for the Urban Fringe and Coastal Areas) was endorsed by the Land Development Policy Committee in 1989. One of the principle objectives of the landscape strategy is the conservation of major landscape features such as hillsides (currently excluded from the Country Parks) by creating new Landscape Protection Areas. The Landscape Strategy Plan designates Hammer Hill as part of a Landscape Protection Area to include Urban Fringe Parks and recognizes its function as a scenic backdrop to the urban area.

More specifically, Hammer Hill is zoned as part of the Kowloon Foothills Urban Fringe Park. The roles of such Urban Fringe Parks is to provide an integrated network of recreational land use providing a link between the urban area and the countryside and maintaining a green backdrop to the urban area.

4. THE PROPOSED SCHEME

4.1 Introduction

CTS-2 recommended provision by the early 1990s of a new single 2 lane grade separated carriageway to carry traffic movements from Lung Cheung Road to New Clearwater Bay Road and thus to increase capacity of signal controlled junctions at Clearwater Bay Road/New Clearwater Bay Road and Clearwater Bay Road/Lung Cheung Road ground level. A two lane single carriageway road has a practical capacity of 12,300 vpd. *However, for assessment of environmental effects of traffic, predicted peak hour flows should be used and these have been obtained from Transport Department. They are shown on Figures 10, 11 & 12.*

4.2 Operational Requirements for the Flyover

To achieve the capacity and functions required the proposed road must start from Lung Cheung Road just east of its junction with Hammer Hill Road and continue to New Clearwater Bay Road east of its junction with Clearwater Bay Road.

It must have a minimum paved width of 7.3 metres and comply with geometric standards of curvature, gradient and superelevation specified in the Traffic and Transport Planning Design Manual. Options A to C prepared by the PSG meet these requirements. For Option C increased width is required in a climbing lane for slow vehicles on the long steep eastbound gradient to ensure capacity requirements are complied with.

4.3 The Construction Works Required

4.3.1 General

The three options each require substantial lengths of elevated carriageway structure to be constructed.

4.3.2 Traffic Management

All schemes start and end at the same location. To facilitate construction of the approach ramps to the flyover temporary closure of one or more lanes of the existing roads will be required. This will lead to reduction in traffic capacity and possible traffic disruption. Disruption will need to be minimised by design of temporary traffic management arrangements when the chosen option is planned and designed in more detail. The extent of lane closures likely to be required varies slightly but the overall effect is likely to be the same since in all three options, capacity is largely governed by width at the approach to junctions.

It is noted that the eastbound lane of Clearwater Bay Road between the Ngau Chi Wan Market and the junction with New Clearwater Bay Road is frequently occupied by waiting buses, minibuses and taxis. This effectively reduces the carriageway to two and sometimes one lane width, particularly in the peak hours. In this respect construction of Option A, over this length of road is likely to require more extensive consideration of temporary traffic management measures during construction.

4.3.3 Utilities

All schemes are likely to require relocation of utilities services. Most of the services to be

relocated will be within Lung Cheung Road and Clearwater Bay Road and will be associated with the approach structures to the flyover options. As has been seen the approach structures are similar for all schemes and it is considered that utilities alterations within Lung Cheung Road and Clearwater Bay Road if required will be the same for all options.

4.3.4 Mass Transit Railway

Mass Transit Railway installations likely to be affected by the schemes or to have influence on them are the existing railway tunnels beneath Lung Cheung Road, possible future extensions thereto and an intake pipeline which is to the west of Clearwater Bay Road. There appears to be no significant difference between the Options in respect of the MTRC, although the engineering constraints do affect the chosen methods for construction (See Section 2.6 and 4.3.5 below).

At their western end all Options are underlain by the running tunnels of the MTR and are thus within the limit of railway protection as shown on the MTR protection plans. All proposals for new construction within these limits are subject to the requirements of the Mass Transit Railway Protection (Land Resumption and Related Provisions) Ordinance. The relevant requirements are summarised below:

"Underground Railway Structures

(a) Site Formation/Foundation Works

Where site formation or foundation works or excavation for basements etc. are proposed above or adjacent to Mass Transit Railway underground structures, the effects of such works shall be within the following limits:

(i) The vertical or horizontal pressure on any underground structure due to the above operations, including filling, dewatering etc. and due to additional loads transmitted from foundations (including loads arising during construction), shall not be increased by more than 20 kPa.

(ii) Differential movement resulting from the works shall not produce final distortion in the plinth or track in excess of 1 in 1000 in any plane or a total movement in the Mass Transit Railway Structure or tracks exceeding 20 mm in any plane.

(iii) The peak particle velocities at any railway structure resulting from blasting (where permitted) and from driving or withdrawing of piles or any operation which can induce prolonged vibration shall not exceed 25 mm/sec and 15 mm/sec respectively.

(iv) No pile, foundation, borehole or well shall be driven or constructed within a distance of 3 m in any plane of any point of the underground railway structure.

In addition the MTRC railway extensions manager has commented on the proposals in a letter ref EKL/609/3 dated 9 March 1990.

The letter is reproduced at Appendix D.

4.3.5 Flyover Foundations

From the Geological Survey of Hong Kong it is seen that subsoil underlying the site comprises generally HK granite to the north, some landslide debris along the line of Option B with alluvium to the south.

Typical boreholes obtained from the GEO library show bed rock at a depth from 30m to 40m over the site in general. In the higher ground traversed by Option C it is possible that bed rock will be closer to the surface at a depth of 10 to 15m.

All flyover options will need to be supported by piled foundations. Piles are either displacement piles or in-situ piles. Displacement piles are formed by percussive driving of preformed steel or concrete piles into the ground at each foundation site. This procedure is almost invariably unacceptably noisy and transmits vibration energy to the surrounding ground. For these reasons it is not recommended for environmentally sensitive areas.

In situ piles are formed of concrete cast in a prebored void. The void may be formed by hand excavation (caissons) or by piling rig. Where rock is encountered in caissons, excavation is sometimes allowed by blasting. As discussed at 2.6 above blasting is restricted by induced vibration effects.

For the purposes of this study it is assumed that all structures will be supported by cast in place piles of up to 2 metres diameter, taken down to bedrock at a depth of about - 30m P.D. They will be constructed throughout to comply with the stringent MTRC conditions. Typical piled foundations are indicated on Figure 14, Sheets 1 to 3.

4.3.6 Flyover End Supports

Options A & B will have two end supports. Option C will have four. At their western end all options will have the same end support which will be a cellular or hollow box structure designed to meet the loading requirements imposed by MTRC.

Elsewhere the end supports may be earthfilled retaining structures, depending on detailed design. Typical end supports are shown on Figure 13.

4.3.7 Flyover Intermediate Supports

Depending on the detailed design of the flyover superstructure (see below) it is considered that spans between intermediate supports of up to 45 metres could be achieved. It is considered that in environmentally sensitive areas, the fewer supports the better. For this study spans of 40 metres have been assumed, from which it may be taken that intermediate supports with a cross sectional area of about 2.5m² will be required. This will be subject to detailed design but at this stage a single rectangular column suitably shaped in cross section and with an appropriate architectural finish has been assumed as shown on Figure 14.

4.3.8 Flyover Superstructure

Two basic forms of construction have been considered, precast and in-situ.

(a) In the former, concrete or steel beams are cast or fabricated elsewhere and brought to the site by road transporter. The beams are themselves straight.

In very large projects the beams may be erected on to the intermediate supports by a

prefabricated travelling lifting gantry. This allows delivery of the beams as required to one location on site only. In a project of this size the high cost of the launching gantry would not be justified and the beams would need to be delivered along the site and lifted into place in each span by crane.

Another feature of this project is the relatively small radius of curvature of some sections of all options. Where such curvature occurs structures formed with straight beams are difficult to make aesthetically pleasing, which is an important consideration in environmentally sensitive areas.

Finally it is generally only possible to handle beams up to a maximum length of 30 metres. Structures in such construction feature more transverse movement joints in the road pavement.

(b) With in situ construction, as is implied concrete to form the superstructure is cast in place in temporary formwork which needs to be supported by scaffolding or "falsework". With this method of construction low radius curves can be accommodated and longer spans are generally possible. Two forms commonly used in Hong Kong have been considered.

(c) For this project it is considered that in situ construction as shown at 3 on Figure 13 Sheet 1 should be adopted. This is because:

- In situ construction is necessary for locations where the options are curved in plan.
- Construction costs are higher if more than one type of construction is adopted.
- There are fewer transverse construction joints to induce traffic noise.

4.3.9 Earthworks

Flyover Option C requires a significant cutting, where the earth removed will be formed into an embankment. It is possible that in the depth of cutting required, Hong Kong granite bedrock will be encountered. This would be removed by blasting, and temporary screens would be provided to give protection from flyrock. Blasting would be controlled by Mines Division of the Civil Engineering Department to eliminate the effects of air blast. Suitable screening would be provided to minimise dust. The completed earthworks would be soiled, seeded and landscaped. Exposed rock surfaces would receive suitable landscape treatment.

4.3.10 Paving Works

All options would be surfaced throughout with asphaltic porous friction course material, which provides minimum traffic tyre noise.

4.3.11 Construction Period and Programme

All options comprise two end supports (ramps) and approximately 20 spans of about 40 metres length. Option C is in two sections of elevated structure each of about 12 spans separated by a length constructed on earthworks.

For the purposes of this report it has been assumed that the construction period will be determined by the time taken to construct 24 flyover spans. Earthworks, traffic and utilities diversions can be included in that time.

At Figure 14 (Sheets 2 & 3) an outline programme has been shown for the construction of twelve flyover spans, working along the route in sequence. The estimated construction time as shown is 21 months which is considered a reasonable overall construction period for Works of this nature. It follows therefore that whichever Option is recommended, it should be constructed in two halves simultaneously, so as to achieve overall completion within the time estimated. In Sections 6 & 8 of this report where the Construction Phase Impacts of each Option are assessed, the amount of plant and equipment required for flyover construction will be that estimated for construction of twelve spans in 21 months. Thus for construction of the flyover as a whole 2 sets of such equipment will be required and it will be necessary to ensure by programme constraints on the Contractor that the environmental effects of both sets do not overlap.

4.3.12 Construction Plant Requirements

These are listed at Table 6.1 in Section 6 and are derived from the operations described on Figure 14 Sheets 2 and 3.

5. THE OPTIONS

5.1 Introduction

This Section describes the engineering features of each scheme in turn by reference to plan, longitudinal section and typical construction details.

5.2 The "Do Nothing" Option

As far as is known, no engineering works are planned to the existing roads in the Study area in the event that none of the flyover options is constructed. For comparison purposes therefore it is assumed that the road layouts will remain as at present and predicted traffic volumes and speeds for evaluation of noise and air quality impacts will be calculated on that assumption.

5.3 Option A

5.3.1 Drawings

The Plan and longitudinal section are shown on Figure 10. The engineering features of the route are shown on Figure 13 Sheet 2.

5.3.2 Traffic

Traffic figures for relevant roads in the study area are shown on Figure 10 in the following form:

Year	Situation	Traffic Figures am Peak Hour	
		veh/hr	% HGV
1991 2011 2011	Existing No change to existing Flyover Option A		

5.3.3 Route Features Description

The route is described in typical sections identified by chainage. Where appropriate the description includes reference to a cross section whose location is marked on Figure 10, with the section shown on Figure 13 Sheet 2.

5.3.4 Chainage 230 to 380

This section comprises the western end of the flyover structure where it rises from ground level to reach the flyover. It occupies two traffic lanes of Lung Cheung Road which will need to be closed during construction. (Once construction is complete the two lanes are effectively replaced by the flyover lanes). In addition working space of at least a further half lane will be required on each side during construction.

The site is underlain by the running tunnels of the MTR and is thus within the limit of

railway protection as shown on the MTR protection plans. All proposals for new construction within these limits are subject to the requirements of the Mass Transit Railway Protection Mass Transit Railway (Land Resumption and Related Provisions) Ordinance (Section 4.3.4).

The abutment will comprise a hollow cellular box which will minimise additional ground pressure as required by the MTRC. At the end of this section the flyover carriageway will be approximately 6m above existing ground level. Cross Section A1 illustrates this feature.

5.3.5 Chainage 380 to 820

Over this length the alignment is virtually straight in plan and follows the existing ground levels at a height of about 8.5m to road level. It is on a rising gradient of 0.8%.

From chainage 380 to 520 temporary traffic arrangements will be required in the east bound carriageway of Lung Cheung Road to facilitate construction. The temporary falsework arrangements will allow traffic to pass beneath. From ch. 610 to 780 the flyover passes immediately to the north of Ngau Chi Wan village development at a distance varying from 8.5m to 6m. Over this length the flyover passes through a number of residential houses which lie in its path. At chainage 820 the flyover is 6.5m from the USD indoor games hall over the market building. Cross Sections A2, A3 and A4 typify this part of the route.

5.3.6 Chainage 820 to 940

The route curves sharply to the left and steepens to a 4% up grade. It passes over the gate to the Home for the Aged. Because of the flyover is approximately 11m above ground level, the proposed exit ramp from future redevelopment of Ping Shek Estate will need to be 19 to 20m above existing ground level. *Further outline proposals for the proposed access ramp have been submitted too late for inclusion in this report.* Cross section A5 indicates the relationship of the flyover to the Home for the Aged. Figure 13 Sheet 2 also indicates how the flyover could be constructed to avoid direct impact on the Gate House to the Home.

5.3.7 Chainage 940 to 1160

The gradient steepens to 5% on a right hand curve. The flyover is widened on its southern side to accommodate the proposed access ramp to the future redevelopment of Ping Shek Estate. The flyover itself is within 20 to 25m of the north side of 3 schools, but the proposed access ramp will be about 4m from a school at its closest. The flyover will also be within 20m of a school on the north side at chainage 1070. Temporary traffic arrangements will be necessary in Clearwater Bay Road during the construction period. Cross sections A6 & A7 typify this section of the route.

As noted in paragraph 4.3.2 particular attention will need to be paid to temporary traffic management measures during construction of this length of the flyover. In order to minimise conflict, possible detailed design options might include shifting the alignment slightly so that the columns encroach into the westbound carriageway. In addition the level of the flyover could be raised to allow construction of "flying falsework" i.e. falsework not supported by scaffolding from the ground, thus minimising obstructions to traffic flow during the construction stage.

5.3.8 Chainage 1160 to 1215

The route returns to ground level beyond its junction with Clearwater Bay Road on a 4% down gradient. Cross Section A8 indicates the form of construction and the location of the

flyover relative to Ngau Chi Wan Estate and Ping Shek THA.

5.4 Option B

5.4.1 Drawings

The Plan and longitudinal section are shown on Figure 11. The engineering features of the route are shown on Figure 13 Sheet 3.

5.4.2 Traffic

Traffic figures for relevant roads in the study area are shown on Figure 11 in the following form:

Year	Situation	Traffic Figures am Peak Hour	
		veh/hr	% HGV
1991 2011 2011	Existing No change to existing Flyover Option B		

5.4.3 Route Features Description

The route is described in typical sections identified by chainage. Where appropriate the description includes reference to a cross section whose location is marked on Figure 11, with the section shown on Figure 13 Sheet 3.

5.4.4 Chainage 230 to 580

Over this length the route is the same as for Option A (see paragraphs 5.3.4 and 5.3.5 (Part)).

5.4.5 Chainage 550 to 770

The route continues on a straight horizontal alignment and on a rising gradient of 0.8%. It passes north of Lung Chi Path and the existing Ngau Chi Wan village development being 13m from the nearest house at its closest point and 32m from the nearest house at its remotest point. Some 23 residential houses would need to be demolished. Cross Sections B2 and B3 illustrate this area.

5.4.6 Chainage 770 to 950

The route steepens to 4% gradient and curves left. It passes across the grounds of the Home for the Aged and at its closest is less than 2m from a residential building. Cross sections B4 and B5 are typical of this length.

5.4.7 Chainage 950 to 1155

The route continues to climb at 5% on viaduct, curving to the right. It affects the site of the Ngau Chi Wai Upper Fresh Water Pumping Station, but it appears that by detailed design the flyover and its supports can be constructed without the need to reprovision the pumping station. It is 30m from the nearest school on the south side and 16m from the school to the north, illustrated on Sections B6 & B7.

5.4.8 Chainage 1155 to 1215

The route is the same as for Option A (paragraph 5.3.8). Cross Section B8 refers.

5.5 Option C

5.5.1 Drawings

The Plan and Longitudinal section are shown on Figure 12. The engineering features of the route are shown on Figure 13 Sheet 4.

5.5.2 Traffic

Traffic figures for relevant roads in the study area are shown on Figure 12 in the following form:

Year	Situation	Traffic Figures am Peak Hour	
		veh/hr	% HGV
1991 2011 2011	Existing No change to existing Flyover Option C		

5.5.3 Route Features Description

The route is described in typical sections identified by chainage. Where appropriate the description includes reference to a cross section whose location is marked on Figure 12, with the section shown on Figure 13 Sheet 4.

5.5.4 Chainage 230 to 380

Over this length Option C is the same as Options A & B.

5.5.5 Chainage 380 to 600

The route curves sharply to the left at a radius of 140m. It is immediately starts to climb at 6% and because this relatively steep gradient will cause heavy vehicles to slow down significantly it is necessary to introduce an additional traffic lane in the east bound direction. Provision of this climbing lane will allow the same traffic flow capacity as Options A & B. The route will encroach on the site of the proposed Hammer Hill Swimming Pool complex and passes over the south end of an open air soccer pitch. Section C2 illustrates this part of the route.

5.5.6 Chainage 600 to 680

The route continues to climb a 6% on a right hand curve of 130m radius which is at or below the desirable minimum radius. It crosses On Ting Road and passes within 10m of the most northerly block in Bayview Garden as illustrated by Section C3.

5.5.7 Chainage 680 to 780

Here the route enters a ridge and then crosses a steep valley. Cross Section C4 shows the proposed arrangement of the route supported on an earthworks platform. For reasons described elsewhere in Section 8.6.3 it is considered that if Option C is to be constructed, this length of the route should also be on structure.

5.5.8 Chainage 780 to 880

Over this length the route, still on a straight alignment and climbing at 6%, enters a steep ridge requiring extensive cutting of the drill slope. It is possible that rock may be encountered which would require excavation by blasting. See Section C5.

5.5.9 Chainage 880 to 1000

The route curves to the right and reaches its highest point. The additional climbing lane ends and the route commences to descend on a 4% gradient. The route is on structure (flyover) again and passes within 41m of the Church at the Home for the Aged and within 12 metres of the nearest building within the Home. Section C6 illustrates this section.

5.5.10 Chainage 1000 to 1265

The route descends at 4% on a left hand curve. It will affect the Caritas Shelter and pass over the site of a proposed bus terminus before crossing the uphill carriageway of Clearwater Bay Road. At its closest the route will be 15 metres from the school to the north and 35m from the nearest school at Ping Shek Estate as shown on Section C7.

5.5.11 Chainage 1265 to 1320

This section is the same as for Options A & B.

6. COMPARISON OF OPTIONS: CONSTRUCTION PHASE

6.1 Introduction

6.1.1 The physical nature of the Options has been described in Section 4. This description and the associated Drawings allows the construction impacts on landscape, landuse and visual aspects to be considered directly. For noise and air quality it is necessary to make an assessment of the likely plant or equivalent to be used in each of the construction operations.

6.1.2 The assessment of construction noise impacts has been based on the tentative equipment list provided in Table 6.1. The calculation of construction noise is based on the assumption of simultaneous operation of all pieces of equipment listed for a given activity.

6.2 Noise

Noise from seven major construction activities has been assessed. These activities are: earthworks, piling, construction of pile caps, construction of piers, drainage, construction of superstructure, and roadworks. Results are listed in Appendix B and are based on a tentative list of the equipment required for these activities as provided in Table 6.1. The calculation of construction noise is based on the assumption of simultaneous operation of all pieces of equipment listed for a given activity.

6.2.1 Do-Nothing

Under this scenario, no flyover construction noise would be experienced by sensitive receivers.

6.2.2 Option A

6.2.2.1 Results of noise calculations due to construction activities associated with Option A are shown in Table 6.2.

6.2.2.2 Because the Option A alignment passes through a densely urban setting, most of the sensitive receivers can expect to be significantly affected by construction activity. Expected noise levels exceed the desired maximum of 75 dB(A) for almost all construction activities at almost all receivers except those well removed from the alignment, such as the northern areas of St Joseph's Home for the Aged and the Hung Sean Chow Memorial College. Particularly badly affected would be the southern areas of the Home for the Aged and village receivers near Lung Chi Path.

6.2.3 Option B

6.2.3.1 Results of noise calculations due to construction activities associated with Option B are shown in Table 6.2.

6.2.3.2 Because the Option B alignment passes through a densely urban setting, most of the sensitive receivers can expect to be significantly affected by construction activity. Expected noise levels exceed the desired maximum of 75 dB(A) for almost all construction activities at almost all receivers except those well removed from the alignment, such as the northern areas of St Joseph's Home for the Aged and the Hung Sean Chow Memorial College. Particularly badly affected would be most of the Home for the Aged (except in the northern part of the grounds) and Ngau Chi Wan Village.

TABLE 6.1 - CONSTRUCTION ACTIVITIES AND REQUIRED EQUIPMENT

Activity Description	Equipment and Quantity		SWL dB(A)
Earthworks (Option C only)	D8 Ripper/Dozer	1	115
	Loader	1	112
	Dump Trucks	4	117
	Vibrating Roller	1	108
	D4 Dozer	1	115
Piling	Bored piling rigs	4	115
	Mobile cranes	2	112
	Pump trucks	1	109
	Concrete trucks	2	109
	Vibratory pokers	*2*	*113*
Pile Cap Construction	Excavator	3	112
	Backhoe	3	112
	Earth moving trucks	3	117
	Compressor	3	100
	Crane	3	112
	Concrete trucks	3	109
	Vibratory pokers	6	113
	Roller	3	108
Pier Construction	Compressor	3	100
	Crane	3	112
	Concrete pump truck	2	109
	Concrete trucks	3	109
	Vibratory pokers	4	113
Superstructure Construction	Compressor for prestressing	1	100
	Mobile cranes	2	112
	Pump truck	1	109
	Concrete trucks	1	109
	Vibratory pokers	*3*	*113*
Roadworks (At-grade and Elevated)	Trucks	2	117
	Paver	1	109
	Roller	2	108
Drainage	Dumptrucks	2	117
	Backhoes	2	112
	Truck with crane	1	117

NOTES:
- This is a preliminary list for the purpose of noise assessment only.
- Sound power level (SWL) shown is for a single piece of equipment.

6.2.4 Option C

6.2.4.1 Results of noise calculations due to construction activities associated with Option C are shown in Table 6.2.

6.2.4.2 The Option C alignment avoids some of the densely urban setting through which Options A and B pass. However, at the flyover's connections with existing roads, the Option C alignment has noise impacts that are not significantly different from the Option A and B alignments. Most receivers can expect to be significantly affected by noise from construction activity that exceeds the desired maximum of 75 dB(A) for almost all construction activities. The Home for the Aged would be badly affected, since the Option C alignment skirts both its northern and eastern boundaries. Also badly affected would be northern- and western-facing receivers in Bayview Gardens.

6.2.5 Ranking

6.2.5.1 In order to assess the impact of construction on sensitive receivers in the area, the single loudest construction activity -- pile cap construction -- has been chosen as a basis for comparison. This approach has been adopted to indicate the most severe impact that can be expected.

6.2.5.2 Comparison of Options A to C is provided in Table 6.2. Almost all calculated noise levels significantly exceed both the existing background noise levels and the desired construction noise maximum of 75 dB(A), and are therefore accorded a high degree of impact (3). Where the calculated construction noise level exceeds the existing background noise level, but is under the desired maximum noise level of 75 dB(A), it is accorded a moderate degree of impact (2). In only *two cases* does the construction noise impose a low degree of impact (1) where it exceeds neither the existing background noise level nor 75 dB(A).

6.2.5.3 Construction noise imposes a high degree of impact at all receivers, due to the close proximity of operating construction equipment. The Option C alignment is judged to be *somewhat* more acceptable. With this alignment, low-rise receivers in Ngau Chi Wan Village are largely shielded from construction noise, and most receivers in Choi Hung and Ping Shek Estates are protected from construction noise by existing high background noise levels and by distance.

6.3 Air Quality

To assess air quality during construction, it has been assumed that construction will proceed simultaneously on four successive groups of piles/piers.

6.3.1 Do-Nothing

Under this scenario, no flyover construction impacts would be experienced by sensitive receivers.

TABLE 6.2 - CONSTRUCTION NOISE IMPACT ASSESSMENT

Receiver		Pop.	Noise from Pile Cap Construction (dB(A))			Degree of Impact		
			Option			Option		
			A	B	C	A	B	C
R1	Kam Hon House	310	*91*	*91*	*86*	3	3	3
R2	Tan Fung House	1600	*77*	*77*	*72*	3	3	1
R3	UC NCW Complex	50	*86*	*81*	*71*	3	3	*2*
R4	Tsuen Shek House	450	*78*	*75*	*70*	3	3	*1*
R5	Ping Shek School	530	*91*	*83*	*78*	3	3	3
R6	Yan Kau School	530	*87*	*84*	*81*	3	3	3
R7	St Johns School	530	*87*	*87*	*85*	3	3	3
R10	Sau Man House	2200	*89*	*89*	*90*	3	3	3
R11	St Josephs School	530	*91*	*92*	*93*	3	3	3
R12	Home for the Aged (South)	40	*107*	*97*	*75*	3	3	3
R13	Home for the Aged (Mid)	40	*83*	*107*	*77*	3	3	3
R14	Home for the Aged (East)	40	*83*	*96*	*89*	3	3	3
R15	Home for the Aged (North)	40	*74*	*77*	*87*	*2*	3	3
R16	Home for the Aged (West)	40	*82*	*89*	*76*	3	3	3
R17	Bayview Gardens (West)	970	*79*	*79*	*84*	3	3	3
R18	Bayview Gardens (East)	970	*78*	*78*	*93*	3	3	3
R19	Bayview Gardens (North)	970	*78*	*78*	*84*	3	3	3
R20	Hung Sean Chow College	530	*69*	*69*	*79*	2	2	3
R21	UC Sports Ground	50	*77*	*77*	*80*	3	3	3
R22	UC Leisure Pools	400	*81*	*81*	*81*	3	3	3
R23	Lung Chi Path	800	*111*	*93*	*106*	3	3	*1*
R28	Pak Fung House	2200	*111*	*93*	*106*	3	3	3
					TOTAL	*64*	65	*59*

6.3.2 Option A

6.3.2.1 Results of air quality calculations due to construction activities associated with Option A are shown in Table 6.3.

6.3.2.2 Receivers along Lung Chi Path in Ngau Chi Wan Village are worst-affected by Option A construction activities, since flyover supports must be constructed at close proximity to dwellings. Due to the relatively small and discrete sites along the Option A alignment, dust concentrations are not expected to exceed the desirable maximum.

6.3.3 Option B

6.3.3.1 Results of air quality calculations due to construction activities associated with Option B are shown in Table 6.3.

6.3.3.2 The Home for the Aged is severely affected by construction along the Option B alignment, since construction activities must take place within the Home's compound and at close proximity to its quarters. In addition, the Choi Wan St Joseph's Primary School could be severely affected, since it is situated within an extension of the straight flyover alignment, and could receive significant levels of windblown dust in the event the wind direction matches the alignment orientation. Due to the relatively small and discrete sites along the Option B alignment, dust concentrations are not expected to exceed the desirable maximum.

6.3.4 Option C

6.3.4.1 Results of air quality calculations due to construction activities associated with Option C are shown in Table 6.3.

6.3.4.2 The concentrations of airborne dust due to the Option C alignment are significantly higher than comparable concentrations of dust due to the alignments of Options A and B. The reason for the increase is the generation of dust at the large area of cut and fill north of Bayview Gardens and Ngau Chi Wan village. Virtually all receivers within the study area could be expected to experience significant increases in particulate levels during earthworks, in some cases approaching the desirable limit.

6.3.5 Ranking

6.3.5.1 Comparison and ranking of Options A to C are provided in Table 6.3. The ranking has been based on the product of the expected dust concentration at, and the population represented by, the receiver. No penalties for exceedance of the desirable limit for dust concentrations have been imposed, since exceedance has not been indicated.

6.3.5.2 It should be noted that the ranking system used in this section diminishes the relative influence of impacts on receivers within St Joseph's Home for the Aged, since the population of the Home is comparatively small. The uniformly low degree of impact accorded receivers in the Home for the Aged in Table 6.3 should be viewed with caution, as the high levels of airborne dust could be particularly detrimental to elderly persons residing in the Home.

6.3.5.3 Construction activities over the Option C alignment impose a significantly higher overall impact due to the extensive earthworks required for the cut-and-fill operations. Options A and B produce similar impacts due to similarities in their alignments.

TABLE 6.3 - CONSTRUCTION AIR QUALITY IMPACT ASSESSMENT

Receiver		Pop.	Concentration of Dust from Construction ($\mu g/m^3$)			Degree of Impact		
			Option			Option		
			A	B	C	A	B	C
R1	Kam Hon House	310	59	42	187	2	1	3
R4	Tsuen Shek House	450	13	13	111	1	1	2
R5	Ping Shek School	530	79	40	137	2	2	3
R6	Yan Kau School	530	31	36	138	1	2	3
R7	St Johns School	530	40	34	190	2	2	3
R10	Sau Man House	2200	51	56	43	3	3	3
R11	St Josephs School	530	35	108	63	2	2	2
R12	Home for the Aged (South)	40	52	57	187	1	1	1
R13	Home for the Aged (Mid)	40	60	104	228	1	1	1
R14	Home for the Aged (East)	40	58	68	261	1	1	1
R15	Home for the Aged (North)	40	17	20	423	1	1	1
R17	Bayview Gardens (West)	970	22	29	294	2	2	3
R18	Bayview Gardens (East)	970	20	24	345	2	2	3
R19	Bayview Gardens (North)	970	22	22	339	2	2	3
R23	Lung Chi Path	800	59	57	213	3	3	3
R28	Pak Fung House	2200	46	35	97	3	3	3
					TOTAL	29	29	38

NOTES:
- ☐ Shows maximum 1-hour average concentration of construction-generated dust.
- ☐ Assumes worst case wind direction.

6.4 Land Use Impact

6.4.1 Introduction

The land use impact of the three flyovers has been assessed for the constructional and operational phases and in relation to the potential to mitigate impact during both phases. Land use impact during the operational phase has been considered of primary importance due to the long term nature of the impact on existing and planned uses, compared to the temporary nature of the impact during the construction stage. In each case land use impact has been assessed in relation to the compatibility of the road to individual land uses, the number of sensitive receivers affected, the proximity of the land use in relation to the road, the degree of permanence of the land use on the basis of the planning framework, and the land ownership status. These factors have been discussed in detail in the context of the operational phase (see section 7.4) which has provided the broad basis of the assessment for each individual receiver and therefore provide an essential starting point for the overall land use assessment. The purpose of this section is to assess the land use impact of the three route options during the construction stage only. This assessment is discussed in general terms and provides a broad ranking for each of the options. The ability to mitigate impact at this stage is discussed in Section 8.4. The overall impact of each route has been ranked as either low (1), moderate (2), severe (3), as shown at Tables E1, E2 & E3 in Appendix E.

Description of the Construction Process

In each case the flyover would be constructed within a 91 week construction period. The flyover would be constructed in sections by two work gangs working along the length of the flyover starting simultaneously from the centre and from one end of the route. The construction process can be broken down into the following stages;

a) Clearance, Site formation and Erection of Hoardings (30 weeks duration):

The initial phase of the works would involve the erection of hoardings, clearance of existing buildings and vegetation and site formation.

The clearance operation would inevitably cause considerable disruption along the length of the construction corridor.

b) Foundation Work (24 weeks)

Following site clearance, the contractor would commence with the construction of foundations.

c) Structural Works (37 Weeks)

The structure of the flyover would be constructed in sections with a maximum of six structural spans being constructed at any one time. Falsework for the structure would remain in place for up to five weeks. The height of the structure varies along the length of each route as shown in Figures 10, 11 and 12.

d) Construction of Lighting, Signage, Noise barriers etc.(22 weeks)

The final stage of the construction will involve the construction of noise barriers, enclosures, lighting and the erection of signage.

Land use Assessment

Land use impact has been defined as a combination of direct and indirect impact as described in Section 2.0. In both cases impact is assessed on the basis of existing and planned land usage because the timing of the road construction in relation to the implementation of planning policy for each section of Study is not known. Indirect land use would generally result from incompatibility of the construction works with adjoining land uses, encompassing all types of nuisance, such as disruption of access, noise and air pollution etc. The land use impact for each option is assessed below;

6.4.2 Option A

The extreme western and eastern sections of Option A would be constructed within the existing Lung Cheung and Clearwater Bay Road corridors. There would be an inevitable conflict with the existing traffic system resulting in a temporary direct land use conflict. Indirect impact in these sections would relate mainly to the incompatibility of the construction work in close proximity to the residential blocks of Choi Hung Estate, immediately adjacent to Lung Cheung Road, and the four schools adjacent to Clearwater Bay Road.

The central section of Option A would require the clearance and resumption of a minimum 20 metre wide corridor of land through the centre of Ngau Chi Wan, immediately to the north of Lung Chi Path. In reality the clearance corridor would be larger than the 20m working area in order to encompass the full area of private building plots which would have to be resumed and cleared to enable construction. The clearance and demolition process would inevitably result in considerable impact on the village requiring a permanent change of land use along the length of the road corridor, although there would be some possibility of preserving certain land uses, by oversailing, as discussed in Section 8.4. In addition there would be an indirect impact on adjoining village houses and commercial premises as a result of disruption to access and impact from noise, air pollution etc., during the construction process. An existing shrine and associated sitting area adjoining Lung Chi Path would be also be disrupted during the construction process.

To the west of the village there would be a direct impact on St Joseph's Home for the Aged due to the need to resume a corridor of land along the southern boundary of the grounds which would in turn result in a temporary indirect impact on the functioning of the Home. The construction corridor would pass through the centre of the entrance gates leading to the Home.

Whilst there would be no direct impact on the UC Ngau Chi Wan Complex the construction work would exert a temporary indirect impact as a result of restricted vehicular access to the rear of the complex. The construction of the route would result in temporary indirect impact on the residential estates to the south of the Lung Cheung and Clearwater Bay Road corridor although this would not be severe in nature.

6.4.3 Option B

The broad configuration and alignment of Option B is similar to Option A and would thereby necessitate a similar clearance operation except that the more northerly routing, in the eastern section of the village, would result in a greater number of village properties to be cleared, and therefore the level of direct land use impact would be generally much greater. By contrast the existing shrine on Lung Chi Path would not be affected.

The direct impact on the Home for the Aged would be greater due to longer length of the

corridor of land required to pass through the Home for this alignment. This routing would also directly affect an existing building within the Home which may as a result need to be demolished. To the east of the Home for the Aged, Route B would conflict directly with an existing WSD water pumping station which may also need to be demolished subject to the possibility of oversailing.

The indirect impact of this route would be similar to Route A in it's western portion but would have a more widespread affect on Ngau chi Wan Village and the Home for the Aged. However it should be stated that the impact of the construction of Route B on the existing village and on the UC Complex would be less than for Route A in respect of a reduced impact on the functioning of Lung Chi Path which provides access to the land uses to the south of the path.

To the east of the village the indirect impact on the three schools to the south of Clearwater Bay road would be marginally less than Route A because of the greater proximity of the road to the schools.

6.4.4 Option C

Similarly to Route Options A and B the extreme western and eastern ends of Route C would be constructed within the existing Lung Cheung and Clearwater Bay road corridors with similar direct and indirect impact on the road system and on adjoining land uses. Route C would however have a lesser affect on one of the two residential blocks adjoining Lung Cheung Road due to the northward bend in the road alignment. Similarly there would be a reduced impact on the three schools located on the south side of Clearwater Bay Road due to the much greater distance between the route and the schools.

Option C would require the clearance of a 25 metre wide corridor along 70% of its length, and a 20m corridor for the rest of the route. In this case the clearance corridor would require the demolition of a few temporary structures to the west of Ngau Chi Wan and to the north of Bayview Gardens, the demolition of USD's football pitch enclosure and, more significantly the clearance and formation of a continuous tract of the Hammer Hill greenbelt in order to enable the contractor to gain vehicular access along the length of the route. The 20 to 25 metre wide track would be considerably larger to the east of Bayview Gardens in order to encompass the large area of cut and fill proposed as a part of the construction of the route. In contrast to Routes A and B there would be very little direct impact on land uses within Ngau Chi Wan or on the Home for the Aged.

Indirect impact would include the incompatibility of the construction works immediately adjoining Bayview Gardens, the Home for the Aged and Pak Fung House in Choi Wan Estate, the disruption to the Ping Ting, On Ting, Wing Ting road network, and the loss of visual amenity suffered by all receivers with northward views as a result of the disruption to Hammer Hill.

6.4.5 Ranking

In conclusion the impact of routes A and B would be similar except that Route B would have more direct impact on more land uses within its central portion and a lesser indirect impact on existing uses to the south of Lung Chi Path. Direct impact resulting in clearance would be more severe than indirect impact caused by the construction works and therefore, of the two options, Route A would be preferable. The main advantage of Route C is the absence of direct impact on land uses within Ngau Chi Wan and on the Home for the Aged, however these benefits are significantly diminished in the light of the eventual clearance of the sections

of Ngau Chi Wan Village affected by Routes A and B as shown on the Village Layout Plan. Having taken into account the moderate to severe indirect impact of Route C on permanent and planned land uses, Option A emerges overall as the preferred option.

6.5 Visual Impact

6.5.1 Introduction

The visual impact of the three flyovers has been assessed for the constructional and operational phases and in relation to the potential to mitigate impact during both phases. Visual impact during the operational stage has been considered of primary importance due to the ongoing nature of the impact, compared to the temporary nature of the impact during the construction stage. Visual impact has been assessed with reference to the number of affected sensitive receivers, the extent, proximity and context of their views, and the degree of permanence of their viewpoint. These factors have been discussed in detail in the context of the operational stage (see Section 7.5) and have provided the broad basis of the assessment for each individual receiver and therefore provide an essential starting point for the overall assessment. The purpose of this section is to assess the visual impact of the three route options during the construction stage only. This assessment is discussed in general terms and provides a broad ranking for each of the options. The ability to mitigate impact at this stage is discussed in Section 8.5. The overall impact of each route has been ranked as either low (1), moderate (2) or severe (3) as shown at Tables F1, F2 and F3 in Appendix F. The construction process is described in Section 6.4.1 and illustrated on Figure 14. The visual impact of the three route options is discussed below;

6.5.2 Option A

In its western and eastern sections the flyover would be constructed within the existing road corridor and therefore the works would be openly visible to drivers using the road and to adjoining sensitive receivers, notably the residents of Hung Ngok and Kam Hon houses and the staff and pupils of the four schools adjacent to the Clearwater Bay Road. Within the central section of the route the construction works would require that a minimum 20 metre wide corridor of land be resumed and cleared through the centre of Ngau Chi Wan, immediately to the north of Lung Chi Path. In reality the clearance corridor would be larger than the 20m working area in order to encompass the full area of private building plots which would have to be resumed and cleared to enable construction. The clearance and demolition process would inevitably result in considerable visual disruption with a resultant impact both on adjoining village houses and from high level viewpoints in the surrounding areas. The elevated structure would be built to heights of between 10-12 metres and would therefore be clearly visible at the various stages of construction above the level of the hoarding from adjoining high and low level viewpoints.

6.5.3 Option B

The visual impact of the construction of Route B in it's western and eastern sections would be very similar to Route A except that the flyover for Option B would be slightly further from the three schools to the south of Clearwater Bay Road. The alignment of Option B through Ngau Chi Wan would necessitate a similar clearance operation as Option A except that the number of properties to be disturbed, and therefore the level of visual impact would be much greater due to the more northerly routing of the road in the eastern section of the village. Route B runs more centrally through the Home for the Aged and would, as a result, be more visually disruptive. The visual impact of Route B on the residential estates to the south of the

Lung Cheung Road corridor would be very similar to Route A.

6.5.4 Option C

At it's western end Route C would exert a similar visual impact as Routes A and B on the Lung Cheung Road corridor and on Hung Ngok House to the south of the road. From this point the more northerly alignment of the route away from the Lung Cheung Road would increase the distance of views of the construction works from the remainder of the Choi Hung estate however this benefit would be diminished by the increased visibility of the road, particularly from higher viewpoints, because of it's higher elevation. The construction of Option C would be much more noticeable from the UC Hammer Hill Sports complex and from Bayview Gardens. To the east of Bayview Gardens Option C would require the clearance of a 20-25 metre wide corridor across the Hammer Hill greenbelt requiring the clearance of a few temporary hillside structures and, more significantly, the clearance and formation of a continuous tract of natural hillside in order to enable the contractor to gain vehicular access along the length of the route. The 20 to 25 metre wide track would be considerably widened to the east of Bayview Gardens to encompass the large areas of cut and fill proposed in order to allow the construction of the route. The vegetation clearance, earth moving activity and structural construction works are likely to be highly visible from much of the Study Area. The elevated structure would be built up to a height of 8-13 metres above adjoining ground levels and generally at higher elevations, above datum than either Routes A or B. As a result the structure would be clearly visible from most high level north facing viewpoints during the course of construction. In its eastern section the construction works would pass, at an elevated level immediately along the boundary of the Home for the Aged resulting in extreme visual impact. To the east of the Home the route is likely to have a lesser impact on the three schools to the south of Clearwater Bay Road but a marginally greater impact on St Josephs Catholic Primary School and Pak Fung House in Choi Wan Estate.

6.5.5 Ranking

In conclusion the visual impact of each of the routes is likely to be worse during construction than during the operation. For Routes A and B this would be due mainly to the clearance of buildings and the close proximity of the construction activity in relation to the village houses, and for route C due to the large extent of hillside disturbance, and as a result of the construction process being openly visible throughout the Study Area. The impact of Route B is likely to be worse than for route A because of the greater area of building clearance in Ngau Chi Wan. The impact of Route C is likely to be worse than both Routes A and B because of the large area of hillside disturbed in the construction process. Route A is therefore the preferred option.

6.6 Landscape Impact

6.6.1 Introduction

The landscape impact of the three flyovers has been assessed for the constructional and operational phases and in relation to the potential to mitigate impact during both phases. Landscape impact has been assessed with reference to the landscape planning policy relevant to the Study Area, the extent of natural landform and vegetation affected, the number of tree which need to be felled and the loss of open spaces. The purpose of this section is to assess the landscape impact of the three route options during the construction stage only. This assessment is discussed in general terms and provides a broad ranking for each of the

options. The ability to mitigate impact at this stage is discussed in Section 8.6. The overall impact of each route has been ranked as either low (1), moderate (2) or severe (3) and summarized in Table 6.4. The construction process is described in Section 6.4.1 and illustrated on Figure 14.

6.6.2 Option A

The construction of Option A would involve the clearance of a minimum 20 m wide corridor of land, extended locally to encompass the full extent of any plots that are to be resumed to enable construction. Option A does not have any impact on natural landform or associated vegetation however a large number of existing trees located mainly to the east and west of the village would need to be felled. It should however be noted that most of the affected trees would also need to felled to implement the proposals of the Village Layout Plan. The route would also result in the disruption of the existing sitting area centred around an existing shrine on Lung Chi Path and the private gardens and associated mature trees within St. Joseph's Home for the Aged. The overall impact is considered to be MODERATE because of the planned disruption of the affected trees by the Village Layout Plan.

6.6.3 Option B

The impact of Route B would be similar to Route A except that marginally less trees would be affected in the western portion of the village, and the shrine on Lung Chi Path could be retained. The area of private open space within the Home for the Aged would be significantly greater. It should again be noted that most of the trees affected within the village area would be affected by the implementation of the Village Layout Plan. A planned area of Local Open Space shown on the Village Layout Plan would be bisected by the route. The overall impact is also considered MODERATE.

6.6.4 Option C

The alignment of Route C across the lower slopes of Hammer Hill would result in a markedly different impact to Routes A and B. The construction of the route would require the clearance of a 20-25 m wide swath of hillside which would be extended, to the east of Bayview Gardens, to encompass a large area of cut and fill included in the works for this option. The extensive cut and fill platform would permanently scar the natural landform and result in complete loss of natural vegetation in the affected area. Such an impact would be in stark contrast to the planning policy for Hammer Hill which is zoned as Green Belt on the OZP and as a future Urban Fringe Park under Metroplan. To the east of the Home for the Aged the construction of the route would affect a further stand of mature trees situated below Choi Wan Estate. The overall impact is considered to be SEVERE.

6.6.5 Ranking

In conclusion Option C is clearly the worst of the options in terms of landscape impact. Route A is therefore the preferred option as a result of a reduced impact on the gardens of the Home for the Aged and on existing trees in the village area bearing in mind the impact of the implementation of the VLP.

Table 6.4
Landscape Impact

Route Option	Affected Landscape Components					Conflict with Planning Policy	Degree of Impact (Construction Phase)	Degree of Impact (Operational Phase)	Ability to Migitage (Construction Phase)	Ability to Migitage (Operational Phase)	Overall
	Landform	Areas of Hillsides	Natural Flora	Existing Trees	Open Spaces						
A	-	-	-	A few mature trees in Central Village Area 45% of Mature trees at East End of Village	Grounds of Home For The Aged Seating Area East End of Village	Loss of some Existing trees Disturbance to Grounds of Home For the Aged	1/2	1	3	2/3	2
B	-	-	-	A Few Mature Trees In Central Village Area 35% of Mature Trees Trees at East End of End of Village	Grounds of Home for Aged	Loss of Existing Trees Disturbance to Grounds of Home For The Aged Disruption to Proposed Landscaped Square (V.L.P)	1/2	1	3	2/3	2
C	Cutting into Hillside: Area Affected 4570m2 Fill: Area Affected 2565m2	40% of Route Affects Hillside Areas+7135m2 of Cut and Fill	40% of Route Affects Natural Flora on Existing Hillside +7135m2 of Cut and Fill	Existing Trees to be Cleared Along 40% of Route 25m Wide Max +7135 m2 of Cut and Fill	Recreational Area of Hammer Hill Football Pitch to U.C Hammer Hill Sports Complex	Conflict with OZ.P in Disruption of Hammer Hill on on a Green Belt Area Conflict with HKPSG Policy to Conserve Areas of Hillside/Natural Flora Conflict with Metroplan in disturbance to Hammer Hill as a scenic backdrop/ Landscape Protection Area/Urban Fringe Park	3	2/3	3	2	3
							1 Low 2 Moderate 3 Severe		1 Good 2 Moderate 3 Poor		1 Low 2 Moderate 3 Severe

7. COMPARISON OF OPTIONS: OPERATIONAL PHASE

7.1 Introduction

The assessment is based in each case on the effects of the presence of the flyover as indicated on Figures 10 to 12 carrying the traffic indicated in the year 2011.

7.2 Noise Assessment

Table 7.1 presents the results of calculations at the top floor of sensitive facades.

Four traffic scenarios have been assessed: 2011 without the flyover (Do-Nothing scenario), and 2011 with each of three flyover options (Options A, B, and C).

7.2.1 Do-Nothing

7.2.1.1 2011 L_{10} (peak hour) predicted noise levels at top-storey sensitive facades are shown in Table 7.1. This information, along with noise at ground-storey facades, is also presented in Figures 15 to 17.

7.2.1.2 Due to increases in traffic flows throughout the study area, noise levels at almost all noise-sensitive receivers are expected to continue to significantly exceed HKPSG standards. Exceptions to this general exceedance occur within Ngau Chi Wan Village, which is shielded from Lung Cheung Road and Clearwater Bay Road traffic by existing buildings lining these routes, and some facades at Bayview Gardens, which benefit from a small angle of view of the roadways.

7.2.2 Option A

7.2.2.1 2011 L_{10} (peak hour) predicted noise levels at top-storey sensitive facades are shown in Table 7.1. This information, along with noise at ground-storey facades, is also presented in Figure 15.

7.2.2.2 Traffic flows along Lung Cheung Road and Clearwater Bay Road are expected to continue to dominate north-facing facades facing these roadways (Receivers R1, R2, and R4); traffic on the flyover should contribute a negligible amount of additional noise relative to the Do-Nothing scenario.

7.2.2.3 *Similarly, noise from traffic flows along Clearwater Bay Road is also expected to dominate the southern areas of St Joseph's Home for the Aged (Receivers R12-R14), and will result in continued exceedance of the HKPSG maximum. (A 2-m barrier wall that presently surrounds the Home helps to screen some noise from the roadway, but is limited in its effectiveness because the Home's grounds rise behind the wall.) Noise from traffic on the Option A alignment is mitigated by the presence of parapets on the flyover that effectively shield the Home's low-rise receivers. Receivers in the northern parts of the Home for the Aged will continue to be protected by distance and by the presence of intervening buildings from much of the noise of traffic on both existing and proposed roadways; however, even these northern receivers are expected to continue to experience noise levels exceeding the HKPSG recommended maximum of 55 dB(A).*

7.2.2.4 *Tower blocks in Bayview Gardens experience various levels of traffic noise depending on the orientation of the chosen facade. Some facades facing Lung Cheung Road will remain*

primarily affected by the noise from traffic on that road. For other facades, the proposed flyover will impose additional noise from traffic that both is slightly closer and is unscreened, and could raise the facade noise levels by about 1 dB(A). Receivers facing away from Lung Cheung Road enjoy a quieter environment, but may still be partially exposed to the flyover under Option A. Facades with a partial view of the flyover (Receiver R18) could expect increases in noise levels due to its proximity and the lack of any intervening buildings to act as a noise barrier.

7.2.2.5 Ngau Chi Wan Village (Receiver R23) will be significantly affected by traffic on the Option A alignment. Most of this low-rise development is, and would continue to be, effectively shielded from Lung Cheung Road and Clearwater Bay Road traffic by the public buildings lining the north side of these roads. The Option A alignment would bring the flyover directly over the village, resulting in a great increase in ambient noise. The use of a low parapet on both sides of the flyover helps to block the transmission of noise, but village receivers will still be significantly affected.

7.2.2.6 Pak *Fung* House in Choi Wan Estate (Receiver R28) is expected to be affected by a moderate increase in traffic noise over the Do-Nothing scenario, due in part to the introduction of a gradient on the eastern end of the Option A alignment.

7.2.3 Option B

7.2.3.1 2011 L_{10} (peak hour) predicted noise levels at top-storey sensitive facades are shown in Table 7.1. This information, along with noise at ground-storey facades, is also presented in Figure 16.

7.2.3.2 Traffic flows along Lung Cheung Road and Clearwater Bay Road are expected to continue to dominate north-facing facades facing these roadways (Receivers R1, R2, and R4); traffic on the flyover should contribute a negligible amount of additional noise relative to the Do-Nothing scenario.

7.2.3.3 *Similarly, noise from traffic flows along Clearwater Bay Road is also expected to dominate the southern areas of St Joseph's Home for the Aged (Receivers R12-R14), and will result in continued exceedance of the HKPSG maximum. (A 2-m barrier wall that presently surrounds the Home helps to screen some noise from the roadway, but is limited in its effectiveness because the Home's grounds rise behind the wall.) Noise from traffic on the Option B alignment is mitigated by the presence of parapets on the flyover that effectively shield the Home's low-rise receivers. Receivers in the northern parts of the Home for the Aged will continue to be protected by distance and by the presence of intervening buildings from much of the noise of traffic on both existing and proposed roadways; however, even these northern receivers are expected to continue to experience noise levels exceeding the HKPSG recommended maximum of 55 dB(A).*

7.2.3.4 *Tower blocks in Bayview Gardens experience various levels of traffic noise depending on the orientation of the chosen facade. Some facades facing Lung Cheung Road will remain primarily affected by the noise from traffic on that road. For other facades, the proposed flyover will impose additional noise from traffic that both is slightly closer and is unscreened, and could raise the facade noise levels by about 1 dB(A). Receivers facing away from Lung Cheung Road enjoy a quieter environment, but may still be partially exposed to the flyover under Option B. Facades with a partial view of the flyover (Receiver R18) could expect increases in noise levels due to its proximity and the lack of any intervening buildings to act as a noise barrier.*

7.2.3.5 Ngau Chi Wan Village (Receiver R23) will be significantly affected by traffic on the Option B alignment. Most of this low-rise development is, and would continue to be, effectively shielded from Lung Cheung Road and Clearwater Bay Road traffic by the public buildings lining the north side of these roads. The Option B alignment would bring the flyover directly over the northern part of the village, resulting in a great increase in ambient noise. The use of a low parapet on both sides of the flyover helps to block the transmission of noise, but village receivers will still be significantly affected.

7.2.3.6 Pak *Fung* House in Choi Wan Estate (Receiver R28) is expected to be affected by a moderate increase in traffic noise over the Do-Nothing scenario, due in part to the introduction of a gradient on the eastern end of the Option B alignment.

7.2.4 Option C

7.2.4.1 2011 L_{10} (peak hour) predicted noise levels at top-storey sensitive facades are shown in Table 7.1. This information, along with noise at ground-storey facades, is also presented in Figure 17.

7.2.4.2 Traffic flows along Lung Cheung Road and Clearwater Bay Road are expected to continue to dominate north-facing facades facing these roadways (Receivers R1, R2, and R4); traffic on the flyover should contribute a negligible amount of additional noise relative to the Do-Nothing scenario.

7.2.4.3 Similarly, noise from traffic flows along Clearwater Bay Road is also expected to dominate the southern areas of St Joseph's Home for the Aged (Receivers R12-R14), and will result in continued exceedance of the HKPSG maximum. *(A 2-m barrier wall that presently surrounds the Home helps* to screen some noise from the roadway, but is limited in its effectiveness because the Home's grounds rise behind the wall.) Traffic on the Option C alignment will contribute additional noise that results in an increase of about 1 dB(A) over the Do-Nothing noise levels *at these southern receivers*; the increase in noise level is mitigated by the presence of parapets on the flyover that effectively shield the Home's low-rise receivers. Under the Do-Nothing scenario and Options A and B, receivers in the northern parts of the Home for the Aged *(R15)* would be protected by distance and by the presence of intervening buildings from much of the noise of traffic on both existing and proposed roadways. However, the introduction of the Option C flyover would result in significant increases in ambient noise at these formerly protected receivers, as the Option C alignment passes close to the northeastern boundary of the Home.

7.2.4.4 Tower blocks in Bayview Gardens experience various levels of traffic noise depending on the orientation of the chosen facade. Facades directly facing Lung Cheung Road are expected to *remain* affected by noise from traffic on that road, *with an increase* due to traffic on the western end of the Option C flyover. Facades facing west, north, and east can expect significant noise increases resulting from traffic on the Option C alignment; facades facing north and east, at which HKPSG standards are expected to be met under the Do-Nothing scenario and under Options A and B, would be exposed to facade noise levels exceeding HKPSG standards under Option C.

7.2.4.5 Ngau Chi Wan Village (Receiver R23) will be significantly affected by traffic on the Option C alignment. Most of this low-rise development is, and would continue to be, effectively shielded from Lung Cheung Road and Clearwater Bay Road traffic by the public buildings lining the north side of these roads. The Option C alignment would bring the flyover onto the hillside north of the village, resulting in a significant increase in ambient noise. *Noise levels are expected to meet the HKPSG maximum.*

7.2.4.6 Pak *Fung* House in Choi Wan Estate (Receiver R28) is expected to be affected by an increase in traffic noise over the Do-Nothing scenario, due in part to the introduction of a gradient on the eastern end of the Option C alignment.

7.2.5 Summary and Ranking

7.2.5.1 Table 7.1 shows the 2011 L_{10} (peak hour) predicted noise levels at top-storey sensitive facades for each of Options A, B, and C. The top storeys have been used in this assessment since short barriers on both sides of the flyover screen lower-level receivers from flyover traffic noise.

7.2.5.2 Tables 7.2 to 7.4 assign a degree of impact to each receiver for each Option. A low degree of impact (1) has been assigned to receivers expected to experience no change (or, rarely, an improvement) in noise levels relative to the Do-Nothing scenario. A moderate degree of impact (2) has been assigned to: receivers experiencing a small increase (1 dB(A)) in noise levels, a small-sized receiver experiencing a moderate increase in noise levels (2-3 dB(A)), and a medium-sized receiver experiencing a moderate increase in noise levels (3-5 dB(A)) where the HKPSG standards are still met. A high degree of impact (3) has been assigned to: any receiver subject to an increase in traffic noise level of 10 dB(A) or more, a medium-sized receiver subject to a moderate noise increase (5 dB(A)) that results in an exceedance of the HKPSG maximum, and a large receiver experiencing a moderate increase (2 dB(A)) in traffic noise levels.

TABLE 7.1 - PREDICTED NOISE LEVELS: DO-NOTHING SCENARIO AND OPTIONS A, B, AND C

ID	Predicted L_{10} (peak hour) Noise Levels at Top Storey dB(A)				ID	Predicted L_{10} (peak hour) Noise Levels at Top Storey dB(A)			
	D-N	A	B	C		D-N	A	B	C
R1	84	84	84	84	R15	60	60	60	70
R2	82	*81*	*81*	81	R17	77	78	78	*77*
R4	*84*	*84*	*84*	*84*	R18	*61*	*62*	*62*	76
R10	*78*	*79*	*79*	*79*	R19	72	72	72	77
R12	*77*	*78*	*78*	*78*	R23	--	84	79	*70*
R13	*77*	*78*	*78*	*78*	R28	*77*	*79*	*79*	*79*
R14	*76*	*77*	*77*	*77*					

NOTES:
- "D-N" = Do-Nothing Scenario (no flyover)
  "A" = Option A flyover alignment
  "B" = Option B flyover alignment
  "C" = Option C flyover alignment
- Sensitive Receiver locations shown in Figure 2.
- Shows L_{10} (peak hour) facade noise levels at top-storey receivers due to 2011 morning peak hour traffic flows on major roads in study area.
- No predicted noise level is provided for the 2011 Do-Nothing scenario along Lung Chi Path because traffic flows along the Path are assumed to be negligible.

TABLE 7.2 - NOISE IMPACT ASSESSMENT: OPTION A

Receiver		Pop.	2011 L_{10} Facade Noise Levels		HKP SG[1]	Degree of Impact
			Do-Nothing	Option A		
R1	Kam Hon House	310	84	84	E	1
R2	Tan Fung House	1600	82	*81*	E	1
R4	Tsuen Shek House	450	*84*	*84*	E	1
R10	Sau Man House	2200	*78*	*79*	E	2
R12	Home for the Aged (South)	40	*77*	*78*	E	2
R13	Home for the Aged (Mid)	40	*77*	*78*	E	2
R14	Home for the Aged (East)	40	*76*	*77*	E	2
R15	Home for the Aged (North)	40	60	60	E	1
R17	Bayview Gardens (West)	970	77	78	E	2
R18	Bayview Gardens (East)	970	*61*	*62*		2
R19	Bayview Gardens (North)	970	72	72	E	1
R23	Lung Chi Path	800	--	84	E	3
R28	Pak Fung House	2200	*77*	*79*	E	3
					TOTAL	23

NOTE: [1] "E" indicates that the HKPSG standard for residential facades (70 dB(A)) or old-age homes (55 dB(A)) is expected to be exceeded in 2011. Note that HKPSG standards are currently exceeded at many of the listed receivers.

TABLE 7.3 - NOISE IMPACT ASSESSMENT: OPTION B

Receiver		Pop.	2011 L_{10} Facade Noise Levels		HKP SG[1]	Degree of Impact
			Do-Nothing	Option B		
R1	Kam Hon House	310	84	84	E	1
R2	Tan Fung House	1600	82	*81*	E	1
R4	Tsuen Shek House	450	*84*	*84*	E	1
R10	Sau Man House	2200	*78*	*79*	E	2
R12	Home for the Aged (South)	40	*77*	*78*	E	2
R13	Home for the Aged (Mid)	40	*77*	*78*	E	2
R14	Home for the Aged (East)	40	*76*	*77*	E	2
R15	Home for the Aged (North)	40	60	60	E	1
R17	Bayview Gardens (West)	970	77	78	E	2
R18	Bayview Gardens (East)	970	*61*	*62*		2
R19	Bayview Gardens (North)	970	72	*72*	E	1
R23	Lung Chi Path	800	--	79	E	3
R28	Pak Fung House	2200	*77*	*79*	E	3
					TOTAL	23

NOTE: [1] "E" indicates that the HKPSG standard for residential facades (70 dB(A)) or old-age homes (55 dB(A)) is expected to be exceeded in 2011. Note that HKPSG standards are currently exceeded at many of the listed receivers.

TABLE 7.4 - NOISE IMPACT ASSESSMENT: OPTION C

Receiver		Pop.	2011 L_{10} Facade Noise Levels		HKP SG[1]	Degree of Impact
			Do-Nothing	Option C		
R1	Kam Hon House	310	84	84	E	1
R2	Tan Fung House	1600	82	81	E	1
R4	Tsuen Shek House	450	*84*	*84*	E	1
R10	Sau Man House	2200	*78*	*79*	E	2
R12	Home for the Aged (South)	40	*77*	*78*	E	2
R13	Home for the Aged (Mid)	40	*77*	*78*	E	2
R14	Home for the Aged (East)	40	*76*	*77*	E	2
R15	Home for the Aged (North)	40	60	70	E	3
R17	Bayview Gardens (West)	970	--	*77*	E	*1*
R18	Bayview Gardens (East)	970	*61*	76	E	3
R19	Bayview Gardens (North)	970	72	77	E	3
R23	Lung Chi Path	800	--	*70*		*2*
R28	Pak Fung House	2200	*77*	*79*	E	3
					TOTAL	*26*

NOTE: [1] "E" indicates that the HKPSG standard for residential facades (70 dB(A)) or old-age homes (55 dB(A)) is expected to be exceeded in 2011. Note that HKPSG standards are currently exceeded at many of the listed receivers.

7.2.5.3 *Results show that Option C is expected to have the greatest noise impacts on the sensitive receivers selected to represent the population in the study area.*

7.2.5.4 *While Options A and B direct the flyover alignment through existing village and institutional settings, receivers in these areas are protected to some extent by the barrier effect of the parapets bordering the traffic lanes. These parapets partially block the transmission of noise to low level receivers in Ngau Chi Wan Village and the Home for the Aged. However, even with the parapets, the impact of Options A and B is severe for receivers in Ngau Chi Wan village, because of the previously well-shielded situation of the village. The impact of Options A and B is mild for those receivers in the Home for the Aged, already affected by high noise levels from Clearwater Bay Road traffic.*

Receivers in Bayview Gardens are affected to different degrees by Options A and B. Those receivers with a wide angle of view of the flyovers *such as R17 and R19*, are also exposed to a wide angle of view of existing high-flow Lung Cheung Road, unshielded for part of its length. For these receivers, additional flyover traffic would have a mild effect. Those receivers *such as R18* with a smaller angle of view of the Option A and B alignments are

subject to more significant impacts, since their exposure to traffic noise from existing roadways is more limited *due to the shielding effect of building near the roadside*. For these receivers, the difference between the Do-Nothing scenario and Options A and B is the introduction of traffic on an elevated roadway at closer range to sensitive facades. The impact of flyover traffic is correspondingly more significant, but *for some receivers still remains* within HKSPG standards for traffic noise.

7.2.5.5 Option C directs the flyover away from Ngau Chi Wan village, but, by introducing a partly-shielded roadway into a previously well-shielded setting, still has a significant impact on village receivers. In addition, since it passes close to Bayview Gardens and the northeastern boundary of the Home for the Aged, it significantly affects receivers at these locations that were previously shielded, and that were less affected by Options A and B.

7.2.5.6 Traffic noise contours for worst-case facade orientations are provided in Figures 22, 23, 24 and 25.

7.2.5.7 Figures 23 and 24 show contours associated with Options A and B. Noise levels are relatively high due to the influence of traffic on Lung Cheung Road and Clearwater Bay Road, as well as traffic on the flyover. The residential-zoned area north of Ngau Chi Wan village is within contours that would render it unsuitable for residential use unless mitigation measures were taken to reduce the impact of traffic noise on sensitive facades.

7.2.5.8 Figure 25 shows contours associated with Option C. The impact of Clearwater Bay Road and Lung Chueng Road traffic is less than in the preceding Figures, but traffic on the flyover again renders the residential-zoned area north of Ngau Chi Wan village unsuitable for residential use unless mitigation measures were taken to reduce the impact of traffic noise on sensitive facades.

7.3 Air Quality

Figures showing the results of air quality calculations at elevations of 0 m, 20 m, and 40 m above ground are shown in Figures 18A, 19A and 20A (CO), 18B, 19B and 20B (NO_2), and 18C, 19C and 20C (TSP).

Tables 7.5 to 7.7, showing comparative concentrations of CO (Table 7.5), NO_2 (Table 7.6), and TSP (Table 7.7) are found below.

7.3.1 Do-Nothing

7.3.1.1 Carbon monoxide (CO) concentrations are not expected to approach or exceed Hong Kong Air Quality Objectives (AQO).

7.3.1.2 Nitrogen dioxide (NO_2) concentrations are anticipated to be high in 2011, and to exceed AQO standards at some facades close to Lung Cheung Road and Clearwater Bay Road. (Current NO_2 concentrations -- both calculated and monitored -- are already high.) Receivers anticipated to experience NO_2 concentrations exceeding AQO standards are those at a low level along Lung Cheung Road in Choi Hung Estate, and along Clearwater Bay Road in Ping Shek and Choi Wan Estates.

Receivers in St Joseph's Home for the Aged, Ngau Chi Wan village, and the planned Leisure Pools Complex are expected to experience high, but acceptable, levels of NO_2. The UC Ngau Chi Wan Complex would also be subject to high concentrations of NO_2.

NO_2 is dispersed by the time it reaches Bayview Gardens and does not present a high concentration.

7.3.1.3 Levels of total suspended particulates (TSP) are expected to be high in 2011, and to exceed AQO standards at receivers very close to the edge of Clearwater Bay Road: Ping Shek Catholic Primary School and Choi Wan St Joseph's Primary School.

Other school and residential receivers in Choi Hung, Ping Shek, and Choi Wan Estates are expected to experience high but acceptable levels of TSP. Receivers in St Joseph's Home for the Aged, Ngau Chi Wan village, and the planned Leisure Pools Complex could expect lower levels of TSP that are well within AQO limits.

TSP is dispersed by the time it reaches Bayview Gardens and does not present a high concentration.

7.3.2 Option A

7.3.2.1 Carbon monoxide concentrations are not expected to approach or exceed Hong Kong Air Quality Objectives (AQO).

7.3.2.2 Nitrogen dioxide (NO_2) concentrations are anticipated to be high under Option A, and to exceed AQO standards at some facades close to Lung Cheung Road and Clearwater Bay Road. Receivers expected to experience NO_2 concentrations exceeding AQO standards are lower-storey residents in Kam Hon House (Choi Hung Estate) and low-level facades immediately beside Clearwater Bay Road in Ping Shek and Choi Wan Estates: Tsuen Shek House, Ping Shek Catholic Primary School, and Yan Kau School.

Other residential and school receivers along Lung Cheung Road and Clearwater Bay Road, as well as receivers in St Joseph's Home for the Aged, Ngau Chi Wan village, and the planned Leisure Pools Complex are expected to experience high, but acceptable, levels of NO_2. The UC Ngau Chi Wan Complex would also be subject to high concentrations of NO_2.

NO_2 is dispersed by the time it reaches Bayview Gardens and does not present a high concentration.

7.3.2.3 Levels of total suspended particulates (TSP) are expected to be high under Option A, but are anticipated to exceed AQO standards only at Ping Shek Catholic Primary School and Choi Wan St Joseph's Primary School.

Other school and residential receivers in Choi Hung, Ping Shek, and Choi Wan Estates are expected to experience high but acceptable levels of TSP. Receivers in St Joseph's Home for the Aged, Ngau Chi Wan village, and the planned Leisure Pools Complex could expect lower levels of TSP that are well within AQO limits.

TSP is dispersed by the time it reaches Bayview Gardens and does not present a high concentration.

7.3.3 Option B

7.3.3.1 Carbon monoxide concentrations are not expected to approach or exceed Hong Kong Air Quality Objectives (AQO).

7.3.3.2 Nitrogen dioxide (NO_2) concentrations are anticipated to be high under Option B, and to exceed AQO standards at some facades close to Lung Cheung Road and Clearwater Bay Road. Receivers expected to experience NO_2 concentrations exceeding AQO standards are lower-storey residents in Kam Hon House (Choi Hung Estate) and low-level facades immediately beside Clearwater Bay Road in Ping Shek and Choi Wan Estates: Tsuen Shek House, Ping Shek Catholic Primary School, and Yan Kau School.

Other residential and school receivers along Lung Cheung Road and Clearwater Bay Road, as well as receivers in St Joseph's Home for the Aged, Ngau Chi Wan village, and the planned Leisure Pools Complex are expected to experience high, but acceptable, levels of NO_2. The UC Ngau Chi Wan Complex would also be subject to high concentrations of NO_2.

NO_2 is dispersed by the time it reaches Bayview Gardens and does not present a high concentration.

7.3.3.3 Levels of total suspended particulates (TSP) are expected to be high under Option B, but are anticipated to exceed AQO standards only at Ping Shek Catholic Primary School and Choi Wan St Joseph's Primary School.

Other school and residential receivers in Choi Hung, Ping Shek, and Choi Wan Estates are expected to experience high but acceptable levels of TSP. Receivers in St Joseph's Home for the Aged, Ngau Chi Wan village, and the planned Leisure Pools Complex could expect lower levels of TSP that are well within AQO limits.

TSP is dispersed by the time it reaches Bayview Gardens and does not present a high concentration.

7.3.4 Option C

7.3.4.1 Carbon monoxide concentrations are not expected to approach or exceed Hong Kong Air Quality Objectives (AQO).

7.3.3.2 Removal of the flyover alignment to the hillside does not greatly affect many receivers that are subject to air quality impacts from Lung Cheung Road and Clearwater Bay Road traffic. In general, nitrogen dioxide (NO_2) concentrations are anticipated to be high under Option C as they are under Options A and B, and could exceed AQO standards at some facades close to Lung Cheung Road and Clearwater Bay Road. Receivers expected to experience NO_2 concentrations exceeding AQO standards are lower-storey residents in Kam Hon House (Choi Hung Estate) and low-level facades immediately beside Clearwater Bay Road in Ping Shek and Choi Wan Estates: Tsuen Shek House and Ping Shek Catholic Primary School.

Other residential and school receivers along Lung Cheung Road and Clearwater Bay Road, as well as receivers in St Joseph's Home for the Aged, Ngau Chi Wan village, and the planned Leisure Pools Complex are expected to experience high, but acceptable, levels of NO_2. The UC Ngau Chi Wan Complex would also be subject to high concentrations of NO_2.

Some receivers in Bayview Gardens experience an increase in NO_2 levels relative to Options A and B, but concentrations at Bayview Gardens are still expected to be well within AQO standards.

7.3.3.3 Removal of the flyover alignment to the hillside does not greatly affect many receivers that are subject to air quality impacts from Lung Cheung Road and Clearwater Bay Road traffic. Levels of total suspended particulates (TSP) are expected to remain high under Option C, but are anticipated to exceed AQO standards only at Ping Shek Catholic Primary School and Choi Wan St Joseph's Primary School.

Other school and residential receivers in Choi Hung, Ping Shek, and Choi Wan Estates are expected to experience high but acceptable levels of TSP. Receivers in St Joseph's Home for the Aged, Ngau Chi Wan village, and the planned Leisure Pools Complex could expect lower levels of TSP that are well within AQO limits.

Some receivers in Bayview Gardens experience an increase in TSP levels relative to Options A and B, but concentrations at Bayview Gardens are still expected to be well within AQO standards.

7.3.5 Summary and Ranking

7.3.5.1 Tables 7.5 to 7.7 show the ground-level concentrations of CO, NO_2, and TSP at sensitive receivers for each of Options A, B, and C.

7.3.5.2 Tables 7.8 to 7.9 show the relative degree of impact expected to be experienced by each sensitive receiver.

The Tables use ground-level NO_2 concentration as an indication of air quality impact. This is because AQO standards for NO_2 are most stringent: calculations show that, in 2011, AQO standards for NO_2 could be exceeded at seven receivers, while AQO standards for TSP could be exceeded at three receivers. The AQO maximum for CO is not expected to be approached or exceeded at any receivers.

Tables 7.8 to 7.10 assign a degree of impact to each receiver for each Option. A low degree of impact (1) has been assigned to receivers expected to experience no change in NO_2 concentration levels relative to the Do-Nothing concentrations. Similarly, a low degree of impact (1) has been assigned to receivers expected to experience an improvement in pollutant concentrations relative to the Do-Nothing concentration. A moderate degree of impact (2) has been assigned to receivers experiencing a small increase in pollutant concentration (10 to 20 $\mu g/m^3$), or to a small population group experiencing a moderate increase in pollutant concentration (30 to 40 $\mu g/m^3$). A high degree of impact (3) has been assigned to a larger population group experiencing a moderate increase in pollutant concentration (30 to 40 $\mu g/m^3$) where that concentration is expected to exceed the AQO maximum. A severe degree of impact (3) has also been assigned to a larger population group experiencing a large increase in pollutant concentration (50 to 90 $\mu g/m^3$).

TABLE 7.5 - CONCENTRATION OF CARBON MONOXIDE: DO-NOTHING SCENARIO AND OPTIONS A, B, AND C

ID	Concentration of CO at Ground Level $\mu g/m^3$				ID	Concentration of CO at Ground Level $\mu g/m^3$			
	D-N	A	B	C		D-N	A	B	C
R1	6360	6240	6160	5630	R13	2970	3790	4020	3340
R2	5100	4870	4750	4700	R14	3220	4200	4360	3950
R3	4450	5500	4820	4820	R15	1910	2210	2270	2230
R4	6300	6650	6640	6630	R17	2390	2520	2580	2300
R5	8550	9760	9500	9490	R18	1980	2110	2140	1820
R6	4920	6470	5990	5520	R19	2130	2230	2240	3500
R7	4000	5450	5140	5030	R21	2040	2120	2120	2460
R10	5950	7950	7880	7580	R22	3450	3600	3580	3570
R11	6960	8690	8430	8370	R23	3600	3160	3160	3160
R12	3650	4870	4280	4120					

NOTES:
- "D-N" = Do-Nothing Scenario (no flyover)
  "A" = Option A flyover alignment
  "B" = Option B flyover alignment
  "C" = Option C flyover alignment
- Sensitive Receiver locations shown in Figure 2.
- Shows CO pollution levels at ground elevation due to 2011 morning peak hour traffic flows on major roads in study area.

TABLE 7.6 - CONCENTRATION OF NITROGEN DIOXIDE: DO-NOTHING SCENARIO AND OPTIONS A, B, AND C

ID	Concentration of NO_2 at Ground Level $\mu g/m^3$				ID	Concentration of NO_2 at Ground Level $\mu g/m^3$			
	D-N	A	B	C		D-N	A	B	C
R1	380	370	360	330	R13	160	180	190	160
R2	290	260	260	250	R14	170	200	210	180
R3	240	260	240	240	R15	110	120	120	110
R4	340	340	340	340	R17	140	140	140	140
R5	440	490	470	470	R18	110	120	120	100
R6	260	320	300	270	R19	120	120	120	180
R7	210	270	260	230	R21	130	120	120	130
R10	300	390	380	360	R22	210	210	210	210
R11	350	410	400	400	R23	210	180	180	180
R12	200	230	200	200					

NOTES:
- "D-N" = Do-Nothing Scenario (no flyover)
  "A" = Option A flyover alignment
  "B" = Option B flyover alignment
  "C" = Option C flyover alignment
- Sensitive Receiver locations shown in Figure 2.
- Shows NO_2 pollution levels at ground elevation due to 2011 morning peak hour traffic flows on major roads in study area.

TABLE 7.7 - CONCENTRATION OF TOTAL SUSPENDED PARTICULATES: DO-NOTHING SCENARIO AND OPTIONS A, B, AND C

ID	Concentration of TSP at Ground Level $\mu g/m^3$				ID	Concentration of TSP at Ground Level $\mu g/m^3$			
	D-N	A	B	C		D-N	A	B	C
R1	260	220	220	200	R13	110	110	120	110
R2	200	160	160	150	R14	120	120	130	120
R3	170	170	150	150	R15	70	70	70	70
R4	240	200	210	210	R17	100	80	90	80
R5	310	300	290	290	R18	80	70	70	60
R6	180	200	190	170	R19	90	80	80	110
R7	150	170	160	150	R21	90	70	70	80
R10	210	240	240	230	R22	140	130	120	120
R11	240	260	250	250	R23	150	110	110	110
R12	140	150	130	120					

NOTES:
- "D-N" = Do-Nothing Scenario (no flyover)
  "A" = Option A flyover alignment
  "B" = Option B flyover alignment
  "C" = Option C flyover alignment
- Sensitive Receiver locations shown in Figure 2.
- Shows TSP pollution levels at ground elevation due to 2011 morning peak hour traffic flows on major roads in study area.

TABLE 7.8 - AIR QUALITY IMPACT ASSESSMENT: OPTION A

Receiver		Pop.	2011 NO_2 Concentration ($\mu g/m^3$)		AQO[1]	Degree of Impact
			Do-Nothing	Option A		
R1	Kam Hon House	310	380	370	E	1
R2	Tan Fung House	1600	290	260		1
R3	UC Complex	50	240	260		2
R4	Tsuen Shek House	450	340	340	E	1
R5	Ping Shek School	530	440	490	E	3
R6	Yan Kau School	530	260	320	E	3
R7	St Johns School	530	210	270		3
R10	Sau Man House	2200	300	390	E	3
R11	St Josephs School	530	350	410	E	3
R12	Home for the Aged (South)	40	200	230		2
R13	Home for the Aged (Mid)	40	160	180		2
R14	Home for the Aged (East)	40	170	200		2
R15	Home for the Aged (North)	40	110	120		2
R17	Bayview Gardens (West)	970	140	140		1
R18	Bayview Gardens (East)	970	110	120		2
R19	Bayview Gardens (North)	970	120	120		1
R21	Football Pitch	50	130	120		1
R22	Liesure Pools	400	210	210		1
R23	Lung Chi Path	800	210	180		1
					TOTAL	35

NOTES: [1] "E" indicates that the AQO standard for NO_2 concentration is expected to be exceeded in 2011.

TABLE 7.9 - AIR QUALITY IMPACT ASSESSMENT: OPTION B

Receiver		Pop.	2011 NO_2 Concentration ($\mu g/m^3$)		AQO[1]	Degree of Impact
			Do-Nothing	Option B		
R1	Kam Hon House	310	380	360	E	1
R2	Tan Fung House	1600	290	260		1
R3	UC Complex	50	240	240		1
R4	Tsuen Shek House	450	340	340	E	1
R5	Ping Shek School	530	440	470	E	3
R6	Yan Kau School	530	260	300	M	3
R7	St Johns School	530	210	260		3
R10	Sau Man House	2200	300	380	E	3
R11	St Josephs School	530	350	400	E	3
R12	Home for the Aged (South)	40	200	200		1
R13	Home for the Aged (Mid)	40	160	190		2
R14	Home for the Aged (East)	40	170	210		2
R15	Home for the Aged (North)	40	110	120		2
R17	Bayview Gardens (West)	970	140	140		1
R18	Bayview Gardens (East)	970	110	120		2
R19	Bayview Gardens (North)	970	120	120		1
R21	Football Pitch	50	130	120		1
R22	Liesure Pools	400	210	210		1
R23	Lung Chi Path	800	210	180		1
					TOTAL	33

NOTE: [1] "E" indicates that the AQO maximum for NO_2 concentration is expected to be exceeded in 2011. "M" indicates that the AQO maximum for NO_2 concentration is expected to be met in 2011.

TABLE 7.10 -AIR QUALITY IMPACT ASSESSMENT: OPTION C

Receiver		Pop.	2011 NO_2 Concentration ($\mu g/m^3$)		AQO[1]	Degree of Impact
			Do-Nothing	Option C		
R1	Kam Hon House	310	380	330	E	1
R2	Tan Fung House	1600	290	250		1
R3	UC Complex	50	240	240		1
R4	Tsuen Shek House	450	340	340	E	1
R5	Ping Shek School	530	440	470	E	3
R6	Yan Kau School	530	260	270		2
R7	St Johns School	530	210	230		2
R10	Sau Man House	2200	300	360	E	3
R11	St Josephs School	530	350	400	E	3
R12	Home for the Aged (South)	40	200	200		1
R13	Home for the Aged (Mid)	40	160	160		1
R14	Home for the Aged (East)	40	170	180		2
R15	Home for the Aged (North)	40	110	110		1
R17	Bayview Gardens (West)	970	140	140		1
R18	Bayview Gardens (East)	970	110	100		1
R19	Bayview Gardens (North)	970	120	180		3
R21	Football Pitch	50	130	130		1
R22	Liesure Pools	400	210	210		1
R23	Lung Chi Path	800	210	180		1
					TOTAL	30

NOTES: [1] "E" indicates that the AQO standard for NO_2 concentration is expected to be exceeded in 2011.

7.3.5.3 Results show that Option A is expected to have the greatest air quality impacts on the sensitive receivers selected to represent the population in the study area. Option B would have slightly less of an impact on air quality, and Option C would have the least impact of the three. The differences in expected impact between the three Options, particularly between Options A and B, are small.

Option A runs very close to, and therefore has a more severe impact on, the UC Complex and the extreme southern area of St Joseph's Home for the Aged.

Yan Kau and St Johns Primary Schools receive a comparatively greater impact from the alignments of Options A and B than they do from the Option C alignment. Ping Shek Catholic Primary School, which is situated very close to the roadway, is severely affected by Clearwater Bay Road traffic under all Options as well as the Do-Nothing scenario.

7.4 Land use

7.4.1 Introduction

The land use impact of the three flyovers has been assessed for the constructional and operational phases and in consideration of the potential to mitigate impact at each phase. The purpose of this section is to assess the land use impact of the three route options during the operational phase. Land use impact during this phase is considered to be of prime importance due to the ongoing nature of the impact and has therefore been assessed in detail for each individual group of receivers. The assessment at this phase provides an essential starting point for the overall land use assessment. The impact on each receiver is evaluated and rated as either low (1), moderate (2) or severe (3). Detailed assessments are given in Appendix E and the results are also tabulated in Tables E1, E2 and E3.

7.4.2 Option A

The detailed assessment of the impact of Option A on each relevant sensitive receiver is given at Appendix E1.

7.4.3 Option B

The detailed assessment of the impact of Option B on each relevant sensitive receiver is given at Appendix E2.

7.4.4 Option C

The detailed assessment of the impact of Option C on each relevant sensitive receiver is given at Appendix E3.

7.4.5 Summary and Ranking

The ranking of landuse impact is judged to be the same as in the construction stage (para 6.4.5).

7.5 Visual Impact

7.5.1 The visual impact of the three flyovers has been assessed for the constructional and operational phases and in consideration of the potential to mitigate impact at each phase. The purpose of this section is to assess the visual impact of the three route options during the operational phase. Visual impact during this phase is considered to be of prime importance due to the ongoing nature of the impact and has therefore been assessed in detail for each individual group of receivers. The assessment at this phase provides an essential starting point for the overall visual assessment. The impact on each receiver is evaluated and rated as either low (1), moderate (2) or severe (3). Detailed assessments are given in Appendix F and the results are also tabulated in Tables F1, F2 and F3.

7.5.2 Option A

The detailed assessment of the impact of Option A on each relevant sensitive receiver is given at Appendix F1.

7.5.3 Option B

The detailed assessment of the impact of Option B on each relevant sensitive receiver is given at Appendix F2.

7.5.4 Option C

The detailed assessment of the impact of Option C on each relevant sensitive receiver is given at Appendix F3.

7.5.5 Summary and Ranking

In terms of visual impact Option C is determined to be severe and A & B are both moderate. Further discussion on A & B is given in 11.2.5.

7.6 Landscape Impact

7.6.1 The purpose of this section is to assess the impact of the three route options on the landscape of the Study Area during the operational phase of the route. Landscape impact has been defined as the loss of natural landform and associated vegetation, loss of trees and the disruption of open spaces. Inevitably the main impact on these elements would take place at the construction phase when the road corridor is cleared and land formation is undertaken. Impact at the operation phase could be described as the ongoing impact of the damage done at the construction stage as there is no further impact caused by the road itself once it is in operation. The main distinction between the construction and operational phases is that the impact would tend to diminish in the operational phase as restorative and compensatory landscaping becomes established and matures. The ability to mitigate the impact of the routes in this way is discussed in Sections 8.6 and 9.6. On the basis of the above argument the impact at the operational phase can be considered to be product of the impact at the construction phase modified by ameliorative planting and has not therefore contributed to the overall assessment.

8. COMPARISON OF OPTIONS: AMELIORATION/ABATEMENT MEASURES CONSTRUCTION PHASE

8.1 Introduction

In this section various measures which could be taken during the construction phase are described and the resulting impacts are assessed for comparison with Section 6.

8.2 Noise

The most effective mitigation measure is to control noise at its source. In the case of powered mechanical equipment, this involves either selecting silenced equipment, or reducing the transmission of noise using mufflers, silencers, or acoustic enclosures.

Construction noise may be mitigated through several measures. This section does not aim to provide a comprehensive accounting of construction noise mitigation, but addresses only those measures that can achieve predictable and quantifiable results for assessment:

(a) Noisy plant or processes may be replaced by quieter alternatives where possible. Silenced diesel and gasoline generators and power units, silenced and super-silenced air compressors, and mufflers can be readily obtained. Silencing measures must be properly maintained and utilised.

(b) The power units of non-electric stationary plant and earth-moving plant can be quietened by vibration isolation and partial or full acoustic enclosures for individual noise-generating components.

(c) Temporary noise barriers or earth embankment may be used to screen specific receivers. Where sufficient space is available, a mobile acoustic enclosure may be used. The barrier material must have a mass per unit of surface area of at least 7 kg/m^2, and have acoustic lining. Where insufficient space is available for acoustic enclosures, free-standing acoustic panels may be used.

Evaluation of the exact effectiveness of these measures at a given receiver requires a knowledge of the planned construction schedule, which is not available at this stage. Estimates of the noise reductions capable are provided below:

Stationary and Earth-moving Plant: These pieces of equipment include compressors, concrete pumps, excavators, bulldozers, loaders, and dumptrucks. Noise reduction can be achieved through proper maintenance of the exhaust system, and through exhaust silencers. Additionally, engine noise is amenable to reduction through isolation of vibrating engine components, installation of partial or full acoustic enclosures of noise-generating components, and damping of vibrating panels. U.S. tests have shown that partial or full enclosures can achieve noise reductions of 10 and 25 dB(A) respectively.

Super-silenced compressors incorporate acoustic casing linings, mufflers, and anti-vibration mounts to isolate the engine and compressor unit for the chassis. A reduction of 5 dB(A) can be achieved with the use of a super-silenced compressor relative to a silenced compressor.

Barrier: Purpose-built mobile noise barriers, located close to the noise source, can be fabricated. Assuming that the barrier has no gaps, and that it blocks the line of sight between noise generator and noise receiver, reductions of 5 to 10 dB(A) can be achieved.

Utilising the mitigating measures outlined above, assuming a 5 dB(A) reduction with the use of a site barrier and a 10 dB(A) reduction from partial enclosure of PME equipment and engines, an overall reduction of about 8 dB(A) during pile cap construction could be achieved.

This reduction brings noise from pile cap construction, the single loudest construction activity, under the desired 75 dB(A) Leq (30 min) noise limit at many receivers. Receivers in close proximity to works would still experience high noise levels. It should be recalled that the noise levels shown above are for the single loudest construction activity, and assume a worst-case situation in which all equipment is operating simultaneously at the closest point of the alignment. This situation is in fact not likely to occur.

An effective method of enforcing noise mitigation efforts is the inclusion of a noise Standard in the contract document, requiring the Contractor to manage the noise and specifying the requirements for noise monitoring on the site. In addition, residents may be provided with a telephone number for the Resident Engineer's office, where they may register complaints concerning excessive noise.

8.2.1 Do-Nothing

No flyover construction noise would be experienced by sensitive receivers.

8.2.2 Option A

8.2.2.1 Results of noise calculations due to noise-mitigated construction activities are shown in Table 8.1.

8.2.2.2 Because the Option A alignment passes through a densely urban setting, many sensitive receivers located close to the alignment remain significantly affected by construction activity.

8.2.3 Option B

8.2.3.1 Results of noise calculations due to construction activities are shown in Table 8.1.

8.2.3.2 As with Option A, Option B has significant noise impacts during construction because the alignment passes through a densely urban setting. Receivers located close to the alignment remain subject to noise levels exceeding the desired 75 dB(A).

8.2.4 Option C

8.2.4.1 Results of noise calculations due to construction activities are shown in Table 8.1.

8.2.4.2 The Option C alignment avoids some of the densely urban setting through which Options A and B pass. However, at the flyover's connections with existing roads, the Option C alignment continues to have noise impacts that are not significantly different from the Option A and B alignments.

8.2.5 Ranking

8.2.5.1 The single loudest construction activity -- pile cap construction -- remains as a basis for comparison.

8.2.5.2 Comparison of Options A to C is provided in Table 8.1. Many calculated noise levels still exceed both the existing background noise levels and the desired construction noise maximum of 75 dB(A), and are therefore accorded a high degree of impact (3). Where the calculated construction noise level exceeds the existing background noise level, but is under the desired maximum noise level of 75 dB(A), it is accorded a moderate degree of impact (2). In cases where the maximum noise level exceeds neither the existing background noise level nor 75 dB(A), construction noise is assigned a low degree of impact (1).

TABLE 8.1 - CONSTRUCTION NOISE IMPACT ASSESSMENT

Receiver		Pop.	Noise from Pile Cap Construction (dB(A))			Degree of Impact		
			Option			Option		
			A	B	C	A	B	C
R1	Kam Hon House	310	88	88	83	3	3	3
R2	Tan Fung House	1600	74	74	69	1	1	1
R3	UC NCW Complex	50	83	78	68	3	3	1
R4	Tsuen Shek House	450	75	72	67	2	1	1
R5	Ping Shek School	530	88	80	75	3	3	2
R6	Yan Kau School	530	84	81	78	3	3	3
R7	St Johns School	530	84	84	82	3	3	3
R10	Sau Man House	2200	86	86	87	3	3	3
R11	St Josephs School	530	88	89	90	3	3	3
R12	Home for the Aged (South)	40	104	94	72	3	3	1
R13	Home for the Aged (Mid)	40	81	104	74	3	3	1
R14	Home for the Aged (East)	40	81	93	86	3	3	3
R15	Home for the Aged (North)	40	71	74	84	2	2	3
R16	Home for the Aged (West)	40	79	86	74	3	3	2
R17	Bayview Gardens (West)	970	76	76	81	3	3	3
R18	Bayview Gardens (East)	970	75	75	90	2	2	3
R19	Bayview Gardens (North)	970	75	75	81	2	2	3
R20	Hung Sean Chow College	530	67	67	76	1	1	3
R21	UC Sports Ground	50	73	73	77	1	1	2
R22	UC Leisure Pools	400	78	78	78	2	2	2
R23	Lung Chi Path	800	108	90	63	3	3	1
R28	Pak Fung House	2200	78	80	82	3	3	3
					TOTAL	55	54	50

8.2.5.3 As with unmitigated construction noise, the Option C alignment is judged to be marginally more acceptable. Low-rise receivers in Ngau Chi Wan Village remain shielded from construction noise along the Option C alignment, and most receivers in Choi Hung and Ping Shek Estates are protected from construction noise by existing high background noise levels and by distance.

8.3 Air Quality

Calculations indicate that dust generation during construction could approach, but is not anticipated to exceed, the desired maximum level of 500 $\mu g/m^3$. Thus, mitigation measures to control dust, a number of which are mentioned below, would not be expected to change the relative impact during construction of the alignments proposed under Options A to C. Measures to control the generation and transmission of dust would merely reduce the relative impacts of the three Options, but could not be expected to render Option C more desirable than Options A and B, or to create differences in the relative impacts of Options A and B.

Mitigation measures are necessary for the benefit of receivers affected by dust from construction of viaduct piers and from cut and fill operations on Hammer Hill.

Watering is the most common dust control method for exposed site surface, but its effectiveness depends on the degree of coverage and the frequency of application. Effective water sprays should be used during delivery and handling of fill when dust is likely to escape. Chemical wetting agents can prolong the effectiveness of a spray application.

It is also desirable to reduce dust transmission. Hoarding erected around the site serves to contain some of the dust raised during construction activities. The effectiveness of hoarding increases with its height.

Lorries transporting fill should be fitted with wind boards and/or tarpaulins to minimise wind erosion and spillage of their loads.

A wheelwashing trough should be installed for trucks leaving the site.

8.4 Land Use

8.4.1 The purpose of this section is to compare the potential to ameliorate land use impact during the construction phase of each of the route options. Land use impact has been defined as a combination of direct impact on existing and planned land uses actually located within the clearance corridor, and indirect impact on adjoining land uses which are in some way incompatible with the proposed road. Indirect land use would generally result from incompatibility of land usage as a result of other types of impact such as noise levels and air pollution.

8.4.2 Mitigation of direct land use impact during the construction stage would necessitate the protection of existing land uses during the construction process. For route options A mitigation could include the preservation by over-sailing of USD's RCP and public lavatory, the existing shrine adjacent to Lung Chi Path and the gate house and boundary wall forming the frontage of St. Josephs Home for the Aged. *Mitigation may also include a slight realignment of Route A subject to MTR's final detailed proposals for the redevelopment of Ping Shek Estate*. Similar opportunities exist for mitigation of impact from Option B in the preservation of the RCP and public lavatory, a building within St

Josephs Home for the Aged and WSD's water pumping station located on Clearwater Bay Road. Mitigation for Option C would include the preservation of the Ping Ting,On Ting, Wing Ting road corridor during the construction process, and the preservation of the existing lodge to the north east of St Josephs Home for the Aged. Mitigation of indirect land use impact would suggest mitigation of related environmental impacts which are discussed in detail elsewhere in this report.

8.5 Visual Impact

8.5.1 Introduction

The purpose of this section is to assess the potential to mitigate against the visual impact of the three route options during the construction stage.

8.5.2 Option A

During the initial stage of construction the main source of visual impact would result from the clearance of the site and the demolition of buildings. The impact of this operation could be reduced by the early erection of hoardings and the construction of building enclosures during the course of building demolition. Screening of views of the construction of the flyover structure would be more difficult to achieve because of the height of the structure above ground level and the large number of adjoining high level viewers who have a clear line of sight into the construction corridor. Screening of views from low level residential facades immediately adjoining the site may however be possible by the erection of temporary high level screens constructed from bamboo and plastic sheet. Screening by landscaping adjacent to the completed structure would not be beneficial during the construction process because such works could only be completed within the narrow road corridor at the end of the construction process.

8.5.3 Option B

The opportunities to mitigate impact would be similar to Option A.

8.5.4 Option C

Visual impact from Option C would result mainly from the clearance and grading of the natural hillside and from the visibility of the road structure during the various stages of construction. Most of the sensitive receivers affected by Route Option C would view the road from high level viewpoints and as a result screening of the structure would be impractical to achieve during the construction process. The visual impact of land disturbed beyond the 20-25 metre wide working corridor could however be reduced by the carrying out of hydroseeding and appropriate tree and shrub planting as soon as earth moving had been completed. This would enable the "greening" of the disturbed areas within the duration of the contract although it should be stressed that full mitigation of the disturbance could only be achieved over a longer period of time during which the proposed planting would have time to become more fully established.

8.5.5 Ranking

In conclusion the ability to mitigate visual impact at the construction stage is limited and no clear advantage emerges for either Route.

8.6 Landscape Impact

8.6.1 Introduction

This section assesses the potential to mitigate against landscape impact during the construction of the three Route Options. Landscape impact has been defined principally as the disturbance to natural hillside and associated vegetation, the loss of individual trees and of existing open spaces which contribute to the urban landscape. Mitigation of such an impact could be achieved both through minimizing impact through modification of the route alignment or the preservation of such feature during the construction process, or their restoration on completion of the works.

8.6.2 Options A and B

Mitigation of impact would be limited to the protection and preservation of existing trees located along the boundary of the works area, or within adjoining cleared sites, which might in other circumstances be felled as a matter of convenience. In addition trees situated within the construction corridor could be transplanted to a holding nursery during the course of the contract and replanted in adjoining open space or amenity areas at the completion of the contract. Mitigation of landscape impact in the form of reprovisioning of disturbed open spaces and the replanting of trees would mostly be carried out in the operational phase.

8.6.3 Option C

As discussed in Section 6.6 Route Option C would have the worst impact on the landscape of the study area largely as a result of the large area of hillside that would be cleared and regraded in order to construct the cut and fill platforms proposed for this option. The best opportunity to mitigate this impact would be to reduce the area of hillside disturbance by increasing the length of the road to be built on structure and reducing the extent of required earthworks. Beyond this, mitigation would relate mostly to restorative treatments such as the hydroseeding and replanting of disturbed hillside areas on completion of the initial site formation stage. The remainder of the disturbed construction corridor could not be restored until the completion of the construction process.

8.6.4 Ranking

In conclusion Option C would have the worst landscape impact at the construction stage but would also offer the best opportunities to mitigate impact by design modification and restoration.

9. COMPARISON OF OPTIONS: AMELIORATION/ABATEMENT MEASURES OPERATIONAL PHASE

9.1 Introduction

In this section various permanent measures which could be included in the construction works are described and the resulting impacts are assessed for comparison with Section 7.

9.2 Noise

Three types of mitigation measures have been considered to reduce the level of flyover traffic noise at sensitive facades.

9.2.1 *Friction Course*

9.2.1.1 *With the introduction of a pervious macadam paving surface on the flyover, noise from traffic on the flyover would decrease by about 2.5 dB(A).*

9.2.1.2 *For receivers affected primarily by the flyover (such as north-facing facades in Bayview Gardens or receivers in Ngau Chi Wan Village), this decrease would be inadequate to bring noise levels to HKPSG standards. However, the use of friction course would be beneficial at the ends of the flyover under all Options; the use of a pervious macadam would improve the overall noise environment by diverting a proportion of the traffic flow onto a quietened surface.*

9.2.1.3 *For example, at the western end of the flyover near Receiver R1, 2011 traffic flows are expected to produce a total facade noise level of 84.5 dB(A) - 83.3 dB(A) from Lung Cheung Road traffic, 77.9 dB(A) from flyover traffic, and a small contribution from other roads. Use of a pervious macadam would reduce the flyover component of traffic noise to 75.4 dB(A), reducing the overall traffic noise level by 0.5 dB(A).*

9.2.1.4 *The benefit of this small but significant reduction is to obviate the need for more expensive mitigation measures at source (such as barriers or total enclosure) and at the receiver (such as glazing). Guidelines recently adopted by EPD, which define the eligibility of individual receivers for noise insulation measures (glazing and air-conditioning), require insulation be provided where the following three criteria are met:*

(1) The predicted overall noise level from the new road, together with other traffic noise, must not be less than the HKPSG criteria, and

(2) The predicted noise level is at least 1.0 dB(A) more than the prevailing noise level, defined here to be the 1991 noise level, and

(3) The contribution to the increase in the noise level from the new road must be at least 1.0 dB(A).

9.2.1.5 *At the western end of the flyover, the first two criteria are met: predicted L_{10} noise levels are about 84 dB(A), 3 dB(A) above the monitored L_{10} noise level of 81 dB(A). However, the use of pervious macadam paving reduces the individual contribution from flyover traffic (the third criterion) from 1.1 dB(A) to 0.6 dB(A). With a pervious paving material, that portion of traffic diverted onto the flyover is sufficiently quietened to obviate the need for further mitigation at the receiver, as determined by the new EPD standard.*

9.2.1.6 *A similar situation exists at the eastern end of the flyover, where pervious macadam paving material reduces the noise from flyover traffic at Pak Fung House (R28) and Sau Man House (R10). With the use of pervious macadam, further mitigation at the receiver is not required.*

9.2.2 *Noise Barriers*

9.2.2.1 *The assessment in Section 7.2 of noise at fixed receivers has accounted for the short (0.8m) solid parapets proposed on both sides of the flyover, which constitute a noise barrier for some low-rise receivers in Ngau Chi Wan village and St. Joseph's Home for the Aged. If the height of these parapets were to be increased, such as is shown in Figure 34, a more effective barrier could be formed. This measure is recommended along the northern side of the flyover under Options A and B, along the boundary of the Home for the Aged. Such a heightened barrier could more effectively block the transmission of noise from goods vehicles, in which engines are often mounted higher than those in passenger vehicles.*

9.2.2.2 *For the existing and future highrise receivers in the study area, noise barriers elsewhere along the proposed alignments would be ineffective, since they would fail to block the noise transmission path.*

9.2.3 *Total Enclosure*

9.2.3.1 *Because of an anticipated high noise level from flyover traffic and the proximity of highrise dwellings (present or planned), use of friction course or barriers alone would not be effective over much of the length of the flyover. Where these measures would be inadequate, a total enclosure would be the only effective measure to block noise transmission from the elevated flyover. Anticipated lengths that would require enclosure are shown in Figures 26 and 27.*

9.2.3.2 *A form of total enclosure is shown in Figure 35. This type of enclosure would be suitable for lengths up to about 50m. If the length were significantly greater than this, mechanical ventilation would have to be considered to ensure adequate interior air quality during normal and emergency conditions. Alternatively, it may be possible to provide self ventilation by omitting side panels at intervals on the side facing less sensitive receivers, e.g., on the south side of Option A or B, or on the north side of Option C.*

The ventilation requirements of the enclouure will be determined in the detailed design stage, and will be based on anticipated traffic conditions and emergency ventilation needs. If forced ventilation is required, a ventilation system must be designed with vents located and positioned so that their plumes do not impinge on sensitive receivers. If natural ventilation is found to be adequate, the number and locations of side panels (if any) to be omitted must be determined. This determination must be made with reference to sensitive receivers likely to be affected by the resulting gaps.

9.2.3.3 *The following paragraphs (9.2.4 to 9.2.6) give an evaluation of the effect of the total enclosure. Table 9.1 presents the results of calculations at the top floor of sensitive facades. Four traffic scenarios were assessed: 2011 without the flyover (Do-Nothing scenario), and 2011 with each of three enclosed flyover options (Options A, B and C).*

A comparative assessment (over three Options) of the effectiveness of pervious macadam paving material is not provided, since the flyover sections for which it is required are those at both ends that are common to all the Options.

9.2.4 Option A

9.2.4.1 Despite the use of a flyover enclosure, noise levels at almost all noise-sensitive receivers are expected to continue to significantly exceed HKPSG standards.

9.2.4.2 Traffic flows along Lung Cheung Road and Clearwater Bay Road are expected to continue to dominate north-facing facades facing these roadways (Receivers R1, R2, and R4).

9.2.4.3 Similarly, noise from traffic flows along Clearwater Bay Road is also expected to continue to dominate the southern areas of St Joseph's Home for the Aged (Receivers R12-*R14*), resulting in continued exceedance of the HKPSG maximum.

9.2.4.4 Tower blocks in Bayview Gardens with facades facing Lung Cheung Road (Receivers R17 and R19) will remain primarily affected by the noise from traffic on that road, somewhat ameliorated by the barrier effect of buildings along the roadway.

9.2.4.5 Receivers in Ngau Chi Wan village would be expected to experience noise levels little different from those experienced under the Do-Nothing scenario.

9.2.4.6 The planned high-rise Fire Services Department Married Staff Quarters in the northern Ngau Chi Wan village redevelopment area would benefit from enclosure of the flyover along Option A. Facades overlooking the flyover will lie close to the alignment, and are partially protected from the noise of traffic on existing roads.

9.2.5 Option B

9.2.5.1 Despite the use of a flyover enclosure, noise levels at almost all noise-sensitive receivers are expected to continue to significantly exceed HKPSG standards.

9.2.5.2 Traffic flows along Lung Cheung Road and Clearwater Bay Road are expected to continue to dominate north-facing facades facing these roadways (Receivers R1, R2, and R4).

9.2.5.3 Similarly, noise from traffic flows along Clearwater Bay Road is also expected to continue to dominate the southern areas of St Joseph's Home for the Aged (Receivers R12-*R14*), resulting in continued exceedance of the HKPSG maximum.

9.2.5.4 Tower blocks in Bayview Gardens with facades facing Lung Cheung Road (Receivers R17 and R19) will remain primarily affected by the noise from traffic on that road, somewhat ameliorated by the barrier effect of buildings along the roadway.

9.2.5.5 Receivers in Ngau Chi Wan village would be expected to experience noise levels little different from those experienced under the Do-Nothing scenario.

9.2.5.6 The planned high-rise Fire Services Department Married Staff Quarters in the northern Ngau Chi Wan village redevelopment area would benefit from enclosure of the flyover along Option B. Facades overlooking the flyover will lie close to the alignment, and are partially protected from the noise of traffic on existing roads.

9.2.6 Option C

9.2.6.1 Despite the use of a flyover enclosure, noise levels at almost all noise-sensitive receivers are expected to continue to significantly exceed HKPSG standards.

9.2.6.2 Traffic flows along Lung Cheung Road and Clearwater Bay Road are expected to continue to dominate north-facing facades facing these roadways (Receivers R1, R2, and R4).

9.2.6.3 Similarly, noise from traffic flows along Clearwater Bay Road is also expected to continue to dominate the southern areas of St Joseph's Home for the Aged (Receivers R12-*R14*), resulting in continued exceedance of the HKPSG maximum. Improvement in the noise environment in the northern areas of the *Home (Receiver R15)* is evident.

9.2.6.4 Tower blocks in Bayview Gardens with facades directly facing Lung Cheung Road are expected to be primarily affected by noise from traffic on that road. Facades facing west, north, and east would expect significant improvements in noise as a result of the total enclosure of the Option C alignment.

9.2.6.5 Receivers in Ngau Chi Wan village would be expected to experience noise levels little different from those experienced under the Do-Nothing scenario.

9.2.6.6 The planned high-rise Fire Services Department Married Staff Quarters in the northern Ngau Chi Wan village redevelopment area would benefit from enclosure of the flyover along Option C. Facades overlooking the flyover will lie close to the alignment, and face away from existing roads.

9.2.7 Summary and Ranking

9.2.7.1 Table 9.1 shows the 2011 L_{10} (peak hour) predicted noise levels at top-storey sensitive facades for each of Options A, B, and C assuming the presence of a total enclosure.

9.2.7.2 Tables 9.2 to 9.4 assign a degree of impact to each receiver for each Option. A low degree of impact (1) has been assigned to receivers expected to experience no change (or, rarely, an improvement) in noise levels relative to the Do-Nothing scenario. A moderate degree of impact (2) has been assigned to: receivers experiencing a small increase (1 dB(A)) in noise levels, a small-sized receiver experiencing a moderate increase in noise levels (2-3 dB(A)), and a medium-sized receiver experiencing a moderate increase in noise levels (3-5 dB(A)) where the HKPSG standards are still met. A high degree of impact (3) has been assigned to: any receiver subject to an increase in traffic noise level of 10 dB(A) or more, a medium-sized receiver subject to a moderate noise increase (5 dB(A)) that results in an exceedance of the HKPSG maximum, and a large receiver experiencing a moderate increase (2 dB(A)) in traffic noise levels.

TABLE 9.1 - PREDICTED NOISE LEVELS: DO-NOTHING SCENARIO AND OPTIONS A, B, AND C (TOTAL ENCLOSURE)

ID	Predicted L_{10} (peak hour) Noise Levels at Top Storey dB(A)				ID	Predicted L_{10} (peak hour) Noise Levels at Top Storey dB(A)			
	D-N	A	B	C		D-N	A	B	C
R1	84	84	84	84	R15	60	60	60	60
R2	82	81	81	81	R17	77	*76*	*76*	*76*
R4	*84*	*84*	*84*	*84*	R18	*61*	*61*	*61*	*61*
R10	*78*	*79*	*79*	*79*	R19	72	*72*	*72*	*72*
R12	*77*	*78*	*78*	*78*	R23	--	--	--	--
R13	*77*	*78*	*78*	*78*	R28	*77*	*79*	*79*	*79*
R14	*76*	*77*	*77*	*77*					

NOTES:
- "D-N" = Do-Nothing Scenario (no flyover)
  "A" = Option A flyover with total enclosure
  "B" = Option B flyover with total enclosure
  "C" = Option C flyover with total enclosure
- Sensitive Receiver locations shown in Figure 2.
- Shows L_{10} (peak hour) facade noise levels at top-storey receivers due to 2011 morning peak hour traffic flows on major roads in study area.
- No predicted noise level is provided for the 2011 Do-Nothing scenario along Lung Chi Path because traffic flows along the Path are assumed to be negligible.

TABLE 9.2 - NOISE IMPACT ASSESSMENT: OPTION A

Receiver		Pop.	2011 L_{10} Facade Noise Levels		HKPSG[1]	Degree of Impact
			Do-Nothing	Option A		
R1	Kam Hon House	310	84	84	E	1
R2	Tan Fung House	1600	82	81	E	1
R4	Tsuen Shek House	450	*84*	*84*	E	1
R10	Sau Man House	2200	*78*	*79*	E	2
R12	Home for the Aged (South)	40	*77*	*78*	E	2
R13	Home for the Aged (Mid)	40	*77*	*78*	E	2
R14	Home for the Aged (East)	40	*76*	*77*	E	2
R15	Home for the Aged (North)	40	60	60	E	1
R17	Bayview Gardens (West)	970	77	*76*	E	1
R18	Bayview Gardens (East)	970	*61*	*61*		1
R19	Bayview Gardens (North)	970	72	*72*	E	*1*
R23	Lung Chi Path	800	--	--		*1*
R28	Pak Fung House	2200	*77*	*79*	E	3
					TOTAL	*19*

NOTE: [1] "E" indicates that the HKPSG standard for residential facades (70 dB(A)) or old-age homes (55 dB(A)) is expected to be exceeded in 2011. Note that HKPSG standards are currently exceeded at many of the listed receivers.

TABLE 9.3 - NOISE IMPACT ASSESSMENT: OPTION B

Receiver		Pop.	2011 L_{10} Facade Noise Levels		HKPSG[1]	Degree of Impact
			Do-Nothing	Option B		
R1	Kam Hon House	310	84	84	E	1
R2	Tan Fung House	1600	82	81	E	1
R4	Tsuen Shek House	450	*84*	*84*	E	1
R10	Sau Man House	2200	*78*	*79*	E	2
R12	Home for the Aged (South)	40	*77*	*78*	E	2
R13	Home for the Aged (Mid)	40	*77*	*78*	E	2
R14	Home for the Aged (East)	40	*76*	*77*	E	2
R15	Home for the Aged (North)	40	60	60	E	1
R17	Bayview Gardens (West)	970	77	*76*	E	1
R18	Bayview Gardens (East)	970	*61*	*61*		1
R19	Bayview Gardens (North)	970	72	*72*	E	*1*
R23	Lung Chi Path	800	--	--		*1*
R28	Pak Fung House	2200	*77*	*79*	E	3
					TOTAL	*19*

NOTE: [1] "E" indicates that the HKPSG standard for residential facades (70 dB(A)) or old-age homes (55 dB(A)) is expected to be exceeded in 2011. Note that HKPSG standards are currently exceeded at many of the listed receivers.

TABLE 9.4 - NOISE IMPACT ASSESSMENT: OPTION C

Receiver		Pop.	2011 L_{10} Facade Noise Levels		HKP SG[1]	Degree of Impact
			Do-Nothing	Option C		
R1	Kam Hon House	310	84	84	E	1
R2	Tan Fung House	1600	82	81	E	1
R4	Tsuen Shek House	450	*84*	*84*	E	1
R10	Sau Man House	2200	*78*	*79*	E	2
R12	Home for the Aged (South)	40	*77*	*78*	E	2
R13	Home for the Aged (Mid)	40	*77*	*78*	E	2
R14	Home for the Aged (East)	40	*76*	*77*	E	2
R15	Home for the Aged (North)	40	60	60	E	1
R17	Bayview Gardens (West)	970	77	*76*	E	1
R18	Bayview Gardens (East)	970	*61*	*61*		1
R19	Bayview Gardens (North)	970	72	*72*	E	*1*
R23	Lung Chi Path	800	--	--		*1*
R28	Pak Fung House	2200	*77*	*79*	E	3
					TOTAL	*19*

NOTE: [1] "E" indicates that the HKPSG standard for residential facades (70 dB(A)) or old-age homes (55 dB(A)) is expected to be exceeded in 2011. Note that HKPSG standards are currently exceeded at many of the listed receivers.

9.2.7.3 Tables 9.2 to 9.4 show that no Option is favoured when a total enclosure blocking the transmission of flyover noise is used. However, due to the expected traffic on major routes in the study area, the flyover enclosure fails to bring noise levels at most facades to acceptable levels.

9.2.7.4 For most receivers along Lung Cheung Road and Clearwater Bay Road, the enclosure of the flyover results in little or no improvement in ambient noise. Traffic on the existing major roads, for which no mitigation measures are assumed, dominates the noise environment at these receivers.

9.2.7.5 At the Home for the Aged, most low-rise receivers are effectively shielded from flyover traffic noise by the flyover's parapet walls. *In order to more effectively shield the Home, it is recommended that the parapet wall be slightly heightened to 2m to block the transmission of noise from heavy-vehicle engines, which are often mounted higher than light-vehicle engines.* The use of a total enclosure in Option C is effective toward the northern areas of the Home, where it blocks the transmission of noise from the Option C alignment.

9.2.7.6 *At Bayview Gardens, the total enclosure alleviates the impact of the Option C alignment on northward-facing facades.*

9.2.7.7 Traffic noise contours assuming the use of a total enclosure on the flyover are provided in Figures 26 and 27.

9.2.7.8 Figure 26 shows contours associated with Options A and B; the contours shown are for southward-facing facades. Noise levels remain relatively high due to the influence of traffic on Lung Cheung Road and Clearwater Bay Road. These contours may be compared with the non-mitigated contours shown in Figures 23 and 24. The effect of enclosing the Option A alignment on the planned Fire Services Department Married Staff Quarters is clearly shown.

9.2.7.9 Figure 27 shows contours associated with Option C; the contours shown are for northward-facing facades. The impact of Clearwater Bay Road and Lung Cheung Road traffic is less than in the preceding Figure, so noise levels, particularly in the residential-zoned area of northern Ngau Chi Wan village, are significantly lower.

9.2.7.10 Partial noise barriers or full noise enclosures are not presently shown as mitigation measures at the west end of the alignments (Figures 26 and 27). This is because there are no current plans for high rise receivers to the north of the proposed flyover. Provision for such barriers or enclosures is recommended at the detailed design stage, if at that time there are existing or planned sensitive receivers to the north.

9.2.7.11 The degree to which the proposed flyover along Option A would be expected to contribute to overall noise levels is shown below in Table 9.5:

Table 9.5 - DISAGGREGATED FACADE NOISE LEVELS

Rec.	Facade Noise Levels dB(A)				
	Due to Traffic on Existing Roads (2011)	Due to Traffic on Proposed Flyover (2011)	Overall Traffic Noise Level (due to all traffic in year 2011)	Contribution to Overall 2011 Traffic Noise Level from Proposed Flyover	1991 Calculated Traffic Noise Level
R1	83.4	75.4	84.0	0.7	84
R2	80.3	63.4	80.4	0.1	81
R4	83.7	68.1	83.8	0.1	80
R10	79.1	67.9	79.4	0.3	75
R12	77.9	62.8	78.0	0.1	74
R13	77.4	61.5	77.5	0.1	75
R14	76.5	60.8	76.6	0.1	72
R15	60.1	0.0	60.1	0.0	60
R17	74.2	66.4	74.9	0.7	76
R18	(expected to remain well within HKPSG standards)				
R19	70.4	63.8	71.3	0.9	72
R23	(expected to remain well within HKPSG standards)				
R28	78.4	71.4	79.1	0.7	74

NOTES:

- *Option A flyover alignment*
- *2011 morning peak hour traffic as predicted by CTS-2 (using associated CTS-2 predicted speeds to a minimum of 20 kph)*
- *1991 traffic estimated from 1991 Annual Traffic Census, with assumed speed of 50 kph*
- *mitigation measures:*
  - *total enclosure as shown in Figure 26*
  - *2.0m noise barriers along the northern side of the flyover along the boundary of the Home for the Aged*
  - *friction course paving material along those portions of the proposed flyover not enclosed*

To be eligible for insulation and air conditioning consideration, all the following criteria should be met at a given facade:

(i) the predicted overall noise level from the proposed flyover, together with other traffic noise in the vicinity, must be above the relevant HKPSG criteria;

(ii) the predicted noise level is at least 1.0 dB(A) more than the prevailing traffic noise level (here taken to be 1991 traffic noise levels);

(iii) the contribution to the increase in the overall noise level from the proposed flyover must be at least 1.0 dB(A).

While criterion (i) is met in all the listed cases, criterion (ii) or (iii) is not fulfilled at the NSRs shown above, generally as a result of the mitigation measures already proposed. Thus, no receivers are expected to require indirect technical remedies (e.g. glazing and air conditioning) if the mitigation measures proposed are adopted.

9.3 Air Quality

Measures to control vehicle exhausts on the flyover would result in no appreciable improvement in local air quality, since the great majority of vehicles contributing to pollution levels travel on existing roads. Effective measures to control pollution would be those measures enacted on a district-wide or territory-wide basis.

In the absence of viable air quality mitigation measures, no alteration is made in the comparative assessment of the unmitigated impacts of Options A, B, and C.

9.4 Land Use

9.4.1 Introduction

The purpose of this section is to assess the potential to ameliorate land use impact during the operational phase of the three route options. This section should be read in conjunction with the Section 7.4 (Comparison of Options : Operational Phase) which establishes the impact of the route options on each of the affected receivers. Land use impact has been defined as a combination of direct impact on existing and planned land uses actually located within the clearance corridor, and indirect impact on adjoining land uses which are in some way incompatible with the proposed road. Indirect land use would generally result from incompatibility of land usage with other factors such as noise and air pollution.

Mitigation of direct land use impact during the operational phase could be achieved by the protection of existing land uses, during the construction process, and their subsequent integration into the land use pattern post construction. Similarly indirect impact could be reduced by the careful planning of post construction land usage.

Mitigation of indirect land use impact would suggest a reduction of incompatibility between the road and adjoining land uses. Where existing land uses are permanent, mitigation of impact would be limited to the abatement of the various forms of pollution discussed elsewhere in the report. Where there is a changing pattern of land use there is potential to reduce the future level of indirect impact through rezoning of the adjoining sensitive land uses.

These factors are discussed below for each of the routes;

9.4.2 Option A

As discussed above the direct land use impact of route A could be reduced by retaining and/or restoring a number of existing land uses which lie within the road corridor. These include principally an RCP, public latrine, a shrine and the gate house of St Josephs Home for the Aged. Subject to the resolution of the detailed design it would appear that the RCP and latrine could be retained with only minimal impact during the operational phase. It should however be noted that whilst it may also be possible to retain the shrine and the gate house the impact of the road would not be totally abated because of the loss of amenity caused by the overhead structure.

Further abatement of direct impact could be achieved by careful planning of future land uses along the length of the route principally within the village area. Future land use, as indicated on the Village Layout Plan have been planned to take into account an elevated along the alignment of Route A and therefore most of the planned uses are compatible with the road. These include the RCP and latrine, parking areas and public open space.

The indirect impact of the route could be reduced by rezoning a number of planned land uses including two residential and one commercial/residential site, incorporating a kindergarden, immediately to the north of the road.

9.4.3 Option B

The opportunity to mitigate impact for option B would be similar to that of Route A. In addition Route B would have a direct impact on a building within the Home for the Aged and the WSD water pumping station on Clearwater Bay Road. The route would not however affect the shrine on Lung Chi Path. Similarly to Route A these structures could be retained under the flyover but the amenity of the building within the Home for the Aged would be permanently affected.

In the case of route B the alignment of the route is not shown on the VLP and as a result there is a direct conflict between the road and the planned Government Building incorporating a Neighbourhood Community Centre, and an area of Public Open Space. Indirect land use impact would also occur as a result of conflict between the route and adjoining residential, commercial/residential and kindergarden uses planned immediately to the north of the road. The direct and indirect impact on planned land uses could be mitigated by replanning of the Village Layout Plan.

9.4.4 Option C

Direct land use impact associated with option C consists principally of the impact on a proposed residential site to the western side of the Village Layout Plan, the UC Hammer Hill Sports Complex football pitch , the Hammer Hill Green Belt and a lodge to the east of the Home for the Aged. It would not be practicable to mitigate impact by retaining these uses except for the possible retention of the lodge and the restoration, in time, of the natural hillside vegetation adjoining the route. It should however be stated that the amenity of the lodge would be permanently affected and the natural hillside is unlikely to ever be fully restored to its current state.

Indirect impact of the route consists principally of the impact on the future Hammer Hill Leisure Pool Complex and the existing Sports Complex, Bayview Gardens,the proposed FSD

quarters, the Home for the Aged and Pak Fung House in Choi Wan Estate. All of these uses are permanent, or given, and therefore mitigation would be limited to the abatement of pollution and restorative landscape treatments described elsewhere in the report.

9.4.5 Ranking

In conclusion Option C provides the least opportunity to mitigate against land use impact because of the limitations of preserving directly affected uses and the permanence of indirectly affected uses. Routes A and B both offer some opportunity for mitigation in the form of the preservation of existing uses and modification of future uses. Of the two routes Option A offers the best choice because the land use planning shown on the Village Layout Plan has already taken into account an elevated road along this route.

9.5 Visual Impact

9.5.1 Introduction

The purpose of this section is to assess the potential to mitigate against the visual impact of the three route options during the operational phase. This Section should be read in conjunction with the Section 7.5 (Comparison of Options : Operational Phase) which establishes the impact of the route options on each of the affected receivers.

Mitigation of visual impact during the operational phase would suggest either the reduction of the visual scale of the road structure, the improvement of its appearance, or the provision of screening between the viewers and the road. The reduction in visual scale and improvement in appearance of the structure would be achieved through careful design of the structure and associated works however it should be stated that the such benefits are likely to apply to all of the route options and are not therefore likely to influence the comparison of the routes. Screening of the flyover is however "route specific" being dependant on the relationship of the flyover to the viewers. Mitigation of impact on each route option is discussed below;

9.5.2 Option A

As described in Section 7.5 the visual impact of Option A would principally affect the residents of Hung Ngok and Kam Hon House in Choi Wan Estate, the existing and future sensitive receivers in Ngau Chi Wan, the Ngau Chi Wan UC complex, St Joseph's Home for the Aged and the three schools to the south of Clearwater Bay Road. The road would exert a lesser impact on other more distant receivers such as the residents of Bayview Gardens and Choi Hung, Ping Shek and Choi Wan Estates.

At the western and eastern ends of the route the flyover would be constructed within the existing road corridor and there would therefore be little scope for reducing the visual impact of the structure except for the provision of a planted strip adjoining the abutment walls of the ramped sections of the road in order to soften the form of the structure. Further mitigation may be achievable in the form of "off-site" pavement tree planting adjacent to Hung Ngok and Kam Hon House and the three schools adjoining Clearwater Bay Road.

The central portion of the route passes through Ngau Chi Wan immediately to the north of Lung Chi Path. Screening of the flyover from the adjoining low rise residential premises would not be practicable because of the immediate proximity and scale of the flyover. Tree and shrub planting beneath the flyover could go some way to improve the appearance of the

streetscape beneath the flyover structure although the benefits of such treatments would be limited to viewers in the immediate vicinity of the road. Trees planted adjoining the flyover could in time contribute to reducing the wider impact of the structure the success of which would be greatly increased if heavy tree planting were carried out in the local open spaces and amenity areas planned to the north and south of the flyover on the Village Layout Plan.

Similarly the impact of the route on St Josephs Home for the Aged could be reduced by heavy tree planting within the grounds of the Home.

9.5.3 Option B

The potential to mitigate the impact of Route B would be similar to that of route A. Route B would require significant revision to the Village Layout Plan and therefore open spaces and amenity areas within the village could be zoned in locations where they could contribute to screening of the structure both from viewpoints to the north and south of the flyover. The immediate proximity of the flyover in relation to the southern most facade of the Home for the Aged would reduce the possibility of screening the structure by tree planting other than from the south. Off site street tree planting along the pavements of Clearwater Bay road could also be of benefit to screening views of the road from the three schools on the south side of the road.

9.5.4 Option C

Visual impact of route C principally affects the residents of Hung Ngok House in Choi Wan Estate,the UC Hammer Hill sports complex and proposed Leisure Pool Complex, Bayview Gardens, the planned high-rise developments in the northern sections of Ngau Chi Wan, Village and St Josephs Home for the Aged. Viewers in the UC Hammer Hill Sports Complex and St Josephs Home for the Aged would see the elevated flyover at a close proximity and from viewpoints generally below the level of the structure. In both cases screening would be possible by extensive tree planting adjacent to the flyover or within the grounds of the UC complex and the Home for the Aged.

Viewers from within Bayview Gardens and the proposed high rise developments in Ngau Chi Wan would see the flyover at a variety of angles of view but predominantly from viewpoints elevated above the road. The large area of earth works to the east of Bayview Gardens would also be very visually dominant from these locations. The effectiveness of screening the road structure by tree planting would be limited because of the typically high level of the viewpoints whereas restorative hillside planting could go a long way to make good the visual impact of the disturbance to the natural hillside.

9.5.5 Ranking

In conclusion the potential to mitigate visual impact at the operational stage would be limited for routes A and B and the benefits would mostly be enjoyed by the viewers immediately adjacent to the flyover. Notwithstanding the greater overall impact of route C the route offers more opportunities for mitigation both in respect of the disturbed areas of hillside and the visibility of the flyover.

9.6 Landscape Impact

9.6.1 Introduction

The purpose of this section is to assess the potential to mitigate the impact of the three flyover options on the landscape of the Study Area during the operational phase. Landscape impact relates mostly to the disturbance to the natural hillside and the loss of existing individual trees and public open spaces. The mitigation of impact on these components during the construction phase is discussed in Section 8.6.

Mitigation of impact during the operational stage would relate mostly to the reprovisioning of open spaces, the carrying out of compensatory tree planting and landscaping and the restoration of areas of disturbed natural hillside and associated vegetation. Each route option is discussed below.

9.6.2 Option A

The impact of route option A relates mostly to the loss of trees within the village area, the disruption of an existing sitting area on Lung Chi Path and the disturbance of the grounds of St Josephs Home for the Aged. Route option A follows the alignment of a proposed elevated road shown on the Ngau Chi Wan Village layout plan and as a result the proposed pattern of land use shown on the plan would be consistant with this option. On this assumption the open spaces and amenity areas shown on the Layout Plan are likely to be implemented and would more than compensate in terms of the extent of open space re-provisioning and the potential for mitigative tree and shrub planting within the village area. There would be further opportunities for landscape improvement works within the corridor of the flyover such as planting around the base of columns and the planting of small trees along the edges of the flyover within areas of pavement. Within the Home for the Aged disruption to the original landscape could be made good by re-turfing of disturbed areas and replanting with new ornamental tree and shrub planting.

In conclusion there are good opportunities to make good the landscape impact of route A during the operational stage.

9.6.3 Option B

The impact of Route B on the landscape of the Study Area would be similar to that of Route A except that the sitting space adjacent to Lung Chi Path would not be affected and the area of land disturbed within the grounds of the Home for the Aged would be much greater.

The alignment of Route B through the village area would conflict with the Village Layout Plan requiring a rearrangement of the planned pattern of land usage. Notwithstanding such conflict there would appear to be equal opportunities to provide new areas of open space and amenity areas within a revised layout in order to mitigate against the impact of the route on the village landscape. Landscape treatments would be similar to option A. Restorative landscaping within St Josephs Home for the Aged could also be undertaken as described for Route A.

9.6.4 Option C

The impact of Route C relates mainly to the disruption of the natural hillside and associated vegetation. The restoration of the areas of land disturbed by cut and fill could commence

within the construction phase as described in Section 8.6. Such treatment would also bring benefits during the operational phase as the planting matures. Restoration of the corridor of land immediately below and adjacent to the flyover could only commence upon the completion of the construction phase. Treatment would comprise of hydroseeding of all disturbed areas to provide an initial " greening", followed by planting of a continuous matrix of shrub and trees species selected for consistency with the vegetation in existence prior to the commencement of the work. Species used would include a number of non-native species selected to accelerate the rate with which the planting would establish and screen the road. Full restoration of the hillside landform is not likely to be achieved whereas restoration of a naturalistic vegetation cover is more practicable. This would however require careful management of the planting over a 4-5 year period after which the planting should be self supporting. Further planting works would be necessary to the east of the Home for the Aged where an existing stand of mature trees would be disturbed by the construction works.

9.6.5 Ranking

In conclusion there are good opportunities to make good the impact of the three route options on the landscape of the study area. The mitigation of impact for routes A and B are similar and would take fairly immediate affect assuming that Ngau Chi Wan is cleared and the Village Layout Plan, or a revised version of the plan, is realised and the proposed provision of open spaces and amenity areas are included. The landscape impact of route C is more significant however there are also good opportunities to mitigate impact by appropriate restorative treatment. Full restoration would not be achievable even over along period and therefore the duration of impact on receivers would be greater. For this reason Options A and B offer better opportunities to mitigate impact than route C.

10. COMPARISON OF OPTIONS: COSTS

10.1 Introduction

The cost element needs to be introduced for two reasons. First, if it is found that there is little or nothing to choose between options on environmental grounds, the choice of route can then be made on grounds of cost. Secondly, if one route is found to have significantly less environmental impact, but also significantly higher costs it is necessary to have costs of Options available so that the magnitude of additional cost necessary to achieve environmental benefits can be known.

10.1.2 It is important to note that in a limited study of this kind costs which are based on very preliminary designs can only be considered as accurate within $\pm 20\%$.

10.2 Assumptions

The following costs have been taken into account:

- Construction Costs
- Land Resumption Costs
- Reprovisioning Costs
- Environmental Impact Abatement Costs
- Operating and Maintenance Costs

10.2.1 Construction Costs

Detailed costs are available for the construction of Prince Edward Interchange and Tate's Cairn Tunnel Approaches. These works are of a similar nature to those proposed and were constructed in the same general area. It was therefore considered appropriate to use those flyover costs for this evaluation. At Working Group Meeting No. 6 it was agreed that more recent prices for similar construction elsewhere in the Territory should be used for flyover construction.

For concrete carriageway and for bulk earthworks costs have been derived from current contracts administered by the Consultants.

Unit costs have been derived for:

. Flyover Construction	$25,000/sq.m.
. Carriageway Construction	$2,110/sq.m.
. Earthworks Construction	$110/cu.m.

The costs may be considered as valid at May 1992.

10.2.2 Land Resumption Costs

It has not been possible to estimate likely resumption costs for individual lots affected by each scheme, nor is it considered that such an estimate is part of the Study. However it is necessary to recognise that the different extent of private lots affected by each of the Options needs some evaluation. *The Steering Group has agreed this approach, although it must be noted the Building and Lands Department consider that such as approach is only valid if such costs are estimated by Land Valuation Professionals.*

Where resumption is indicated, *for the purpose of this study*, a cost of $63,000/sq.m. has been assumed. This figure has been derived from the mean of the four most recent entries in Table 5.13 of the HK Monthly Digest of Statistics dated July 1992. (Realised premium for Disposals of Government Land by Public Auction/Tender in Urban Area).

In each option where private lots occur, a judgement has been made on the extent to which the whole or part of the lot is affected. Thus, although in the case of St. Josephs Home and Option B, for example, it is considered probable that the whole of the area beneath the flyover would be resumed, it also considered that upon completion, virtually the whole of the land would revert to the Home for their enjoyment. Accordingly, for this exercise, the unit cost refered to above has been multiplied by the finished area of the flyover supports.

10.2.3 Reprovisioning Costs

It is assumed that any Government building directly affected by the scheme would be reprovisioned.

Items identified are:

Urban Council RCP & latrines	Options A & B
WSD Pumping Station	Option B

10.2.4 Environmental Impact Mitigation Costs

Unit costs for noise barriers and noise enclosures have been derived from the same source as construction costs.

Noise barrier on structure	$22,520/sq.m. (elevation)
Noise enclosure (w/o wall panels)	$ 5,270/sq.m. (plan)
Wall Panels	$23,100/sq.m. (elevation)

These unit costs include an allowance for increasing the capacity of the flyover structure itself to accommodate increased loads arising from wind forces acting on the enclosure.

For the purposes of the cost comparison in this Study, it has been assumed that it would be possible to make the enclosures self ventilating over the lengths where their provision is recommended.

Recommended visual and landscape mitigation costs are deemed to be included in the average construction costs.

10.2.5 Maintenance and Operating Costs

(i) *Maintenance Costs*
Option C is approximately 0.1km longer than A & B and so this item has been included for completeness. A period of 15 years costs is assumed.

For maintenance costs the 1992 HK year book indicates that in 1990/91 $548 million was spent on improving and maintaining 1529km of roads, approximately $350,000/km. It can thus be seen that over 15 years the estimated additional cost of maintaining Option C would be $525,000 which is not significant.

(ii) *Operating Costs*

A two lane carriageway may carry an average of 17,000 vehicles per day. At an assumed average vehicle operating cost of $3/km the additional user costs of Option C over 15 years could amount to nearly $30 million. However it has been agreed in Working Group No. 6 that this cost should not form part of the comparison exercise.

Similarly it has been assumed that the noise enclosures would be self ventilating and thus there would thus be no operational costs in providing electrical power.

10.3 The Cost Analysis

10.3.1 Option A

			HK$ m.
i) Construction Costs			
Length of Flyover	955m		
Width	8.25m		
Area	7,878.75 sq.m.		
Unit Cost	$25,000		
Cost			196.97
ii) Land Resumption Costs			29.04
iii) Reprovisioning Costs			
USD, RCP & Latrine			
800m² @ $15,000			12.00
iv) Environmental Impact Abatement Costs			
Noise enclosure			
230m long x 8.25m wide x $5,270		10.00	
Wall panels 230m x 3.5 x 2 x $23,100		37.19	
170m x 2.0 x 1 x $23,100		*7.85*	*55.04*
	Total Cost:		*293.05*

10.3.2 Option B

			HK$ m.
i) Construction Costs			
Length of Flyover	953m		
Width	8.25m		
Area	7,862.25 sq.m.		
Unit Cost	$25,000		
Cost			196.56
ii) Land Resumption Costs			44.02
iii) Reprovisioning Costs			
USD, RCP & Latrine			
800m² @ $15,000			12.00
iv) Environmental Impact Abatement Costs			
Noise enclosure			

230m long x 8.25m wide x $5,270	10.00	
Wall panels 230m x 3.5 x 2 x $23,100	37.19	
170m x 2.0 x 1 x $23,100	*7.85*	*55.04*
Total Cost:		*307.62*

10.3.3 Option C

i) Construction Costs — HK$ m.

. Length of Flyover 520m + 490m = 1,010m
Width 8.25m
Area 8,332.50 sq.m.
Add for climbing lane 3.75 x 385 = 1,443.75 sq.m.
9,776.25 sq.m.
Unit Cost $25,000
Cost 244.44

. Volume of Earthworks
940 x 70 = 66,000 cu.m.
Unit Cost $110
Cost 7.26

. Carriageway
100 x 11.9 = 1,190 sq.m.
Unit Cost $2,110
Cost 2.51

ii) Land Resumption Costs 11.97

iii) Reprovisioning Costs
USD Football pitch 68m x 48m @ $1,220/m² 4.0

iv) Environmental Impact Abatement Costs
Noise enclosure
520m long x 8.25 wide x $5,270
Add for extra lane
300 x 3.75 x $5,270
Wall panels
220 x 3.5 x *2 x $23,100*
300 x 3.5 x 1 x $23,100 *88.37*

v) Maintenance Costs 0.53

Total Cost: 359.08

10.4 Cost Summary

	HK$ million	
	without mitigation	with mitigation
Option A	238.00	*293.05*
Option B	252.58	*307.62*
Option C	270.68	359.08

11. CONCLUSIONS AND RECOMMENDATIONS

11.1 Introduction

11.1.1 A study has been made of the following environmental impacts, both during construction and in operation, caused by the proposed Lung Cheung Road Flyover.

Noise
Air Quality
Vibration
Landuse
Visual
Landscape

11.1.2 The flyover Options A, B & C have been specified in the study brief. Because the proposed flyover is not in the current 5 years Public Works Programme, a year of 2011 has been assumed for evaluation of the impacts. The impacts have been compared with what is expected to be the existing situation in 2011.

11.1.3 The impacts have been assessed in terms of their effects on a number of agreed representative sensitive receivers. Where mitigation of the effects is possible mitigation measures have been proposed. For each impact a preferred scheme has been identified in terms of minimum effect.

11.1.4 The costs of each option with recommended mitigation measures have been estimated.

11.1.5 In the principal findings which follow, references are given to the Sections of this Report where details can be found.

11.2 Principal Findings

11.2.1 Noise

(i) *Construction Stage.* Of the 66 assessments, *59* were ranked severe, where both existing background and desirable construction noise maxima were exceeded. Application of noise abatement measures *reduced* the number of severe *rankings to 40.* In both circumstances the effects of construction noise were found to be least severe in Option C. (Ref. 6.2; 8.2)

(ii) *Operational Noise. All alignments impose traffic noise impacts by exposing facades that were previously shielded from traffic noise to noise from traffic on the new flyover. The impact of Option C is greater than that of Option A or B, however, because the number of receivers newly exposed is greater. A package of mitigation measures has been proposed, including the use of pervious macadam, noise barriers, and total enclosure. The most effective of these measures, the total enclosure, would render all alignment options equal in ranking: the remaining measures provide further small reductions aimed at preventing further deterioration of a noise environment that presently fails to meet HKPSG standards. (Ref 6.2; 8.2)*

11.2.2 Air Quality

(i) *Construction.* Because Option C includes substantial earthworks this option is

expected to give significantly higher impact than either Option A or B. There is *little* difference between Options A and B. (Ref. 6.3; 8.3)

(ii) *Operational Phase. The effects of the alignments are similar, since emissions from traffic on existing roads dominate the environment in the study area. However, by directing a portion of the traffic away from sensitive receivers, Option C imposes the least impact on air quality, while Option A produces the greatest effect. Exceedance of AQO standards is anticipated at low-level receivers lining existing Lung Cheung Road and Clearwater Bay Road, and is expected whether or not the flyover is built. (Ref 7.3; 9.3)*

(iii) *Mitigation.* Measures are recommended to control air quality during construction but the effects will be similar on all Options and will thus not affect the rankings. There are not considered to be any mitigation measures to improve operational air quality that could be adopted specifically for this scheme. (Ref 8.3; 9.3)

11.2.3 Vibration

It has been concluded that vibration effects need only be considered during the construction stage. By attention to detailed design of piling methods vibration effects can be reduced to acceptable levels in all Options and thus vibration does not affect the decision process. (Ref. 2.6)

11.2.4 Land Use

The land use impact of the Options A and B are generally similar. Route B is superior to A insofar as it is further from the three schools adjoining Clearwater Bay Road and the Ngau Chi Wan UC complex and it avoids the sitting out area and shrine adjacent to Lung Chi Path. It is markedly inferior to A in respect of its increased private land resumption and clearance requirements and disruption to planned land uses in Ngau Chi Wan village, its impact on St. Joseph's home for the Aged and its potential effect on the WSD pumping station in Clearwater Bay Road. For these reasons Option A is considered preferable to B.

Option C requires resumption of less private land than A avoiding most of the existing and planned development in the area. Land use conflict would be less with Choi Hung and Ping Shek Estates and the three schools in Clearwater Bay Road with Option C, but there would be a significant land use conflict between route C and the existing USD grass football pitch within the Hammer Hill Sports Complex and the proposed leisure pool complex.

In addition there would be a moderate land use conflict with Bayview Gardens (assuming noise mitigation) and the Route would encroach on a significant area of Green Belt conflicting with the Outline Zoning Plan for the area. Route C would not require resumption of land or a way leave within the Home for the Aged although the indirect Land Use Impact would be similar to Option A.

Because noise contours indicate little difference between Options A & C (provided that noise enclosures are adopted), and because the Ngau Chi Wan Village Landuse Plan already accommodates a high level road along the alignment of Route A, the effects on land use in the area north of Lung Chi Path are similar for A and C. (Ref. 6.4; 7.4; 8.4; 9.4)

11.2.5 Visual Impact

The visual impact of Options A and B are similar except at their eastern end. Option B

would be marginally less visually intrusive on houses to the south of Lung Chi Path and on the schools to the south of Clearwater Bay Road. Adoption of Option A would make the exit ramp of the proposed Ping Shek MTRC redevelopment more intrusive visually.

The benefits of Option B are however only of limited value, in visual terms, particularly when the increased impact on the village properties to the north of Lung Chi Path and the very severe impact on St. Joseph's Home for the Aged are taken into account. In addition there would be little benefit in Route B to viewers using the higher level USD library facility from where Route B would arguably be more prominent.

In conclusion the disadvantages of selecting route B outweigh the benefits, and therefore of the two routes, route A is the preferred choice.

In comparison with Option A, Option C would result in reduced visual impact on the existing low rise properties in Ngau Chi Wan Village, on Kam Hon House in Choi Hung Estate on the three schools along the Clear Water Bay Road.

There are however significant disadvantages of Option C which can be summarised as follows:

- the impact on the users of the Hammer Hill Sports and future Leisure Pool Complex.
- the impact on west, north and east facing receivers in Bayview Gardens, who would otherwise enjoy pleasant views out over the Hammer Hill Sports Complex and the adjoining hillsides.
- the general increase in visibility of the route from high level viewpoints in Choi Hung, Ping Shek and Choi Wan Estates as a result of its higher elevation and greater conspicuousness against the green backdrop of the hills. Visual impact of this route would be significantly greater at the construction stage and in the following two or three years during which time large areas of the hillside would remain scarred by earthworks until such time as replanting works had become fully established.
- the impact on the north side of the Home for the Aged which otherwise enjoys an undisturbed and largely green outlook in this direction.
- on residents living on the lower floors of Pak Fung House, in Choi Wan Estate, who would otherwise tend to look out over the lower alignment of Route A and suffer only limited impact.

Mitigation of visual impact of the three flyover options would be limited in view of the elevated form of the structure, the generally high level of view points and the lack of space in which to plant trees which may otherwise have provided a possible mitigation solution. Mitigation of the visual impact of the earthworks in Option C is feasible, although mitigative planting would take about three years to mask the considerable depth of cutting required.

Having taken account of the planned FSD quarters and other high rise R1 development in the redeveloped area of Ngau Chi Wan Village it is considered that overall Option C will have a greater visual impact than Option A and therefore Option A is the preferred option. (Ref. 6.5; 7.5; 8.5; 9.5)

11.2.6 Landscape

The main impact of Routes A and B relate to the loss of trees and open spaces within Ngau Chi Wan Village and the Home for the Aged. Although many trees would be affected it should be noted that a number of trees within the village area (but not within the Home) are also likely to be felled as a result of the redevelopment of the village area, whether or not Routes A or B are constructed. The impact of Route C has much greater implications potentially affecting a large tract of greenbelt in stark contrast to the policy of preserving the backdrop of hills in the urban fringe.

The loss of trees in urban areas is easier to compensate for, through new planting, than is the restoration of natural landform, vegetation and scenery and therefore Option C is the worst case from the point of view of landscape impact. The final selection therefore lies between routes A and B and relates mainly to the number of the trees affected by the two routes, the likely permanence of the trees as a result of the assumed future implementation of planning policy and the ability to mitigate impact after construction. Having taken all of these considerations into account Route A emerges as the preferred option. (Ref. 6.6; 7.6; 8.6; 9.6)

11.2.7 Costs

Costs have been estimated in 1992 prices. The following costs have been taken into consideration:

Construction
Land Resumption
Reprovisioning
Environmental Mitigation
Maintenance

The estimated costs for the Options are as follows:

Without mitigation measures:-

	HK$ million
Option A	238.00
Option B	252.58
Option C	270.68

With mitigation measures:-

	HK$ million	
Option A	*293.05*	
Option B	*307.62*	
Option C	*359.08*	(Ref. 10.3)

11.3 Conclusions

There is a clear choice against Option C on grounds of *Landscape* assessment. Unsurprisingly, the effects of A and B are similar but B is considered to be less

environmentally acceptable than A because of its increased impact on the Ngau Chi Wan Village and St. Joseph's Home for the Aged. No clear choice in favour of Option B has emerged in any assessment. The choice in environmental terms thus falls to be made between Options A and C with regard to Noise, Air Quality, Land Use and Visual Impacts.

Visual Impact is dependent on the extent to which future development in Ngau Chi Wan Village is allowed as a result of potential noise and air quality impacts of the proposed flyover. It is apparent from these considerations that high rise development is likely and thus the significance of the visual impact of C increases. This leads to the conclusion that on visual impact grounds A is the preferred option.

With regard to *Land Use*, it is considered that because Ngau Chi Wan Village redevelopment will proceed in the "do nothing" scenario and because the Village Layout Plan already accommodates a high level road on the route of Option A, the disadvantages of Option C outweigh those of Option A, and A is therefore the preferred choice.

In terms of *Air Quality* Option C is worst in the construction stage and the preferred Option during the remainder of its life.

As to *Noise*, without mitigation Option C has the most impact. With mitigation measures there becomes no clear choice between Options A, B or C.
The choices can thus be summarised:-

	Preferred Choice	
	Option A	Option C
Landscape	X	
Visual	X	
Land Use	X	
Air Quality Construction Stage Operation Stage	X	 X
Noise Construction Without Mitigation With Mitigation	 X X	 X X

In only two assessments is the choice clearly in favour of Option C. Options A and C could be as equally acceptable in terms of noise provided a full noise enclosure were adopted. *The total cost of Option A would be $293 million whereas the total cost of Option C would be $359 million.*

As Option A is the preferred choice in terms of less severe Landuse, Visual and Landscape Impact, it is considered that there can be no justification for the expenditure of an additional $66 million to construct Option C and therefore Option A is the preferred choice.

11.4 Recommendation

The proposed flyover should be constructed in accordance with Option A.

Appropriate attenuation measures should be adopted during construction to minimise noise and air quality impacts.

Construction methods should meet the requirements of MTRC with regard to foundations throughout the project to minimise vibration.

The noise sensitive residential land uses shown on the Ngau Chi Wan Village Layout Plan will need to be "self protecting" in relation to noise impact on the south facing facades.

The entrance to be St. Joseph's Home for the Aged should be preserved by designing the flyover to cross over it.

In detailed design consideration should be given to adjusting the vertical alignment of the flyover to allow retention of the USD RCP and latrine.

Further consideration to vertical and horizontal alignment between chainage 940 and 1160 should be given at the detailed design stage in order to minimise traffic disruption during construction (para 5.3.7).

It is recommended that a total noise enclosure be provided at detailed design stage over the length indicated in Figure 26. Pervious macadam paving should also be provided at the non enclosed ends of the flyover, to satisfy recent EPD guidelines aimed at minimising further deterioration of the noise environment. A heightened parapet or noise barrier of 2m height above the carriageway should be provided to further protect the Home for the Aged. If at the time of detailed design there exist or are proposals for sensitive receivers to the north of the flyover at its western end, then further evaluation is recommended to determine the extent of partial or full noise enclosures.

The recommended scheme is shown on Figure 40.

The shrine on Lung Chi Path should be preserved.

APPENDIX A - THE STUDY BRIEF

A1. STUDY OBJECTIVES

A1.1 The study shall assess identified air, noise, vibration and visual impacts of each of the three proposed alignments.

A1.2 The study shall:-

(i) assemble information on the background to the project, and on alignments and projected traffic volumes on the proposed flyover;

(ii) identify the current environmental impact of existing roads on present and future land uses in the area as a basis for determining the environmental impact of the proposed flyover on existing and proposed developments;

(iii) identify all existing and future land uses;

(iv) derive environmental standards from existing laws of Hong Kong and planning standards (largely from the Hong Kong Planning Standards Guideline (HKPSG), Chapter 9);

(v) quantify the impact of assessed air, noise, vibration and visual impacts of the proposed alignments of the flyover;

(vi) identify and assess landuse, layout and design measures to mitigate the impacts where this is necessary; and

(vii) propose an optimum mitigation package for each alignment with cost estimates.

A2. DUTIES OF CONSULTANTS

With due consideration of the Guidelines for noise and air pollution assessments at Annex 1 and 2 of this Brief, the Consultants shall:-

(i) assemble, assess and interpret existing environmental data and practice;

(ii) consult and liaise with Government Departments, Agencies and private organisations;

(iii) define the functional requirements based on environmental standards;

(iv) carry out surveys of existing levels of pollution in the area and identify existing effects of such pollution;

(v) examine the feasibility of each of the three alignments in terms of environmental impact;

(vi) discuss the implications of the three proposed alignments and consider alternative schemes within the ambit of proposing an optimum mitigation package, which may or may not include the optimum alignment;

(vii) prepare plans and forecasts of traffic flows and resulting pollution impacts;

(viii) prepare discussion papers, technical papers for consideration by a Working Group and the PSG, a draft final report and a final report.

A3. STUDY OUTPUT

A3.1 The consultants shall within 12 weeks of the commencement of the study submit to the Director's Representative 40 copies of the Draft Final Report which shall inter alia include the following:-

(i) a summary of existing and future pollution levels at adjacent buildings and proposed developments for the three proposed alignments;

(ii) conceptual designs and details of amelioration measures for each proposed alignment deemed necessary on environmental grounds; including vertical and horizontal alignments of the flyover;

(iii) cost estimates of amelioration measure for each proposed alignment;

(iv) recommendations on the most suitable alignment based on environmental, engineering and cost implications.

A3.2 The consultants shall within 17 weeks of the commencement of the study submit to the Director's Representative 50 copies of each of the Final Report and an Executive Summary of the Final Report, incorporating wherever possible those comments on the Draft Final Report and also a summary of comments, the Consultant's replies to, advice/recommendations for further action on, and/or report on action taken arising out of those comments that have an influence on the layout design and/or construction of each of the proposed flyover alignments.

A3.3 The Consultants shall prepare, supply and present all drawings and display materials required for submissions to District Boards, the Town Planning Board and the Urban Council and attend meetings as and when instructed by the Director's Representative.

A3.4 Reports shall be of A4 size, except that drawings shall be presented in A3 size.

APPENDIX B - AIR QUALITY AND PEAK HOUR NOISE MONITORING

B1. INTRODUCTION

This section presents the methodology and results of the baseline air quality monitoring in Lung Cheung Road, Ngau Chi Wan and peak hour noise monitoring at several locations throughout the Study Area. For baseline air quality monitoring a strategic location within the Study Area was selected in accordance with the USEPA's siting criteria (40 CFR Part 58, 1987). The air quality data has been used for assessing the potential impacts of the proposed Lung Cheung Road Flyover upon the air quality in the Study Area. Air quality monitoring results are presented below, followed by noise monitoring results in paragraphs B7 and B8.

B2. MONITORING LOCATION

One monitoring location was identified at Ngau Chi Wan for monitoring. Gaseous pollutants, particulate matter and wind were monitored at the roof of St. Joseph's Home for the Aged. The site is bounded by a hill to the north and Clear Water Bay Road to the south. Lung Cheung Road is situated at the west of the station, and Prince Edward Road East to the southwest. Figure 6 shows the location of the site and the nearby geographic features.

B3. MONITORING PARAMETERS AND DURATION OF MEASUREMENTS

Ambient concentrations of oxides of nitrogen (NO/NO_2), total suspended particulate (TSP) and respirable suspended particulate (RSP) were measured at the Study Area. In addition, wind speed and wind direction were measured at the site. The measurement period was between 1 September 1992 and 14 September 1992, a total of 14 days, for the gaseous pollutants. Dust concentrations (TSP and RSP) were measured from 27 August through 13 September. Showers were recorded between 27 August and 29 August, and occasional rain was reported from 5 September through 8 September.

B4. MEASUREMENT METHODOLOGY

B4.1 Instrumentation and Equipment Setup

Instrumental methods which are recognized by the U.S. Environmental Protection Agency as either equivalent or reference methods were employed for the air quality monitoring. Appendix B-1 (on page B.6) lists the equipment used at the monitoring site.

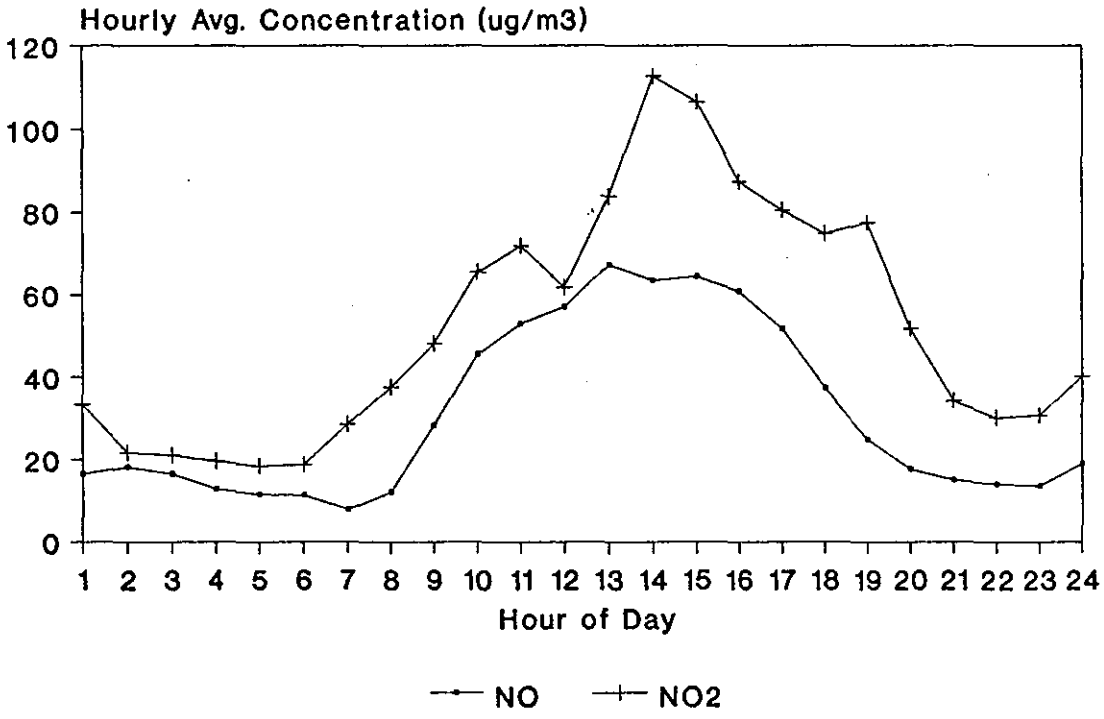
A sampling probe was sited in accordance with USEPA's probe siting criteria (40 CFR part 58, 1987) on the roof of St. Joseph's Home for the Aged in Ngau Chi Wan. Ambient air was delivered via the probe to the analyzers. The wind sensors were mounted on a mast 10 m above the roof. High volume samplers were also located on the roof of the same building.

B4.2 Calibration Procedures

The analyzers were calibrated once a week during sampling. Zero air and span gas were fed into the analyzers through the calibrator. Five-point calibration was performed. The high volume samplers were calibrated prior to the monitoring period.

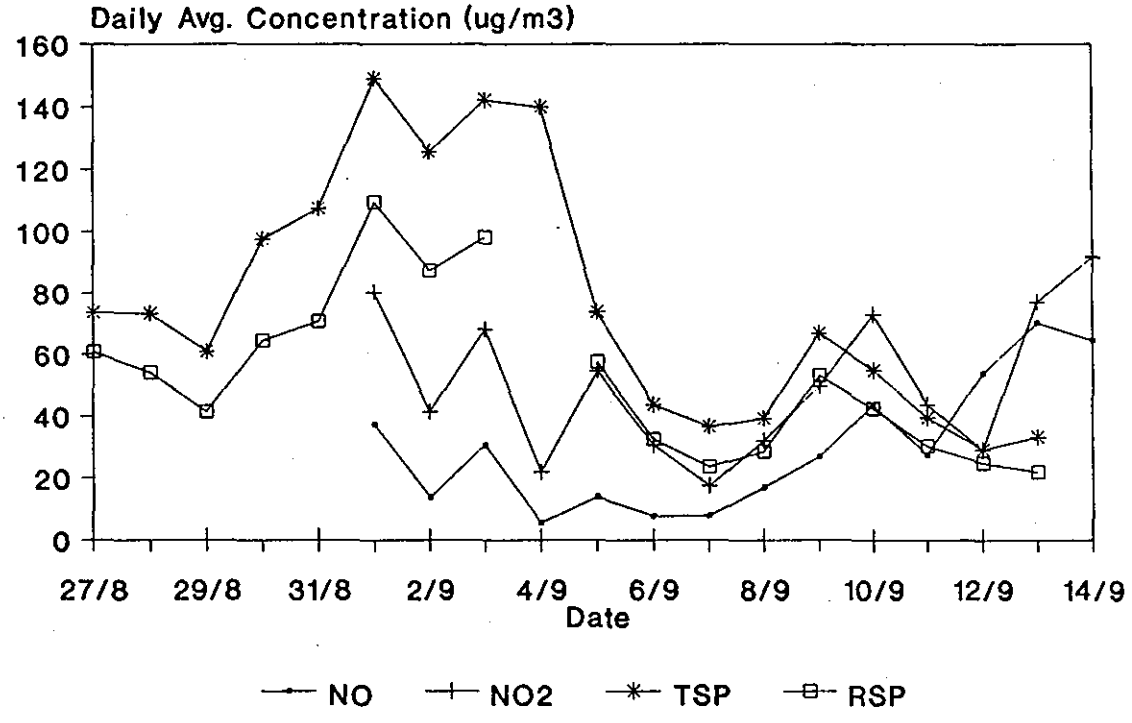
Diurnal Variation of Pollutant Conc.

Lung Cheung Road 1/9/92-14/9/92



Daily Variation of Pollutant Conc.

Lung Cheung Road 27/8/92-14/9/92



B4.3 Measurement Procedures

The datalogger sampled the ambient concentration of NOx/NO and the wind data at intervals of one minute. These data were stored in a data cartridge tape of the datalogger and were later transferred to a computer for data analysis. Samples of TSP and RSP were collected manually every 24 hours for subsequent laboratory analysis.

B5. RESULTS AND DISCUSSIONS

Hourly average data of NO and NO_2 over the sampling period are tabulated in Appendix B-2. The daily mean concentration and the statistical data are also presented. In addition, air quality data have been correlated with the hourly wind speeds and directions and the results are tabulated in Appendix B-3. Appendix B-4 gives the daily average TSP and RSP concentrations. The wind roses and pollutants roses are plotted and presented in Appendix B-5. During the period of measurement, the prevailing wind at the station was northerly; 39.1% of the time, winds were below 1 m/s.

B5.1 Mean Diurnal Variation of Pollutants

Average diurnal variations of NO and NO_2 over the period of monitoring are shown in Figure 1 opposite. The plot shows that the concentrations of NO2 rose steadily at 0600 and reached to the maximum around 1400 hours. After 1900 hours, the concentration decreased gradually. NO concentration followed similar diurnal trend as NO_2 concentration.

B5.2 Day to Day Variation of Pollutants

The pollutant concentration exhibited day-to-day variations over the monitoring period. Figure 2 shows the variation of the daily average NO, NO_2, TSP and RSP concentrations. The concentration of TSP and RSP were higher between 31 August and 4 August.

B5.3 Maximum and Mean Concentration

Nitric oxide concentrations were higher between 1400 hours and 1600 hours on 1 September. During this period, the wind was blowing from the west. Nitrogen dioxide concentrations were higher between 1300 hours and 1500 hours on 2 September, when winds were blowing from the southwest. Maximum concentrations of 194 ug/m3 for NO and 248 ug/m3 for NO2 were recorded in the monitoring period.

The concentrations of the pollutants over the monitoring period have been averaged and the results are listed in Table B1.

TABLE B1 - MEAN POLLUTANT CONCENTRATION

Pollutant	Arithmetic Mean ($\mu g/m^3$)	Geometric Mean ($\mu g/m^3$)	Standard Deviation
NO	30	/	36.4
NO_2	49	/	50.1
TSP	/	67.5	/
RSP	/	47.1	/

Meteorological conditions prevalent at the time of monitoring may have resulted in abnormal levels of pollutant concentrations. Tropical Storm Mark brought very calm conditions to Hong Kong prior to its arrival. The EPD monitoring station in Mongkok showed a significantly higher daily level of TSP at this time: almost 300 $\mu g/m^3$, well over the objective of 260 $\mu g/m^3$. NO_2 levels were also high at the EPD monitoring stations.

B5.4 Wind Rose and Pollutant Rose

The pollutant rose of nitric oxide and nitrogen dioxide indicated that the source of these pollutants is located in the southwestern quadrant. Vehicles on Lung Cheung Road, Prince Edward Road East and Clear Water Bay Road could be the source of these pollutants.

B6. COMPARISON WITH AIR QUALITY OBJECTIVES

By Hong Kong Air Quality Objectives (AQO), the measured pollutant levels at the site were high. Table B2 compares the maximum 1-hr. and 24-hr. concentration during the monitoring period with the Hong Kong AQO.

Table B2 shows that the measured values of pollutants are below the 1-hr and 24-hr standards. However, the maximum level of NO2 is not far below the 1-hr standard. There is currently no guideline level for NO.

TABLE B2 - MAXIMUM MEASURED POLLUTANT CONCENTRATIONS COMPARED TO AIR QUALITY OBJECTIVES

Pollutant	Averaging Time	Air Quality Objective ($\mu g/m^3$)	Maximum Levels ($\mu g/m^3$)
NO	1 hr 24 hr	- -	194 70
NO_2	1 hr 24 hr	300 150	248 80
TSP	24 hr	260	149
RSP	24 hr	180	110

Note: 1. Air Quality Objectives have not been established for nitrogen oxides other than NO_2.

2. No comparison is possible with the annual Air Quality Objectives due to the two-week duration of the monitoring period.

B7. PEAK-HOUR NOISE MEASUREMENTS

Noise measurements were carried out at several locations in the study area during morning peak traffic conditions (8.30 to 10.00 a.m.).

TABLE B3 - MORNING PEAK NOISE MEASUREMENTS

Site and Time Period	Measured Noise Level (dB(A))		
	L_{eq}	L_{10}	L_{90}
Tsuen Shek House (Ping Shek Estate)[1]			
8.30 to 9.00 a.m.	80.2	80.9	73.4
9.00 to 9.30 a.m.	76.4	78.4	73.9
9.30 to 10.00 a.m.	76.6	78.4	73.9
Pak Shuet House (Choi Hung Estate)[2]			
8.30 to 9.00 a.m.	79.2	80.8	76.8
9.00 to 9.30 a.m.	79.0	80.8	76.8
9.30 to 10.00 a.m.	78.4	80.3	75.8
Bayview Gardens[3]			
8.30 to 9.00 a.m.	55.0	56.3	53.3
9.00 to 9.30 a.m.	56.1	57.8	54.3
U.C. Ngau Chi Wan Complex[4]			
8.30 to 9.00 a.m.	70.7	72.3	68.8
9.00 to 9.30 a.m.	70.8	72.3	69.3
9.30 to 10.00 a.m.	70.6	72.3	68.8
Rear of St Josephs Home for the Aged[5]			
8.30 to 9.00 a.m.	59.3	60.5	58.0
9.00 to 9.30 a.m.	61.6	62.5	60.5
9.30 to 10.00 a.m.	60.6	61.5	59.5
Yan Kau School (Clearwater Bay Road)[6]			
8.30 to 9.00 a.m.	75.0	77.5	71.5
9.00 to 9.30 a.m.	74.7	77.0	71.0

1 Measurements taken 5 August 1992 at 8th floor facade facing Clearwater Bay Road.

2 Measurements taken 6 August 1992 at 8th floor facade facing Clearwater Bay Road. Pak Shuet House is located next to Kam Hon House, which was not accessible for monitoring.

3 Measurements taken 7 August 1992 from the roof (31st floor) of Bayview Gardens under free-field conditions. Technical problems prevented measurements from being taken from 9.30 to 10.00 a.m.

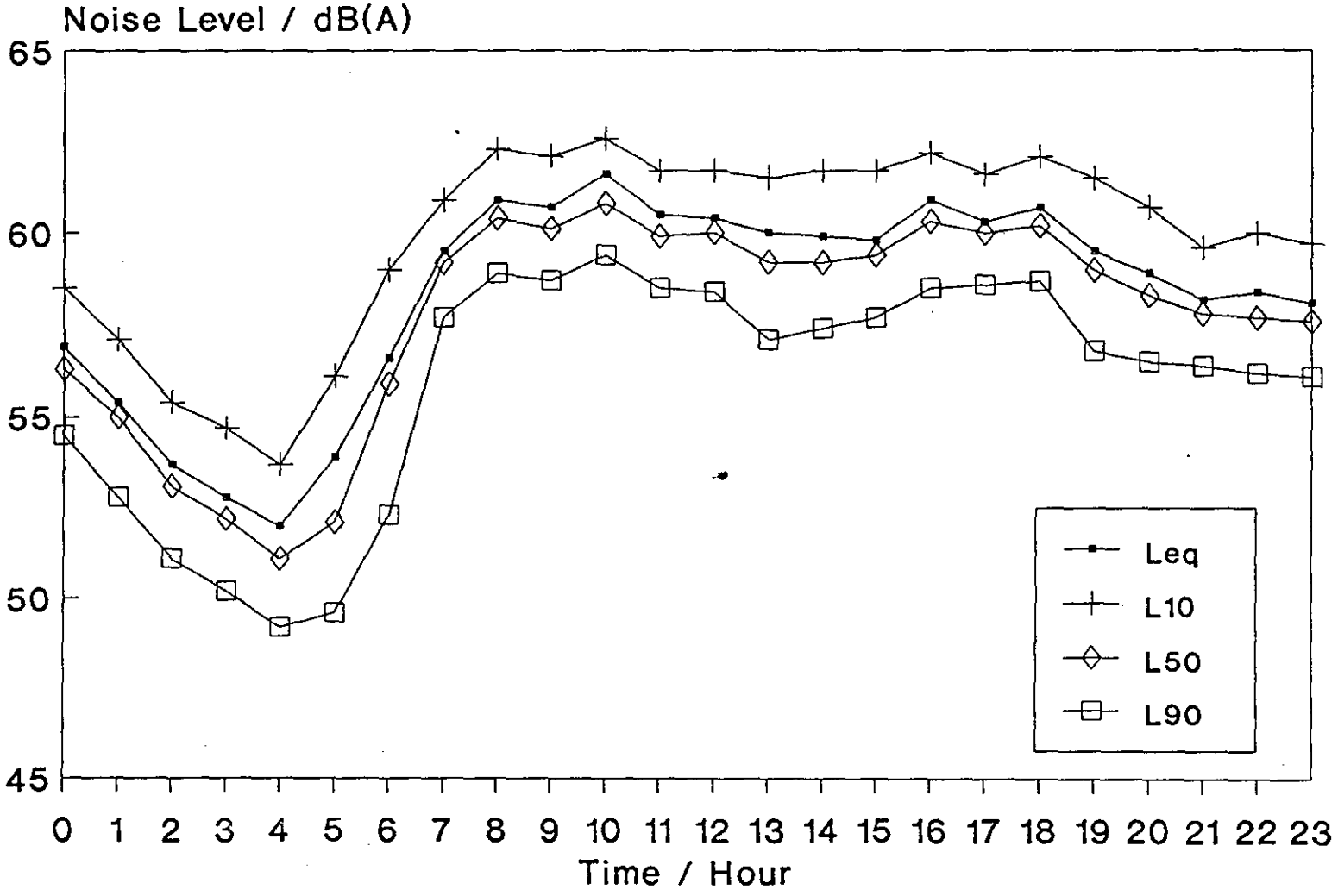
4 Measurements taken 10 August 1992 at the 3rd floor facade of the Complex, facing Kam Chi Path. Noise levels reflect market activities; contribution from traffic is minor.

5 Measurements taken 13 August 1992 in the open area north of the Home for the Aged (outside the complex) under free-field conditions.

6 Measurements taken 14 August 1992 at the 8th floor facade of Yan Kau School, facing Clearwater Bay Road.

Lung Cheung Road Flyover

St. Joseph's Home for the Aged - 15/9/92



B8. 24-HOUR NOISE MONITORING

B8.1 Monitoring over a 24-hour period was carried out from a rooftop at the St Joseph's Home for the Aged on 15 September 1992. Four parameters were recorded for each hour: L_{eq}, L_{10}, L_{50}, and L_{90}. Results are shown in Appendix A.

B8.2 The monitoring indicates that background noise levels at the site are 56 to 59 dB(A) during the daytime and evening (7.00 a.m. to 11.00 p.m.), and 49 to 56 dB(A) during the nighttime (11.00 p.m. to 7.00 a.m.).

B8.3 Results are shown in Figure 2 opposite.

APPENDIX B1 - LIST OF EQUIPMENT FOR THE AIR MONITORING

Instrument Type	Manufacturer & Detail	Model
NO-NO_2-NOx Analyzer	TECO	42
Multigas Calibration System	TECO	146
Wind System	Climatronics	WM-III
TSP Sampler	GMW	G 1200
RSP Sampler	GMW	1200
Datalogger	Microdata	1600

AIR QUALITY DATA MONTHLY TIME SERIES REPORT NO.1

SITE LOCATION : Lung Cheung Road
POLLUTION : Nitrogen Dioxide

MONTH : 1-14 Sept, 92
UNIT : MICROGRAMS PER CUBIC METRE

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1	30	30	29	29	30	30	29	30	30	30	43	89	150	171	220	193	179	153	151	57	57	30	41	95	80
2	18	9	9	9	9	9	9	31	45	88	**	**	**	**	**	**	**	**	127	90	68	68	32	43	41
3	77	37	13	11	25	13	26	50	78	85	111	183	212	181	238	170	32	29	11	9	9	9	9	17	68
4	26	9	9	9	9	9	9	7	32	**	28	33	23	44	22	36	37	36	22	9	10	65	12	10	22
5	16	9	9	9	9	9	9	11	55	68	63	53	75	84	44	106	149	166	155	82	45	7	31	45	54
6	5	4	6	9	9	15	14	23	49	28	38	29	28	30	54	69	56	39	82	48	34	28	26	16	31
7	4	4	4	4	6	7	6	11	15	13	17	18	37	38	23	15	28	35	45	23	23	12	22	9	18
8	6	6	7	5	4	4	19	28	45	29	35	49	78	88	81	35	61	57	33	19	21	15	20	25	32
9	19	3	5	7	6	6	8	33	38	65	65	77	116	144	126	90	68	73	49	24	11	12	29	122	50
10	145	144	135	74	44	45	39	52	90	203	248	**	**	**	**	38	58	52	18	41	8	7	7	11	73
11	8	9	9	9	8	9	**	**	36	16	**	**	**	**	**	74	137	122	133	112	17	16	13	15	44
12	8	8	9	8	9	7	8	7	10	114	**	26	37	**	**	**	**	61	75	39	31	13	50	34	29
13	16	7	6	8	7	9	78	106	102	49	**	**	**	211	150	**	**	**	106	120	112	111	108	82	77
14	89	25	44	83	83	91	117	100	**	**	**	**	**	136	107	136	**								92

STATISTICS:

GEOM MEAN	MEDIAN	ARITH MEAN	<----------PERCENTILES--------> 50	90	95	98	99	<------- RANGE ------> 1-HR	24-HR
29	30	49	30	122	151	194	212	245	63

NOTES: ** MEANS INVALID DATA.

APPENDIX B2 - HOURLY AVERAGE DATA OF GASEOUS POLLUTANTS

AIR QUALITY DATA MONTHLY TIME SERIES REPORT NO.1

SITE LOCATION : Lung Cheung Road
POLLUTION : Nitric oxide

MONTH : 1-14 Sept, 92
UNIT : MICROGRAMS PER CUBIC METRE

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1	2	2	3	3	2	2	3	2	2	7	30	78	126	141	194	142	82	42	26	2	2	2	2	2	38
2	1	1	1	1	1	1	1	10	18	55	**	**	**	**	**	**	**	**	33	24	22	18	17	16	14
3	17	16	14	12	12	11	11	19	36	48	55	89	96	86	104	75	15	10	3	2	2	2	2	2	31
4	2	2	2	2	2	2	2	5	17	**	15	13	11	17	12	9	7	4	1	1	1	1	1	1	6
5	1	1	1	1	1	1	1	2	16	17	15	12	13	15	11	35	49	46	36	20	14	5	6	13	14
6	4	4	3	2	2	2	3	4	10	6	8	8	8	9	13	15	11	7	21	12	9	9	8	5	8
7	5	5	4	4	3	3	4	5	6	6	8	9	14	14	10	8	11	12	15	7	9	8	11	6	8
8	4	3	2	4	5	4	11	16	23	18	19	22	34	39	38	19	29	27	18	13	14	12	15	19	17
9	13	5	4	3	3	3	2	17	24	36	36	43	58	70	62	47	36	39	24	17	12	14	22	60	27
10	70	70	67	41	28	29	27	32	46	82	94	**	**	**	**	93	103	50	6	16	4	4	4	6	44
11	2	1	1	1	2	1	6	15	68	98	84	**	**	52	**	74	31	28	34	24	20	15	12	11	28
12	4	1	1	2	1	3	3	6	5	8	77	94	115	123	130	132	106	75	58	73	71	79	59	65	54
13	72	79	77	76	76	75	30	12	28	94	125	131	129	94	90	112	126	108	48	18	16	13	17	41	70
14	34	65	52	27	24	22	5	25	97	116	123	129	136	102	44	31	66								65

STATISTICS:

GEOM MEAN	MEDIAN	ARITH MEAN	<----------PERCENTILES--------> 50	90	95	98	99	<------- RANGE ------> 1-HR	24-HR
13	14	30	14	88	113	130	135	193	65

NOTES: ** MEANS INVALID DATA.

APPENDIX B3 - AIR QUALITY DATA CORRELATED WITH THE PROCESSED WIND DATA

AIR QUALITY DATA MONTHLY TIME SERIES REPORT NO.2

SITE LOCATION : Lung Cheung Road
POLLUTION : Nitric oxide

MONTH : 1-14 Sept., 92
UNIT : MICROGRAMS PER CUBIC METRE

YYMMDD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
920901	2	2	3	3	2	2	3	2	2	7	30	78	126	141	194	142	82	42	26	2	2	2	2	2	38
	0.6	0.8	0.7	0.8	0.7	0.8	0.5	0.9	0.6	1.0	0.7	0.8	1.3	1.7	1.5	1.4	1.4	1.4	1.0	1.0	0.8	0.8	0.7	0.8	0.3
	194	17	4	15	8	201	2	21	5	16	27	254	241	249	260	253	250	233	7	38	24	16	45	197	233
920902	1	1	1	1	1	1	1	10	18	55	**	**	**	**	**	**	**	**	33	24	22	18	17	16	14
	0.9	1.0	0.8	0.7	1.1	1.1	0.8	0.9	0.5	0.8	0.4	0.9	0.7	1.0	1.6	1.3	1.1	1.0	1.3	1.4	1.3	1.2	1.2	0.9	0.3
	17	20	14	184	25	34	14	186	23	159	150	123	26	254	253	257	249	194	21	25	36	33	47	16	18
920903	17	16	14	12	12	11	11	19	36	48	55	89	96	86	104	75	15	10	3	2	2	2	2	2	31
	0.9	0.7	**	0.5	0.6	0.5	0.4	0.6	1.0	0.9	0.8	1.0	1.1	1.0	1.4	1.3	1.2	1.2	1.1	1.3	1.5	1.2	1.0	1.1	0.1
	10	20	**	34	13	3	219	201	194	51	206	192	195	22	204	232	204	188	21	33	42	37	4	22	38
920904	2	2	2	2	2	2	2	5	17	**	15	13	11	17	12	9	7	4	1	1	1	1	1	1	6
	1.2	1.0	0.8	0.8	0.8	1.0	0.9	1.1	0.8	**	1.3	1.2	0.9	1.0	1.3	0.7	1.0	0.9	0.9	0.9	0.7	0.7	1.7	0.9	0.0
	18	14	9	10	30	43	27	26	23	**	206	209	204	252	184	218	200	188	9	35	34	185	212	180	222
920905	1	1	1	1	1	1	1	2	16	17	15	12	13	15	11	35	49	46	36	20	14	5	6	13	14
	1.0	1.1	1.0	0.8	0.7	1.3	1.8	1.9	1.8	1.8	1.8	2.0	2.1	2.6	2.4	2.4	1.6	1.4	1.4	1.6	1.2	1.5	0.3	0.5	1.2
	4	217	204	183	203	229	233	214	223	241	253	262	246	228	232	224	211	206	208	234	192	11	4	64	229
920906	4	4	3	2	2	2	3	4	10	6	8	8	8	9	13	15	11	7	21	12	9	9	8	5	8
	0.9	1.1	1.3	0.8	1.0	1.2	0.4	1.2	1.1	1.9	1.5	2.6	2.2	2.0	1.9	1.9	1.0	0.5	0.0	0.9	1.4	1.4	1.6	1.3	0.9
	191	205	226	231	207	204	244	12	186	223	245	237	236	234	239	270	256	22	97	142	148	136	138	156	215
920907	5	5	4	4	3	3	4	5	6	6	8	9	14	14	10	8	11	12	15	7	9	8	11	6	8
	1.7	2.3	1.8	2.1	2.0	1.7	2.9	2.1	1.6	1.6	1.4	1.4	1.6	1.5	1.2	1.3	1.6	1.4	1.3	1.2	1.2	1.2	0.4	0.2	1.5
	129	142	146	124	126	131	145	138	133	142	135	145	156	136	130	127	138	146	148	132	135	127	133	83	137
920908	4	3	2	4	5	4	11	16	23	18	19	22	34	39	38	19	29	27	18	13	14	12	15	19	17
	1.0	1.5	1.2	0.9	0.6	1.3	1.4	1.3	1.9	2.0	2.9	0.4	1.1	0.8	1.4	0.3	0.9	0.8	0.8	0.9	0.9	0.7	0.6	0.5	0.9
	130	142	131	132	142	135	164	144	144	144	158	257	241	228	155	87	154	154	78	86	75	76	71	77	140
920909	13	5	4	3	3	3	2	17	24	36	36	43	58	70	62	47	36	39	24	17	12	14	22	60	27
	0.2	0.1	0.5	**	**	**	**	**	0.3	1.4	1.2	2.2	1.7	2.3	2.3	2.7	1.4	1.0	0.7	0.8	0.8	1.0	0.5	0.5	0.9
	159	201	63	**	**	**	**	**	64	135	138	138	148	166	167	166	132	119	103	95	59	58	71	25	135

APPENDIX B3 - AIR QUALITY DATA CORRELATED WITH THE PROCESSED WIND DATA

920910	70	70	67	41	28	29	27	32	46	82	94	**	**	**	**	93	103	50	6	16	4	4	4	6	44
	0.8	0.6	0.7	**	**	**	**	0.5	0.7	0.8	1.1	**	1.1	0.7	0.4	0.6	0.8	0.5	0.5	0.5	0.6	0.7	0.8	0.3	0.2
	10	11	15	**	**	**	**	21	35	224	233	**	254	259	232	87	70	85	38	128	76	91	71	38	46
920911	2	1	1	1	2	1	6	15	68	98	84	**	**	52	**	74	31	28	34	24	20	15	12	11	28
	0.4	0.1	0.5	0.3	0.6	0.6	**	0.4	0.9	1.4	1.8	1.9	1.9	2.3	2.4	2.1	2.2	2.0	1.9	1.6	1.3	1.2	1.1	1.0	1.3
	5	231	189	253	83	75	**	141	175	136	142	147	140	133	**	**	**	**	**	**	**	**	**	**	**
920912	4	1	1	2	1	3	3	6	5	8	77	94	115	123	130	132	106	75	58	73	71	79	59	65	54
	1.1	0.9	0.5	0.7	**	0.5	1.1	1.3	1.8	1.9	2.4	2.1	2.3	2.4	2.5	2.3	2.1	1.7	1.7	1.4	1.2	1.3	1.1	0.7	1.5
	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
920913	72	79	77	76	76	75	30	12	28	94	125	131	129	94	90	112	126	108	48	18	16	13	17	41	70
	1.0	1.1	0.9	0.7	0.6	0.5	0.7	0.6	1.1	1.6	1.7	1.7	1.6	2.7	2.1	2.0	1.7	1.7	1.3	1.2	1.0	1.0	0.7	0.9	1.3
	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
920914	34	65	52	27	24	22	5	25	97	116	123	129	136	102	44	31	66								65
	0.9	0.8	0.8	1.0	0.8	0.9	0.6	0.8	1.0	1.0	1.4	1.4	1.6	1.5	0.9	1.2	1.3								1.1
	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**								**

NOTES: 1. ** MEANS INVALID DATA.
2. POLLUTANT CONCENTRATIONS ON LINE 1.
3. WIND SPEED (METRE/SECOND) ON LINE 2.
4. WIND DIRECTION (DEGREE) ON LINE 3.

APPENDIX B3 - AIR QUALITY DATA CORRELATED WITH THE PROCESSED WIND DATA

AIR QUALITY DATA MONTHLY TIME SERIES REPORT NO.2

SITE LOCATION : Lung Cheung Road
POLLUTION : Nitrogen Dioxide

MONTH : 1-14 Sept, 92
UNIT : MICROGRAMS PER CUBIC METRE

YYMMDD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
920901	30	30	29	29	30	30	29	30	30	30	43	89	150	171	220	193	179	153	151	57	57	30	41	95	80
	0.6	0.8	0.7	0.8	0.7	0.8	0.5	0.9	0.6	1.0	0.7	0.8	1.3	1.7	1.5	1.4	1.4	1.4	1.0	1.0	0.8	0.8	0.7	0.8	0.3
	194	17	4	15	8	201	2	21	5	16	27	254	241	249	260	253	250	233	7	38	24	16	45	197	233
920902	18	9	9	9	9	9	9	31	45	88	**	**	**	**	**	**	**	**	127	90	68	68	32	43	41
	0.9	1.0	0.8	0.7	1.1	1.1	0.8	0.9	0.5	0.8	0.4	0.9	0.7	1.0	1.6	1.3	1.1	1.0	1.3	1.4	1.3	1.2	1.2	0.9	0.3
	17	20	14	184	25	34	14	186	23	159	150	123	26	254	253	257	249	194	21	25	36	33	47	16	18
920903	77	37	13	11	25	13	26	50	78	85	111	183	212	181	238	170	32	29	11	9	9	9	9	17	68
	0.9	0.7	**	0.5	0.6	0.5	0.4	0.6	1.0	0.9	0.8	1.0	1.1	1.0	1.4	1.3	1.2	1.2	1.1	1.3	1.5	1.2	1.0	1.1	0.1
	10	20	**	34	13	3	219	201	194	51	206	192	195	22	204	232	204	188	21	33	42	37	4	22	38
920904	26	9	9	9	9	9	9	7	32	**	28	33	23	44	22	36	37	36	22	9	10	65	12	10	22
	1.2	1.0	0.8	0.8	0.8	1.0	0.9	1.1	0.8	**	1.3	1.2	0.9	1.0	1.3	0.7	1.0	0.9	0.9	0.9	0.7	0.7	1.7	0.9	0.0
	18	14	9	10	30	43	27	26	23	**	206	209	204	252	184	218	200	188	9	35	34	185	212	180	222
920905	16	9	9	9	9	9	9	11	55	68	63	53	75	84	44	106	149	166	155	82	45	7	31	45	54
	1.0	1.1	1.0	0.8	0.7	1.3	1.8	1.9	1.8	1.8	1.8	2.0	2.1	2.6	2.4	2.4	1.6	1.4	1.4	1.6	1.2	1.5	0.3	0.5	1.2
	4	217	204	183	203	229	233	214	223	241	253	262	246	228	232	224	211	206	208	234	192	11	4	64	229
920906	5	4	6	9	9	15	14	23	49	28	38	29	28	30	54	69	56	39	82	48	34	28	26	16	31
	0.9	1.1	1.3	0.8	1.0	1.2	0.4	1.2	1.1	1.9	1.5	2.6	2.2	2.0	1.9	1.9	1.0	0.5	0.0	0.9	1.4	1.4	1.6	1.3	0.9
	191	205	226	231	207	204	244	12	186	223	245	237	236	234	239	270	256	22	97	142	148	136	138	156	215
920907	4	4	4	4	6	7	6	11	15	13	17	18	37	38	23	15	28	35	45	23	23	12	22	9	18
	1.7	2.3	1.8	2.1	2.0	1.7	2.9	2.1	1.6	1.6	1.4	1.4	1.6	1.5	1.2	1.3	1.6	1.4	1.3	1.2	1.2	1.2	0.4	0.2	1.5
	129	142	146	124	126	131	145	138	133	142	135	145	156	136	130	127	138	146	148	132	135	127	133	83	137
920908	6	6	7	5	4	4	19	28	45	29	35	49	78	88	81	35	61	57	33	19	21	15	20	25	32
	1.0	1.5	1.2	0.9	0.6	1.3	1.4	1.3	1.9	2.0	2.9	0.4	1.1	0.8	1.4	0.3	0.9	0.8	0.8	0.9	0.9	0.7	0.6	0.5	0.9
	130	142	131	132	142	135	164	144	144	144	158	257	241	228	155	87	154	154	78	86	75	76	71	77	140
920909	19	3	5	7	6	6	8	33	38	65	65	77	116	144	126	90	68	73	49	24	11	12	29	122	50
	0.2	0.1	0.5	**	**	**	**	**	0.3	1.4	1.2	2.2	1.7	2.3	2.3	2.7	1.4	1.0	0.7	0.8	0.8	1.0	0.5	0.5	0.9
	159	201	63	**	**	**	**	**	64	135	138	138	148	166	167	166	132	119	103	95	59	58	71	25	135

APPENDIX B3 - AIR QUALITY DATA CORRELATED WITH THE PROCESSED WIND DATA

920910	145	144	135	74	44	45	39	52	90	203	248	**	**	**	**	38	58	52	18	41	8	7	7	11	73
	0.8	0.6	0.7	**	**	**	**	0.5	0.7	0.8	1.1	**	1.1	0.7	0.4	0.6	0.8	0.5	0.5	0.5	0.6	0.7	0.8	0.3	0.2
	10	11	15	**	**	**	**	21	35	224	233	**	254	259	232	87	70	85	38	128	76	91	71	38	46
920911	8	9	9	9	8	9	**	**	36	16	**	**	**	**	**	74	137	122	133	112	17	16	13	15	44
	0.4	0.1	0.5	0.3	0.6	0.6	**	0.4	0.9	1.4	1.8	1.9	1.9	2.3	2.4	2.1	2.2	2.0	1.9	1.6	1.3	1.2	1.1	1.0	0.4
	5	231	189	253	83	75	**	141	175	136	142	147	140	133	**	**	**	**	**	**	**	**	**	**	**
920912	8	8	9	8	9	7	8	7	10	114	**	26	37	**	**	**	**	61	75	39	31	13	50	34	29
	1.1	0.9	0.5	0.7	**	0.5	1.1	1.3	1.8	1.9	2.4	2.1	2.3	2.4	2.5	2.3	2.1	1.7	1.7	1.4	1.2	1.3	1.1	0.7	1.5
	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
920913	16	7	6	8	7	9	78	106	102	49	**	**	**	211	150	**	**	**	106	120	112	111	108	82	77
	1.0	1.1	0.9	0.7	0.6	0.5	0.7	0.6	1.1	1.6	1.7	1.7	1.6	2.7	2.1	2.0	1.7	1.7	1.3	1.2	1.0	1.0	0.7	0.9	1.3
	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
920914	89	25	44	83	83	91	117	100	**	**	**	**	**	136	107	136	**								92
	0.9	0.8	0.8	1.0	0.8	0.9	0.6	0.8	1.0	1.0	1.4	1.4	1.6	1.5	0.9	1.2	1.3								**
	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**								**

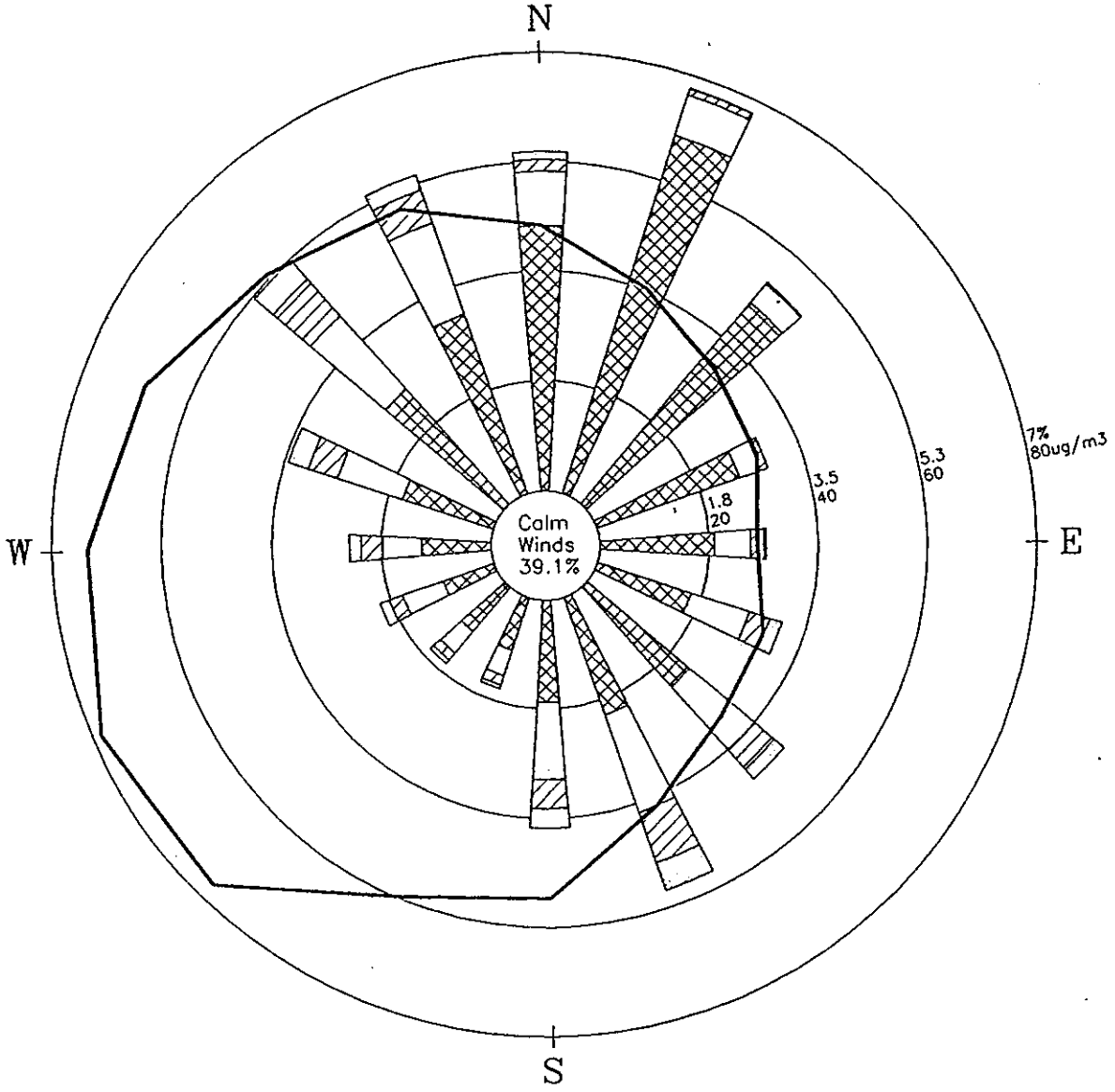
NOTES: 1. ** MEANS INVALID DATA.
2. POLLUTANT CONCENTRATIONS ON LINE 1.
3. WIND SPEED (METRE/SECOND) ON LINE 2.
4. WIND DIRECTION (DEGREE) ON LINE 3.

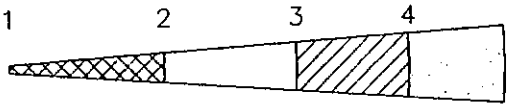
APPENDIX B4 - CONCENTRATION OF TSP AND RSP

DATE	Concentration ($\mu g/m^3$)	
	TSP	RSP
27 Aug	73.6	60.8
28 Aug	73.3	54.1
29 Aug	61.0	41.5
30 Aug	97.6	64.5
31 Aug	107.5	70.7
1 Sept	149.0	109.5
2 Sept	125.7	87.4
3 Sept	142.3	98.2
4 Sept	139.9	**
5 Sept	73.8	57.4
6 Sept	43.8	32.6
7 Sept	36.6	23.7
8 Sept	39.4	28.6
9 Sept	66.9	53.2
10 Sept	54.9	42.6
11 Sept	39.5	30.3
12 Sept	29.2	24.9
13 Sept	33.4	22.0
MEAN	71.1	57.1

Note: ** means invalid data.

APPENDIX B5 - WIND ROSES AND POLLUTANT ROSES





WIND SPEED CLASSES (m/s)
Pollutant Concentration (ug/m3)

Wind Direction is the direction from which the wind is blowing. Percentage of occurence of the wind speed is indicated by the length of the sector.

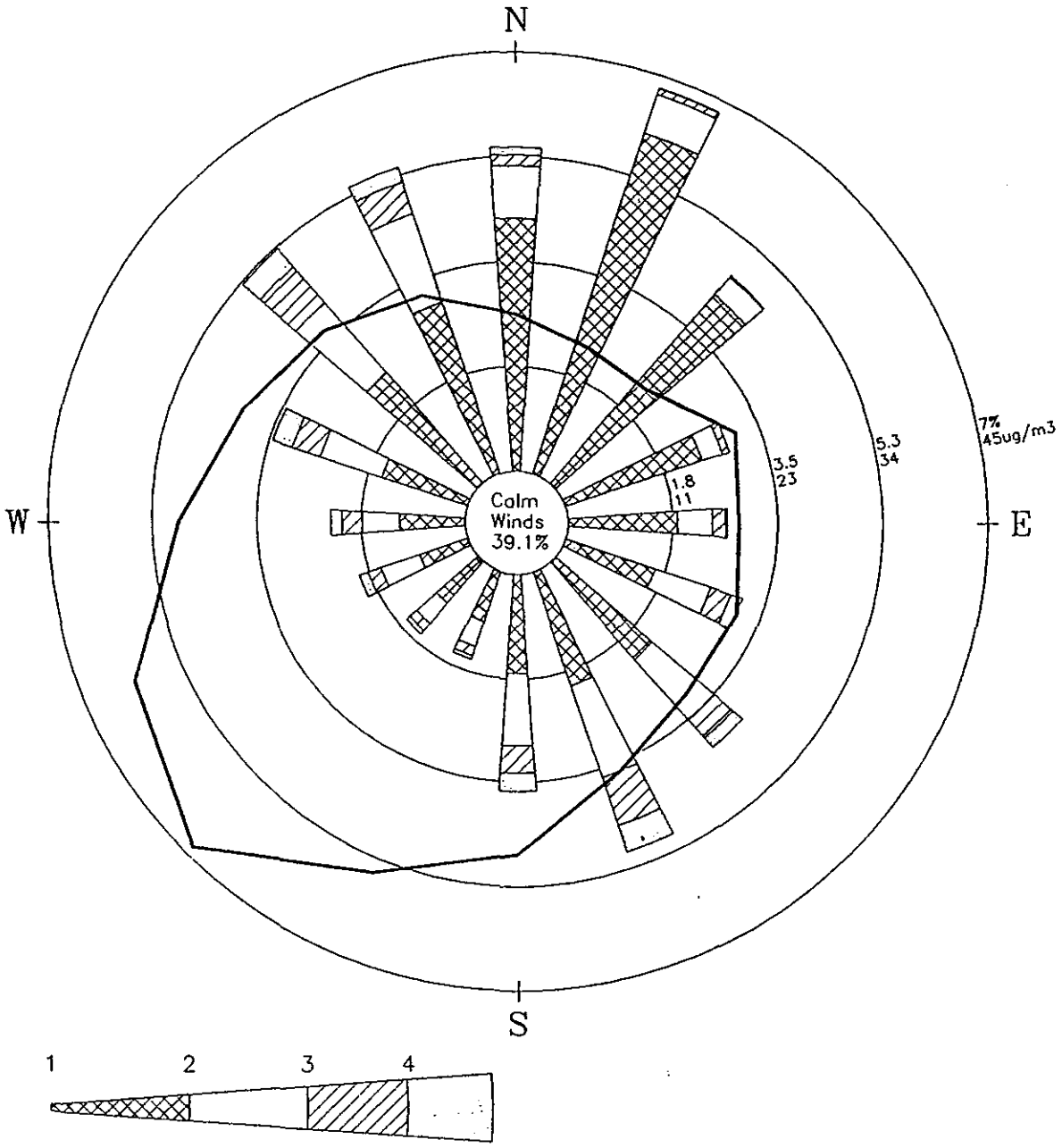
STATION : Lung Cheung Road

PERIOD : 1–14 Sept, 92

POLLUTANT : Nitrogen Dioxide

WIND ROSE & POLLUTANT ROSE

APPENDIX B5 - WIND ROSES AND POLLUTANT ROSES Sheet 2 of 2



WIND SPEED CLASSES (m/s)
Pollutant Concentration (ug/m3)

Wind Direction is the direction from which the wind is blowing. Percentage of occurence of the wind speed is indicated by the length of the sector.

STATION : Lung Cheung Road

PERIOD : 1–14 Sept, 92

POLLUTANT : Nitric oxide

WIND ROSE & POLLUTANT ROSE

APPENDIX C - CONSTRUCTION NOISE

C1. Construction equipment has been listed in Section 6.1. For this assessment, the following assumptions have been made:

A reduced amount of equipment (appropriate for a discrete pier site) for a given construction activity has been assumed to operate simultaneously. The combined sound power level of the construction equipment is a shown in the following table:

Construction Activity	Combined Sound Power Level of All Equipment dB(A)
Earthworks	*123*
Piling	*120*
Pile Cap Construction	*122*
Pier Construction	*119*
Superstructure	*118*
Roadworks	*118*
Drainage	*121*

NOTE: Construction equipment listed in Section 6.1.

For each sensitive receiver, construction equipment has been assumed to be located at the nearest point on the Option alignment. This is a worst-case situation. Works are expected to progress on two to three spans at a time (see Figure 14), so that all construction equipment for a given activity is expected to operate over a 90 to 120 meter section of the alignment. The approximate duration of each activity is also shown in Figure 14.

Where appropriate, a barrier correction has been made. This correction is -10 dB(A) for a fully-screened receiver, or -5 dB(A) for a partially-screened receiver.

C2. Results of construction noise calculations are provided in the following tables.

Receiver Number and Identification		Facade Noise Levels due to Construction Activity (dB(A))											
		Earthworks			Piling			Pile Caps			Piers		
		Option			Option			Option			Option		
		A	B	C	A	B	C	A	B	C	A	B	C
R1	Kam Hon	-	-	*87*	*90*	*90*	*85*	*91*	*91*	*86*	*88*	*88*	*83*
R2	Tan Fung	-	-	*73*	*76*	*76*	*71*	*77*	*77*	*72*	*74*	*74*	*69*
R3	UC Complex	-	-	*72*	*85*	*80*	*70*	*86*	*81*	*71*	*83*	*78*	*68*
R4	Tsuen Shek	-	-	*72*	*77*	*74*	*70*	*78*	*75*	*70*	*75*	*74*	*68*
R5	PSC School	-	-	*79*	*90*	*82*	*77*	*91*	*83*	*77*	*88*	*80*	*75*
R6	Yan Kau	-	-	*82*	*86*	*83*	*80*	*87*	*84*	*81*	*84*	*81*	*78*
R7	St Johns	-	-	*86*	*86*	*86*	*84*	*87*	*87*	*85*	*84*	*84*	*82*
R8	THA	-	-	*82*	*80*	*79*	*80*	*81*	*80*	*81*	*78*	*77*	*78*
R9	THA	-	-	*82*	*80*	*79*	*80*	*81*	*80*	*81*	*78*	*77*	*78*
R10	Sau Man	-	-	*91*	*88*	*88*	*89*	*89*	*89*	*90*	*86*	*86*	*87*
R11	St Josephs	-	-	*94*	*90*	*91*	*92*	*91*	*92*	*93*	*88*	*89*	*90*
R12	H Aged S	-	-	*76*	*106*	*96*	*74*	*107*	*97*	*75*	*104*	*94*	*72*
R13	H Aged Mid	-	-	*78*	*83*	*106*	*76*	*82*	*107*	*77*	*81*	*104*	*74*
R14	H Aged E	-	-	*90*	*82*	*95*	*88*	*81*	*96*	*89*	*80*	*93*	*86*
R15	H Aged N	-	-	*88*	*73*	*76*	*86*	*72*	*77*	*87*	*71*	*74*	*84*
R16	H Aged W	-	-	*78*	*81*	*88*	*76*	*80*	*89*	*77*	*79*	*86*	*74*
R17	Bayview W	-	-	-	*78*	*78*	-	*79*	*79*	-	*76*	*76*	-
R18	Bayview E	-	-	*94*	-	-	*92*	-	-	*93*	-	-	*90*

Receiver Number and Identification		Facade Noise Levels due to Construction Activity (dB(A))											
		Earthworks			Piling			Pile Caps			Piers		
		Option			Option			Option			Option		
		A	B	C	A	B	C	A	B	C	A	B	C
R19	Bayview N	-	-	*85*	-	-	*83*	-	-	*84*	-	-	*81*
R20	HSC Coll.	-	-	*80*	*68*	*68*	*78*	*69*	*69*	*79*	*66*	*66*	*76*
R21	Football	-	-	*81*	*76*	*76*	*79*	*77*	*77*	*80*	*74*	*74*	*77*
R22	Pools	-	-	*82*	*80*	*80*	*80*	*81*	*81*	*81*	*78*	*78*	*78*
R23	LC Path	-	-	*72*	*110*	*92*	*70*	*111*	*93*	*71*	*108*	*90*	*68*
R24	Village S	-	-	*75*	*83*	*89*	*73*	*84*	*90*	*74*	*81*	*87*	*71*
R25	Village W	-	-	*84*	*84*	*84*	*82*	*85*	*85*	*83*	*82*	*82*	*80*
R26	Village N	-	-	-	*72*	*72*	-	*73*	*73*	-	*70*	*70*	-
R27	Ham Hill	-	-	-	-	-	-	-	-	-	-	-	-
R28	Pak Fun	-	-	*86*	*80*	*82*	*84*	*81*	*83*	*85*	*78*	*80*	*82*

Receiver Number and Identification		Facade Noise Levels due to Construction Activity (dB(A))								
		Superstructure			Roadworks			Drainage		
		Option			Option			Option		
		A	B	C	A	B	C	A	B	C
R1	Kam Hon	*87*	*87*	*82*	*87*	*87*	*82*	*90*	*90*	*85*
R2	Tan Fung	*73*	*73*	*68*	*73*	*73*	*69*	*76*	*76*	*71*
R3	UC Complex	*82*	*77*	*67*	*82*	*77*	*67*	*85*	*80*	*70*
R4	Tsuen Shek	*74*	*71*	*67*	*74*	*71*	*67*	*77*	*74*	*70*
R5	PSC School	*87*	*79*	*74*	*87*	*79*	*74*	*90*	*82*	*77*
R6	Yan Kau	*83*	*80*	*77*	*83*	*80*	*77*	*86*	*83*	*80*
R7	St Johns	*83*	*83*	*81*	*83*	*83*	*81*	*86*	*86*	*84*
R8	THA	*77*	*76*	*77*	*77*	*76*	*77*	*80*	*79*	*80*
R9	THA	*77*	*76*	*77*	*77*	*76*	*77*	*80*	*79*	*80*
R10	Sau Man	*85*	*85*	*86*	*85*	*85*	*86*	*88*	*88*	*89*
R11	St Josephs	*87*	*88*	*89*	*87*	*88*	*89*	*90*	*91*	*92*
R12	H Aged S	*103*	*93*	*71*	*101*	*93*	*71*	*106*	*96*	*74*
R13	H Aged Mid	*80*	*103*	*73*	*80*	*103*	*73*	*83*	*106*	*76*
R14	H Aged E	*79*	*92*	*85*	*79*	*92*	*85*	*82*	*95*	*88*
R15	H Aged N	*70*	*73*	*83*	*70*	*73*	*83*	*73*	*76*	*86*
R16	H Aged W	*78*	*85*	*73*	*68*	*85*	*73*	*81*	*88*	*76*
R17	Bayview W	*75*	*75*	-	*75*	*75*	-	*78*	*78*	-
R18	Bayview E	-	-	*89*	-	-	*89*	-	-	*92*

Receiver Number and Identification		Facade Noise Levels due to Construction Activity (dB(A))								
		Superstructure			Roadworks			Drainage		
		Option			Opton			Option		
		A	B	C	A	B	C	A	B	C
R19	Bayview N	-	-	*80*	-	-	*80*	-	-	*83*
R20	HSC Coll.	*65*	*65*	*75*	*65*	*65*	*75*	*68*	*68*	*78*
R21	Football	*73*	*73*	*76*	*73*	*73*	*76*	*76*	*76*	*79*
R22	Pools	*77*	*77*	*77*	*77*	*77*	*77*	*80*	*80*	*80*
R23	LC Path	*107*	*89*	*67*	*107*	*89*	*67*	*110*	*92*	*70*
R24	Village S	*80*	*86*	*70*	*80*	*86*	*70*	*83*	*89*	*73*
R25	Village W	*81*	*81*	*79*	*81*	*81*	*79*	*84*	*84*	*82*
R26	Village N	*69*	*69*	-	*69*	*69*	-	*72*	*72*	-
R27	Ham Hill	-	-	-	-	-	-	-	-	-
R28	Pak Fun	*77*	*79*	*81*	*77*	*79*	*81*	*80*	*82*	*84*

APPENDIX D MTR CONSTRUCTION REQUIREMENTS

Chief Highway Engineer/Structures
10/F Empire Centre
Tsimshatsui East
Kowloon

BY FAX & POST

Attention Mr S K Yeung

EKL/609/3 STR 5/20/26 9 March 1990

Dear Sir

Lung Cheung Road/New Clear Water Bay Road Flyover
MTR Route Protection

Thank you for your letter of 20 February which I received on 26 February.

Enclosed are comments by the Corporation's Project Design Manager (Civil Engineering Services) concerning the railway protection aspect.

As discussed on Feb 2, constraints imposed by your proposed flyover and surface traffic on Lung Cheung Road preclude the construction of the future MTR tunnel by cut-and-cover method. Extensive ground treatment may be necessary for this section of relatively shallow tunnel. Under the abutment, for example, a pile cap is shown to be spanning over the future tunnel. A viable alternative would be to incorporate into your foundation a section of the future tunnel. This should alleviate the problem and cost not only at this stage but also for the future.

In summary, the detailed design of your flyover foundation should take into account the effect of future tunnel work.

Yours faithfully

Original signed by D. H. Murray

D H Murray
for Railway Extensions Manager

Enc

PY/tl

b c c PDM(CES)
c.c. EKL/609/6/5

From: PDM (CES)

Location: 2/F
Extension: 2245

Reference: EC/260/06.11/43 ~~EC/260/06.12/61~~
Date: 8/3/1990

Lung Cheung Road/New Clearwater Bay Road Flyover

The letter from Highways Department dated 20/2/1990 and the enclosed tentative foundation layout of the above flyover refer.

Our comments on the submission are as follows:-

1) The proposal includes installation of bored piles at a distance of 1.5m from the existing CHH-DIH tunnel between the gap of the running & future tunnels. In order to ascertain the location of the tunnel and to minimise the possible disturbance to the tunnel structure, we require that hand dug caissons of diameter slightly larger than that of the bored piles be dug to a level of not less than 1 metre below the tunnel crown before bored piling commences.

2) The bored piles on the N-E side of MTR tunnel should be at least 2.5m away from the existing tunnel structure. Otherwise, similar requirement as stated in (1) should be applied.

3) An assessment report of the effect on MTR tunnel due to the work including induced loading and movement shall be submitted for our comment.

4) Plans and sections indicating the relationship of each of these foundation to the existing and future tunnel structures with dimensions and co-ordinates should be shown for MTRC to check.

5) Instrumentation and alignment monitoring of the tunnel structure shall be carried out by the Contractor before and during construction of the work as required by MTRC.

6) A compressible layer shall be installed underneath the soffit of the pile caps bridging over MTR tunnel so as to prevent any loading transfer on to the tunnel structure.

7) Technical circular 14 for Railway Protection shall be referred to.

T S K Lai

cc: T Yeung

TSKL/DCCL/2256/rb

APPENDIX E - LANDUSE IMPACT ASSESSMENT OPERATIONAL STAGE

E1 - Option A
Detailed Assessment of the Impact on Each Relevant Sensitive Receiver

SR1 : Hung Kgok and Kam Hon House, Choi Hung Estate

Population : 310.
Direct Impact : none
Indirect Impact : In view of the permanent use of the site as a public housing estate, the size of population and the close proximity of the flyover, the impact would be SEVERE.

SR2 : Tan Fung House, Choi Hung Estate

Population : 1600
Direct Impact: none
Indirect Impact: In view of the permanent use of the site as a public housing estate, the size of population and the moderate proximity of the flyover, the impact would be MODERATE.

SR3 : UC Ngau Chi Wan Complex

Population : not applicable
Direct Impact: none
Indirect Impact: This Complex accommodates a variety of uses including a market, library, indoor recreation centre and outdoor roof top play area and garden. The site is zoned to remain as a GIC use. The impact of the proposed flyover on the complex would be MODERATE.

SR4 : Ping Shek Estate

Population : 450
Direct Impact: none
Indirect Impact: In view of the moderate proximity of the block to the flyover the impact would be MODERATE.

SR5 : Ping Shek Estate Catholic Primary School

Population : 360
Direct Impact: none
Indirect Impact: The site is zoned to continue to be used as a school site. In view of the land use conflict between the school and the road and the close proximity, the impact would be SEVERE.

SR6 : Yan Kau School

As SR5.

SR7 : St Josephs Primary School

As SR5.

SR8 and SR9 : Ping Shek Temporary Housing Area

Population : not known
Direct Impact : none
Indirect Impact : In view of the future clearance of the THA the impact would be LOW.

SR10 : Sau Man House, Choi Wan Estate

Population : 2200
Direct Impact : none
Indirect Impact : The site is zoned to remain in residential use. In view of the moderate proximity and the relatively high elevation of the block above the road the overall impact would be LOW

SR11 : Choi Wan St Josephs Primary School

Population :
Direct Impact: none
Indirect Impact: The site is zoned to continue to be used as a school site. In view of the land use conflict between a school and the road and the close proximity the impact would be SEVERE.

SR12 to SR16 : St Josephs Home for the Aged

Population : 170
Direct Impact: Partial resumption or wayleave required along the southern boundary of the site.
Indirect Impact: The site is zoned to remain as a GIC site. In view of the incompatibility of the Home next to the road and the direct impact on the site the impact would be SEVERE.

SR17 to SR19 : Bayview Gardens

Population : 2910
Direct Impact: none
Indirect Impact: The site is zoned as an R1 development. In view of the moderate proximity of the block to the road and the high elevation of the development above he road the overall impact would be LOW.

SR20 : Hung Sean Chau College

Population : not known
Direct Impact : none
Indirect Impact: In view of the moderate proximity of the road to the school the overall impact would be low.

SR21 : UC Hammer Hill Sports Complex

Population : not applicable
Direct Impact : none
Indirect Impact: The site is zoned to remain as a GIC use. In view of the distance between the road and the complex, and the relative lack of sensitivity of the use the impact would be LOW.

SR22 : Proposed UC Hammer Hill Leisure Pool Complex

Population : not relevant
Direct Impact : none
Indirect Impact : The site is zoned for GIC and will be developed as a leisure pool complex. The flyover would run along the southern boundary of the complex. The impact would be MODERATE.

SR23 : Ngau Chi Wan Village : South of Lung Chi Path

Population : 190
Direct Impact : The flyover would run along the length of Lung Chi Path and would therefore have a direct impact on adjoining village properties.
Indirect Impact : The properties to the south of Lung Chi Path are largely residential with commercial premises at the ground level. There is no intended change of land use in the area in accordance with the present planning documents. In view of the sensitivity of the use and the immediate proximity the impact would be SEVERE.

SR24 : Ngau Chi Wan Village : North of Lung Chi Path

Population : 800
Direct Impact : The proposed flyover would require resumption of the first row of properties to the north of Lung Chi Path, assuming that the road was built before redevelopment, suggesting high resumption costs, compensation payments or re-housing of the residents.
Indirect Impact: The properties to the north of Lung Chi Path are largely residential with commercial premises at the ground level. The site is zoned for clearance and redevelopment in accordance with the Ngau Chi Wan Village Layout Plan. The VLP recognizes the alignment of a high level road along the course of route A and the land uses beneath and adjoining the road comprise a GIC site, parking, open space, amenity areas, an RCP and public latrine. In view of the direct impact on the village and the resultant change of use the overall impact would however be SEVERE.

SR25 : Ngau Chi Wan Nunnery

Population : not known
Direct Impact : The site would need to be resumed assuming that the flyover were built before redevelopment of the village.
Indirect Impact : The site is zoned for residential development on the VLP. In view of the direct impact on the site and the incompatibility of the existing and future land uses with the road the overall impact is SEVERE.

SR26 : Ngau Chi Wan Village North

Population : not known
Direct Impact : none
Indirect Impact : This site is located on the northern part of Ngau Chi Wan Village and is occupied by temporary residential structures. The site is zoned for redevelopment with R1 developments being shown on the VLP. In view of the incompatibility of both the existing and future land uses with the flyover the overall impact would be SEVERE.

SR27 : Hammer Hill

Population : not applicable
Direct Impact : none
Indirect Impact : LOW impact.

SR28 : Pak Fung House : Choi Wan Estate

Population : 2200
Direct Impact : none
Indirect Impact: The site is zoned to remain as a residential use. In view of the moderate proximity of the block from the road the overall impact would be MODERATE.

SR29 : Planned FSD Quarters

Population : 2900
Direct Impact : none
Indirect Impact : The site is currently occupied by temporary residential structures. The site is zoned for redevelopment and use as a FSD quarters. The proposed use is generally incompatible with the flyover but in view of the distance between the road and the quarters, the overall impact would only be MODERATE.

E2 - Option B
Detailed Assessment of the Impact on Each Relevant Sensitive Receiver

SR1: Hung Kgok and Kam Hon House, Choi Hung Estate

Population : 310
Direct Impact : none
Indirect Impact : In view of the permanent use of the site as a public housing estate, the size of population and the close proximity of the flyover, the impact would be SEVERE.

SR2 : Tan Fung House, Choi Hung Estate

Population : 1600
Direct Impact: none
Indirect Impact: In view of the permanent use of the site as a public housing estate, the size of population and the moderate proximity of the flyover, the impact would be MODERATE.

SR3 : UC Ngau Chi Wan Complex

Population : not applicable
Direct Impact: none
Indirect Impact: This Complex accommodates a variety of uses including a market, library, indoor recreation centre and outdoor roof top play area and garden. The site is zoned to remain as a GIC use. In view of the greater distance between the road and the complex the impact of the proposed flyover on the complex would be LOW

SR4 : Ping Shek Estate

Population : 450
Direct Impact: none
Indirect Impact: In view of the moderate proximity of the estate to the flyover the impact would be MODERATE.

SR5 : Ping Shek Catholic Primary School

Population : 360
Direct Impact: none
Indirect Impact: The site is zoned to continue to be used as a school site. In view of the land use conflict between the school and the road, and the close proximity, the impact would be SEVERE.

SR6 : Yan Kau School

As SR5.

SR7 : St Joseph Primary School

As SR5.

SR8 and SR9 : Ping Shek Temporary Housing Area

Population : not known
Direct Impact: none
Indirect Impact: In view of the future clearance of the THA the impact would be LOW.

SR10 : Sau Man House, Choi Wan Estate

Population : 2200
Direct Impact: none
Indirect Impact: The site is zoned to remain in residential use. In view of the moderate proximity of the block from the road and the relatively high elevation of the block above the road the overall impact would be LOW.

SR11 : Choi Wan St Josephs Primary School

Direct Impact: not known
Indirect Impact: The site is zoned to continue to be used as a school site. In view of the land use conflict between the school and the road and the close proximity the impact would be SEVERE.

SR12 to SR16 : St Josephs Home for the Aged

Population : 170
Direct Impact: Partial resumption or wayleave required through the centre of the site.
Indirect Impact: The site is zoned to remain as a GIC site. In view of the incompatibility of the Home next and the road, and the direct affect on the site, the overall impact would be SEVERE.

SR17 to SR19 : Bayview Gardens

Population : 2910
Direct Impact: none
Indirect Impact: The site is zoned as an R1 development. In view of the moderate proximity of the development to the road and the high elevation of the development above the road the overall impact would be LOW.

SR20 : Hung Sean Chau College

Population : not known
Direct Impact : none
Indirect Impact: In view of the moderate proximity of the road and the school the overall impact would be LOW.

SR21 : UC Hammer Hill Sports Complex

Population : not applicable
Direct Impact : none

Indirect Impact: The site is zoned to remain as a GIC use. In view of the distance between the road and the complex, and the relative lack of sensitivity of the use the impact would be LOW.

SR22 : Proposed UC Hammer Hill Leisure Pool Complex

Population : not relevant
Direct Impact : none
Indirect Impact : The site is zoned for GIC and will be developed as an leisure pool complex. The flyover would run along the southern boundary of the complex. The impact would be MODERATE.

SR23 : Ngau Chi Wan Village : South of Lung Chi Path

Population : 190
Direct Impact : The flyover would run along the length of Lung Chi Path and would therefore have a direct impact on adjoining village houses.
Indirect Impact : The properties to the south of Lung Chi Path are largely residential with commercial premises at the ground level. There is no intended change of land use in the area in accordance with the present planning documents. In view of the sensitivity of the use and the immediate proximity the impact would be SEVERE.

SR24 : Ngau Chi Wan Village : North of Lung Chi Path

Population : 800
Direct Impact : The proposed flyover would require resumption of the first two rows of properties to the north of Lung Chi Path, assuming that the road was built before redevelopment, suggesting high resumption costs, compensation payments or re-housing of the residents.
Indirect Impact: The properties to the north of Lung Chi Path are largely residential with commercial premises at the ground level. The site is zoned for clearance and redevelopment in accordance with the Ngau Chi Wan Village Layout Plan. The VLP does not recognize the alignment of a high level road along the course of route B and therefore the land uses beneath and adjoining the road would need to rezoned. In view of the direct and indirect impact the overall impact would be SEVERE.

SR25 : Ngau Chi Wan Nunnery

Population : not known
Direct Impact : The site would need to be resumed assuming that the flyover were built before redevelopment of the village.
Indirect Impact: This site is currently occupied by a nunnery situated on private land. The site is zoned for residential development on the VLP. In view of the direct impact on the site and the incompatibility of the existing and future land uses with the road the overall impact is SEVERE.

SR26 : Ngau Chi Wan Village North

Population : not known
Direct Impact : none

Indirect Impact : This site is located on the northern part of Ngau Chi Wan Village and is occupied by temporary residential structures. The site is zoned for redevelopment with R1 developments being shown on the VLP. In view of the incompatibility of both the existing and future land uses with the flyover the overall impact would be SEVERE.

SR27 : Hammer Hill

Population : not applicable
Direct Impact : none
Indirect Impact : LOW impact.

SR28 : Pak Fung House : Choi Wan Estate

Population : 2200
Direct Impact : none
Indirect Impact: The site is zoned to remain as a residential use. In view of the moderate proximity of the block from the road the overall impact would be MODERATE.

SR29 : Planned FSD Quarters

Population : 2900
Direct Impact : none
Indirect Impact : The site is currently occupied by temporary residential structures. The site is zoned for redevelopment and use as a FSD residential quarters. The proposed use is generally incompatible with the flyover but in view of the distance between the road and the quarters the overall impact would only be MODERATE.

E3 - Option C
Detailed Assessment of the Impact on Each Relevant Sensitive Receiver

SR1 : Hung Kgok and Kam Hon House, Choi Hung Estate

Population : 310
Direct Impact : none
Indirect Impact : The impact would be less on Kam Hon house than for routes A and B, however in view of the permanent use of the site as a public housing estate, the size of population and the close proximity of the flyover, the overall impact would also be SEVERE.

SR2 : Tan Fung House, Choi Hung Estate

Population : 1600
Direct Impact: none
Indirect Impact: In view of the routing of the flyover away from this block the impact would LOW.

SR3 : UC Ngau Chi Wan Complex

Population : not applicable
Direct Impact: none
Indirect Impact : In view of the distance between the road and the complex the impact would be LOW.

SR4 : Ping Shek Estate

Population : 450
Direct Impact: none
Indirect Impact: In view of the distance between the estate and the flyover the impact would be LOW.

SR5 : Ping Shek Catholic Primary School

Population : 360
Direct Impact: none
Indirect Impact: The site is zoned to continue to be used as a school site. Despite the land use conflict between the school and the road, in view of the moderate to distant proximity, the impact would be MODERATE.

SR6 : Yan Kau School

As SR5.

SR7 : St Joseph Primary School

As SR5.

SR8 and SR9 : Ping Shek Temporary Housing Area

Population : not known
Direct Impact: none
Indirect Impact: In view of the future clearance of the THA the impact would be LOW.

SR10 : Sau Man House, Choi Wan Estate

Population : 2200
Direct Impact: none
Indirect Impact: The site is zoned to remain in residential use. In view of the moderate proximity of the block from the road and the relatively high elevation of the block above the road the overall impact would be LOW.

SR11 : Choi Wan St Josephs Primary School

Population : not known
Direct Impact: none
Indirect Impact: The site is zoned to continue to be used as a school site. In view of the land use conflict between the school and the road, and the close proximity the impact would be SEVERE.

SR12 to SR16 : St Josephs Home for the Aged

Population : 170
Direct Impact: none
Indirect Impact: The site is zoned to remain as a GIC site. In view of the incompatibility of the Home next to the road and the direct proximity of the road the impact would be SEVERE.

SR17 to SR19 : Bayview Gardens

Population : 2910
Direct Impact: none
Indirect Impact : The site is zoned to remain as a R1 development. In view of the close proximity of the road to the residential blocks and the high elevation of the road the impact would be SEVERE.

SR20 : Hung Sean Chau college

Population : Not known
Direct Impact : none
Indirect Impact: In view of the moderate distance between the road and the school the overall impact would be MODERATE.

SR21 : UC Hammer Hill Sports Complex

Population : not applicable
Direct Impact : The route would require the resumption of the existing grass football pitch.
Indirect Impact: The site is zoned to remain as a GIC use. In view of the direct impact on the complex and the close proximity of the road to the stadium, the relative lack of sensitivity of use, the overall impact would be MODERATE.

SR22 : Proposed UC Hammer Hill Leisure Pool Complex

Population : not relevant
Direct Impact : none
Indirect Impact : The site is zoned for GIC uses and will be developed as a leisure pool complex. The flyover would run along the southern and south eastern boundary of the complex. Despite the proximity of the route, in view of the type of receiver the impact would be MODERATE.

SR23 : Ngau Chi Wan Village : South of Lung Chi Path

Population : 190
Direct Impact : None
Indirect impact : In view of the distance of the route from the village the overall impact would be LOW.

SR24 : Ngau Chi Wan Village : North of Lung Chi Path

Population : 800
Direct Impact : None
Indirect impact : The village currently comprises a mixture of temporary and permanent residential dwellings with commercial and industrial uses to the west. The entire area is zoned for redevelopment with a mixture of future residential (R1), commercial / residential, GIC, road, open space and amenity uses. The worst case scenario would result from the close proximity of the route to the proposed residential uses zoned in the northern section of the village and therefore the overall impact is considered to be will SEVERE.

SR25 : Ngau Chi Wan Nunnery

Population : Not known
Direct Impact : None
Indirect impact : In view of the distance between the route and this land use the impact would be MODERATE.

SR26 : Ngau Chi Wan Village

Population : Not known
Direct Impact : None
Indirect impact : As 24

SR27 : Hammer Hill

Population : not applicable
Direct Impact : The route would occupy a 20-25 metre wide corridor of land across the hillside with substantially larger areas affected as a result of the cut and fill platforms proposed as a part of this option.
Indirect Impact : The route is incompatible with the green belt zoning of the land and therefore would result in a SEVERE impact

SR28 : Pak Fung House : Choi Wan Estate

Population : 2200
Direct Impact : none
Indirect Impact: The site is zoned to remain as a residential use. Despite the high elevation of the block above the road, in view of the close proximity of the block to the road the overall impact would be MODERATE.

SR29 : Planned FSD Quarters

Population : 2900
Direct Impact : none
Indirect Impact : The site is currently occupied by temporary residential structures. The site is zoned for redevelopment and use as a FSD residential quarters. The proposed use is generally incompatible with the flyover and in view of the close proximity and elevation of the road the overall impact would be SEVERE.

Table E1
Land Use Impact Assessment
Route Option A

Sensitive Receivers	Existing Use	Popula-tion	Impact on Site	Land Ownership	Future Use	Degree of Impact (Construction Phase)	Degree of Impact (Operational Phase)	Ability to Mitigate (Cons-truction Stage)	Ability to Mitigate (Opera-tional Stage)	Degree of Impact (Overall)
SR1	Residential	310	No	GL	Residential	3	3	1	1	2
SR2	Residential	1600	No	GL	Residential	2	2	1	1	1/2
SR3	G/IC	–	No	GL	G/IC	3	2	1	1	2
SR4	Residential	450	No	GL	Residential	2	2	1	1	1/2
SR5	G/IC School	–	No	GL	G/IC	3	3	1	1	2
SR6	G/IC	–	No	GL	G/IC	3	3	1	1	2
SR7	G/IC	–	No	GL	G/IC	3	3	1	1	2
SR8] SR9]	Residential	–	No	GL	Residential	1	1	1	1	1
SR10	Residential	2200	No	GL	Residential	1	1	1	1	1
SR11	G/IC School	–	No	GL	G/IC	3	3	1	1	2
SR12] SR13] SR14] SR15] SR16]	G/IC	170	Partial	PL	G/IC	3	3	1	2	2/3
SR17] SR18] SR19]	Residential	967	No	PL	Residential	1	1	1	1	1
SR20	G/IC School	–	No	GL	G/IC	1	1	1	1	1
SR21	G/IC Recreation	–	No	GL	G/IC	1	1	1	1	1
SR22	Recreation	–	No	GL	G/IC	2	2	1	2	2
SR23	Residential	190	Yes	PL	Residential	3	3	1	1	2
SR24	Village	{800	Partial	GL	Residential	3	3	1	2	2/3
SR25	G/IC	{800	Yes	PL	G/IC	3	3	1	2	2/3
SR26	Village	{800	No	GL	Road	3	3	1	2	2/3
SR27	Green Belt	–	No	GL	Green Belt	1	1	1	1	1
SR28	Residential	2200	No	GL	Residential	2	2	1	1	1/2
SR29	Village	(as SR24)	No	GL	Residential	2	2	1	2	2
Overall						3	2/3	1	1	2
						1 Low 2 Moderate 3 Severe		1 Good 2 Moderate 3 Poor		1 Low 2 Moderate 3 Severe

Table E2
Land Use Impact Assessment
Route Option B

Sensitive Receivers	Existing Use	Popula-tion	Impact on Site	Land Ownership	Future Use	Degree of Impact (Construction Phase)	Degree of Impact (Operational Phase)	Ability to Mitigate (Cons-truction Stage)	Ability to Mitigate (Opera-tional Stage)	Degree of Impact (Overall)
SR1	Residential	310	No	GL	Residential	3	3	1	1	2
SR2	Residential	1600	No	GL	Residential	2	2	1	1	1/2
SR3	G/IC	–	No	GL	G/IC	2	1	1	1	1
SR4	Residential	450	No	GL	Residential	2	2	1	1	1/2
SR5	G/IC School	–	No	GL	G/IC	3	3	1	1	2
SR6	G/IC	–	No	GL	G/IC	3	3	1	1	2
SR7	G/IC	–	No	GL	G/IC	3	3	1	1	2
SR8] SR9]	Residential	–	No	GL	Residential	1	1	1	1	1
SR10	Residential	2200	No	GL	Residential	1	1	1	1	1
SR11	G/IC School	–	No	GL	G/IC	3	3	1	2	2/3
SR12] SR13] SR14] SR15] SR16]	G/IC	170	Partial	PL	G/IC	3	3	1	2	2/3
SR17] SR18] SR19]	Residential	967	No	PL	Residential	1	1	1	1	1
SR20	G/IC School	–	No	GL	G/IC	1	1	1	1	1
SR21	G/IC Recreation	–	No	GL	G/IC	1	1	1	1	1
SR22	Recreation	–	No	GL	G/IC	2	2	1	2	2
SR23	Residential	190	Yes	PL	Residential	3	3	1	1	2
SR24	Village	{800	Partial	GL	Residential	3	3	1	2	2/3
SR25	G/IC	{800	Yes	PL	G/IC	3	3	1	2	2/3
SR26	Village	{800	No	GL	Road	3	3	1	2	2/3
SR27	Green Belt	–	No	GL	Green Belt	1	1	1	1	1
SR28	Residential	2200	No	GL	Residential	2	2	1	2	2
SR29	Village	(as SR24)	No	GL	Residential	2	2	1	1	1/2
Overall						3	2/3	1	1	2
						1 Low 2 Moderate 3 Severe		1 Good 2 Moderate 3 Poor		1 Low 2 Moderate 3 Severe

Table E3

Land Use Impact Assessment

Route Option C

Sensitive Receivers	Existing Use	Popula-tion	Impact on Site	Land Ownership	Future Use	Degree of Impact (Construction Phase)	Degree of Impact (Operational Phase)	Ability to Mitigate (Cons-truction Stage)	Ability to Mitigate (Opera-tional Stage)	Degree of Impact (Overall)
SR1	Residential	310	No	GL	Residential	3	3	1	1	2
SR2	Residential	1600	No	GL	Residential	1	1	1	1	1
SR3	G/IC	–	No	GL	G/IC	1	1	1	2	1
SR4	Residential	450	No	GL	Residential	2	1	1	2	1/2
SR5	G/IC School	–	No	GL	G/IC	2	2	1	2	2
SR6	G/IC	–	No	GL	G/IC	2	2	1	2	2
SR7	G/IC	–	No	GL	G/IC	2	2	1	2	2
SR8] SR9]	Residential	–	No	GL	Residential	1	1	1	1	1
SR10	Residential	2200	No	GL	Residential	1	1	1	2	1
SR11	G/IC School	–	No	GL	G/IC	3	3	1	1	2
SR12] SR13] SR14] SR15] SR16]	G/IC	170	Partial	PL	G/IC	3	3	1	2	2/3
SR17] SR18] SR19]	Residential	967	No	PL	Residential	3	3	1	2	2/3
SR20	G/IC School	–	No	GL	G/IC	1	1	1	1	1
SR21	G/IC Recreation	–	No	GL	G/IC	2	2	1	2	2
SR22	Recreation	–	No	GL	G/IC	3	2	1	2	2
SR23	Residential	190	Yes	PL	Residential	1	1	1	1	1
SR24	Village	{800	Partial	GL	Residential	3	3	1	2	2/3
SR25	G/IC	{800	Yes	PL	G/IC	3	3	1	2	2/3
SR26	Village	{800	No	GL	Road	3	3	1	2	2/3
SR27	Green Belt	–	No	GL	Green Belt	3	3	1	2	2/3
SR28	Residential	2200	No	GL	Residential	2	2	1	1	1/2
SR29	Village	(as SR24)	No	GL	Residential	3	3	1	2	2/3
Overall						3	2/3	1	2	2
						1 Low 2 Moderate 3 Severe		1 Good 2 Moderate 3 Poor		1 Low 2 Moderate 3 Severe

APPENDIX F - VISUAL IMPACT ASSESSMENT OPERATIONAL STAGE

F1 - Option A
Detailed Assessment of the Impact on Each Relevant Sensitive Receiver

SR1 : Hung Ngok and Kam Hon House : Choi Hung Estate

Sensitive Receivers : Residents of Hung Ngok House with north facing facades. Estimated population: 1,360.

Planning Prognosis : Permanent.

Extent and Proximity : The western end of the flyover passes within 20 metres of the block, at grade, and rises to 8 metres elevation above ground level at a distance of 60 metres. From elevated positions, the flyover would also be visible, at an increasingly oblique angle of view, as it passes through Ngau Chi Wan Village.

Context of View : Existing : View dominated by existing Lung Cheung Road Corridor, adjacent squatter site and an open storage/car park area. The Hammer Hill Sports complex and Bayview Gardens dominate the middle distance views with Hammer Hill beyond.

Planned : View will remain dominated by existing Lung Cheung Road Corridor. The existing car park area will be developed as an outdoor leisure pool complex. The squatter area will be cleared and redeveloped.

Overall Impact : SEVERE at low levels particularly from the western end of the block. Moderate impact elsewhere.

SR2 : Tan Fung House, Choi Hung Estate

Sensitive Receivers : Residents of Tan Fung House with north facing facades. Estimated population: 1,360.

Planning Prognosis : Permanent.

Extent and Proximity: Full view of entire route from high level floors except where screened by the existing high-rise buildings at the junction of Clear Water Bay and Lung Cheung Roads. The flyover would be viewed at a distance of 100m, at its closest point, where it would be seen at a level of 10.0m above ground, ie. just above the roof level of the existing village housing.

Context of View : Existing : The existing context is dominated by a foreground view of the Lung Cheung Road corridor, and the village area beyond.

Planned : The existing road corridor and southern village area will remain largely unchanged. The northern village area will be cleared and redeveloped.

Overall Impact : LOW : Resulting from moderate proximity and existing and planned urban context of view.

SR3 : Ngau Chi Wan Market Complex

Sensitive Receivers : a) Users of the library.
b) Users of rooftop play area.

Planning Prognosis : Permanent.

Extent and Proximity : a) Extensive overview of flyover including immediate views as flyover passing within 12 metres at an elevation of 12 metres above ground level.

b) Immediate view of flyover within 12 metres at an elevation of 12 metres above ground level.

Context of View : Existing : Roofscape of village and Home for the Aged with a dense canopy of trees in the foreground and a hillside backdrop.

Planned : Existing village roofscape, north of Lung Chi Path, would be replaced by largely high-rise development. Views of the Home for the Aged would remain unchanged. Backdrop of Hammer Hill would tend to become obscured by high rise residential and commercial developments.

Overall Impact : SEVERE : Despite the small population affected, the immediate proximity of the flyover would result in a SEVERE impact.

SR4 : Ping Shek Estate

Sensitive Receivers : Residents with north/north easterly facing facades (above 15 floors in height where low level blocks exist between the viewer and the flyover). Estimated total affected population : 1,740.

Planning Prognosis : Permanent.

Extent of Proximity : Viewpoints can be subdivided into residents living in low and high rise blocks. From high rise locations, the flyover would be openly visible except where screened by the existing high rise building at the junction of Clear Water Bay and Lung Cheung Roads. The most dominant section of the road would be its eastern half, to the east of Ngau Chi Wan Market Complex. Views from low rise blocks would be limited to oblique views of the eastern section of the flyover.

Context of View : Existing : Largely urban character dominated by a foreground of the Lung Cheung Road/Clear Water Bay Road corridor. Middle distance views are dominated by high-rise developments at the junction of Clear Water Bay and Lung Cheung Road, the Home for the Aged and Ngau Chi Wan Village and Hammer Hill beyond.

Planned : Visual impact of existing road corridor likely to worsen as a result of the construction of a proposed ramped access to a proposed transport interchange. Middle distance views of Ngau Chi Wan Village to change as the northern section of the village is cleared and redeveloped. Some low level views of the flyover would be obscured by the new multi-storey Transport Interchange resulting from the distance of the view and the urban context, both existing and planned.

Overall Impact : LOW : In view of the distance of the view and urban context.

SR8 and SR9 : Ping Shek Temporary Housing Area

The flyover would not be visible from this location and therefore the impact would be LOW.

SR10 : Sau Man House, Choi Wan Estate

Sensitive Receivers : Residents with west facing views. Estimated population : 400

Planning Prognosis : Permanent.

Extent and Proximity : The entire flyover is likely to be visible with the eastern portion (up to the USD market) being the most visually dominant section. The flyover will be viewed from a high level. Immediate views of eastern at grade section of the flyover at a proximity of 20 metres.

Context of View : Existing : Existing views enjoy a wide panorama encompassing the entire study area.

Planned : Views will become more urban as the Ngau Chi Wan village area is cleared and high rise developments constructed.

Overall Impact : LOW : The flyover will largely follow the alignment of Clear Water Bay Road in its eastern-most section. Views of the structure will mostly be distant and from high levels.

SR11 : St Joseph's Primary School

Sensitive Receivers : Occupants of school. Estimated population : 240.

Planning Prognosis : Permanent.

Extent and Proximity : Extent of view limited to extreme eastern end of flyover where it joins Clear Water Bay Road. Immediate views at distance of 18 metres at an elevation of 13 metres above ground level.

Context of View : Existing : At present, the school overlooks the wooded slopes to the south of the road.

Planned : as existing.

Overall Impact : MODERATE : The flyover will largely follow the alignment of Clear Water Bay Road and therefore there will only be a moderate impact.

SR12 to SR16 : St Josephs Home for the Aged

Sensitive Receivers : Residents and staff residential. Estimated population : 170.

Planning Prognosis : Permanent.

Extent and Proximity : The flyover passes within a distance of 40 metres from the nearest south facing facade and at an elevation of 12 metres above ground level. The flyover passes

SR5 : Ping Shek Estate Catholic Primary School

Sensitive Receivers : Occupants of the school. Estimated population : 360.

Planning Prognosis : Permanent.

Extent and Proximity : The flyover would be visible at close proximity along its length between the Ngau Chi Wan market complex and its junction with Clear Water bay Road. Views of the flyover at a minimum distance of 20 metres and an elevation of 12 metres above ground level.

Context of View : Existing : Existing view dominated by Clear Water Bay Road, trees are visible on the north side of the road.

Planned : As existing.

Overall Impact : The proximity and elevation of the flyover would tend to exert a severe impact on the school. The flyover would aggravate the existing visual context (of Clear Water Bay Road) and result in loss of trees within the Home for the Aged which currently 'green' existing views. The overall impact is SEVERE.

SR6 : Yan Kau School

Sensitive Receivers : Occupants of school. Estimated population : 240.

Planning Prognosis : Permanent.

Extent and Proximity : As SR5 but with more distant viewpoint.

Context of View : Existing : As SR5.

Planned : As SR5.

Overall Impact : Low : SEVERE as SR5.

SR7 : St Joseph's Primary School

Sensitive Receivers : Occupants of school. Estimated population : 360.

Planning Prognosis : Permanent.

Extent and Proximity : As SR5 but with more distant viewpoint.

Context of View : Existing : As SR5.

Planned : As SR5.

Overall Impact : SEVERE : As SR5.

directly through the gate house of the home and is therefore highly visible at the frontage of the Home.

Context of View : Existing : The flyover would be seen in the context of the existing walled and heavily wooded grounds. The environs of the existing grounds would be severely impacted.

Planned : As existing.

Overall Impact : Despite the close proximity of the flyover, the screening effect of retained trees and the small population affected result in an overall MODERATE impact.

SR17 to SR19 : Bay View Gardens

Sensitive Receivers : a) Residents of south-western facades of all 3 tower blocks.
b) Residents of south-east facing facades of 2 tower blocks.

Estimated total affected population : 960.

Planning Prognosis : Permanent.

Extent and Proximity : a) Extent of view from south-west facing facades limited to western section of route. The flyover would be viewed from an elevated position at a distance of 85 metres to the nearest tower block.

b) The central and eastern sections of the flyover would be visible from this location. The flyover would be clearly visible above the roof level of the adjoining village buildings.

Context of View : Existing :
a) The flyover would be viewed in the context of the Lung Cheung Road flyover, Choi Hung Estate and squatter development in the foreground.

b) Predominantly urban including Ngau Chi Wan Village and Ping Shek Estate in the distance.

Planned :
a) The existing temporary structures would be cleared and redeveloped.

b) Increasingly urban context with clearance of village and build up of new high rise residential and commercial developments resulting in screening of the flyover.

Overall Impact : LOW : resulting from the distance and elevation of the view, its urban context and planned development.

SR20 : Hung Sean Chau College

The flyover would only be visible at great distance and from an oblique angle of vision and therefore the overall impact would be LOW.

SR21 : Hammer Hill Sports Complex

Sensitive Receivers : Users of sports complex.

Planning Prognosis : Permanent.

Extent and Proximity: The western portion of the flyover would be visible mainly from the rear of the tiered spectator stand on the west side of the stadium and from the grass football pitch.

Context of View : Existing : The flyover would be viewed in the context of the existing carpark, Lung Cheung Road corridor and Ngau Chi Wan village flanked by Bayview Gardens and Choi Hung Estate.

Planned : The existing carpark would be developed as a Leisure Pool Complex and the temporary structures would be cleared for development.

Overall Impact : LOW : In view of the lack of sensitivity of the viewers, the distance and context of view.

SR22 : Hammer Hill Leisure Pool Complex

Sensitive Receivers : Users of proposed swimming pool complex.

Planning Prognosis : Proposed permanent development.

Extent and Proximity : The ramped western end of the flyover would be visible within 20 metres of the complex.

Context of View : Existing : The flyover would be viewed in the context of the Lung Cheung Road corridor backed by Choi Hung Estate.

Planned : As existing.

Overall Impact : LOW : resulting from the elevation of road in relation to complex, its alignment with the existing Lung Cheung Road and the urban context of the view (existing and planned).

SR23 : Ngau Chi Wan Village : South of Lung Chi Path

Sensitive Receivers : Residents and commercial users with north facing facades. Estimated population : 200.

Planning Prognosis : Permanent.

Extent and Proximity : Immediate views of flyover passing at a distance of 6 metres to the nearest facade and at an elevation of 12 metres above ground level.

Context of View : Existing : Low rise low density village environment.

Planned : Redeveloped village area with mixed residential commercial development.

Overall Impact : SEVERE : In view of close proximity of flyover.

SR24 to SR26 : Ngau Chi Wan Village, North of Lung Chi Path

Sensitive Receivers : Residents of village houses and temporary structures with south facing facades. Estimated affected population : 500.

Planning Prognosis : The village would be cleared and redeveloped in accordance with the Village Layout Plan.

Extent and Proximity : The flyover would run along the northern edge of Lung Chi Path requiring demolition of houses along its path. Views from structures to the north of the road would be visually dominated by the overhead structure. This impact would be less severe on views from structures located in the northern sections of the village due to screening of intervening buildings.

Context of View : Existing : The flyover would be seen in the context of the existing low rise village housing to the south of Lung Chi Path.

Planned : Redeveloped village area with mixed residential commercial development to north of Lung Chi Path. Existing village houses to south.

Overall Impact : SEVERE : Severe impact on demolished properties and on viewers immediately adjacent to the road. Moderate impact on northern sections of the village.

SR27 : Hammer Hill

Sensitive Receivers : Walkers using footpaths on Hammer Hill.

Planning Prognosis : Permanent.

Extent and Proximity : The entire flyover would be visible at a distance of around 100-300m except where screened by Bay View Gardens.

Context of View : Existing : The flyover would be seen in the context of Ngau Chi Wan Village, Lung Cheung Road and Clear Water Bay Road corridor, with Choi Hung and Ping Shek Estates to the rear.

Planned : The context would become more urban as a result of redevelopment of Ngau Chi Wan village and the flyover would tend to be less visible as a result of screening by new high rise developments in the redeveloped village area.

Overall Impact : LOW : Due to the distance of the viewer, small population and urban context, particularly planned.

SR28 : Pak Fung House, Choi Wan Estate

Sensitive Receivers : Residents with west facing views. Estimated population : 550.

Planning Prognosis : Permanent.

Extent and Proximity : The eastern section of flyover would be seen from elevated positions at an approximate distance of 60 metres.

Context of View : Existing : The flyover would be seen predominantly in the context of the Clear Water Bay Road. Views of the western section of the road within Ngau Chi Wan Village would be less apparent.

Planned : The existing visual context would be affected by the construction of the proposed multi-storey transport terminus and associated ramps.

Overall Impact : LOW : Resulting from the elevation of the viewer and the urban context of the view (existing and planned).

SR29 : Planned FSD Quarters

Sensitive Receivers : Residents with south facing views. Estimated Population : 1450.

Planning Prognosis : Proposed permanent development.

Extent and Proximity : The central section of the flyover would be clearly visible from elevated view points and at a closest approximate proximity of 70m.

Context of View : Existing : Not relevant.

Planned : The road would be viewed in the context of the proposed GIC and open space developments planned to the north of Lung Chi Path and the existing village houses to the south.

Overall Impact : MODERATE : In view of the elevated viewpoint and urban context.

F2 - Option B
Detailed Assessment of the Impact on Each Relevant Sensitive Receiver

SR1 : Hung Ngok and Kam Hon House, Choi Hung Estate

Sensitive Receivers : Residents of Hung Ngok House with north facing facades. Estimated population : 1,360.

Planning Prognosis : Permanent.

Extent and Proximity : The western end of the flyover passes within 20 metres of the block, at grade, and rises to 8 metres elevation above ground level at a distance of 60 metres. From elevated positions, the flyover would also be visible, at an increasingly oblique angle of view, as it passes through Ngau Chi Wan Village.

Context of View : Existing : View dominated by existing Lung Cheung Road Corridor, adjacent squatter site and an open storage/car park area. The Hammer Hill Sports complex and Bayview Gardens dominate the middle distance views with Hammer Hill beyond.

Planned : View will remain dominated by existing Lung Cheung Road Corridor. The existing car park area will be developed as an outdoor leisure pool complex. The squatter area will be cleared and redeveloped.

Overall Impact : SEVERE at low levels particularly from the western end of the block. MODERATE elsewhere.

SR2 : Tang Fung House, Choi Hung Estate

Sensitive Receivers : Residents of Tan Fung House with north facing facades. Estimated population : 1,360.

Planning Prognosis : Permanent.

Extent and Proximity : Full view of entire route from high level floors except where screened by the existing highrise buildings at the junction of Clear Water Bay and Lung Cheung Roads. The flyover would be viewed at a distance of 100m, at its closest point, where it would be seen at a level of 10.0m above ground, ie. just above the roof level of the existing village housing.

Context of View : Existing : The existing context is dominated by a foreground view of the Lung Cheung Road corridor, and the village area beyond.

Planned : The existing road corridor and southern village area will remain largely unchanged. The northern village area will be cleared and redeveloped.

Overall Impact : LOW : Resulting from moderate proximity and existing and planned urban context of view.

SR3 : Ngau Chi Wan Market Complex

Sensitive Receivers : a) Users of library.
b) Users of rooftop play area.

Planning Prognosis : Permanent.

Extent and Proximity : a) Extensive overview of flyover including immediate views as flyover passes within 80 metres at an elevations of 9-13 metres.
b) More immediate lower level views of flyover, although obscured by existing vegetation to an extent.

Context of View : Existing : Roofscape of village and Home for the Aged with a dense canopy of trees in the foreground and a hillside backdrop.

Planned : Existing village roofscape, north of Lung Chi Path, would be replaced by largely high-rise development. Views of the Home for the Aged would remain unchanged. Backdrop of Hammer Hill would tend to become obscured by high rise residential and commercial developments.

Overall Impact : Despite small populations affected, the close proximity of the view will result in a MODERATE impact.

SR4 : Ping Shek Estate

Sensitive Receivers : Residents with north/north easterly facing facades (above 15 floors in height where low level blocks exist between the viewer and the flyover). Estimated total sensitive population : 1,740.

Planning Prognosis : Permanent.

Extent and Proximity : Viewpoints can be subdivided into residents living in low and high rise blocks. From high rise locations, the flyover would be openly visible except where screened by the existing high rise building at the junction of Clear Water Bay and Lung Cheung Roads. The most dominant section of the road would be its eastern half, to the east of Ngau Chi Wan Market Complex. Views from low rise blocks would be limited to oblique views of the eastern section of the flyover.

Context of View : Existing : Largely urban character dominated by a foreground of the Lung Cheung Road/Clear Water Bay Road corridor. Middle distance views are dominated by high-rise developments at the junction of Clear Water Bay and Lung Cheung Road, the Home for the Aged and Ngau Chi Wan Village and Hammer Hill beyond.

Planned : Visual impact of existing road corridor likely to worsen as a result of the construction of a proposed ramped access to a proposed transport interchange. Middle distance views of Ngau Chi Wan Village to change as the northern section of the village is cleared and redeveloped. Some low level views of the flyover would be obscured by the new multi-storey Transport Interchange resulting from the distance of the view and the urban context, both existing and planned.

Overall Impact : LOW : In view of the distance of the view and the urban context.

SR5 : Ping Shek Estate Catholic Primary School

Sensitive Receivers : Occupants of school. Estimated population : 360.

Planning Prognosis : Permanent.

Extent and Proximity : The flyover would be visible at a proximity of 40m along its length from St Jospehs Home for The Aged to its junction with Clear Water Bay Road.

Context of View : Existing : Existing view dominated by Clear Water Bay Road, trees are visible on the north side of the road.

Planned : As existing.

Overall Impact : MODERATE : In view of the proximity of the view and screening of the road by trees in the Home For The Aged.

SR6 : Yan Kan School

Sensitive Receivers : Occupants of school. Estimated Population : 240.

Planning Prognosis : Permanent.

Extent and Proximity : As SR5.

Context of View : Existing : As SR5.
Planned : As SR5.

Overall Impact : MODERATE : In view of the distance of view and context of Clear Water Bay Road.

SR7 : St Joseph's Primary School

Sensitive Receivers : Occupants of school. Estimated population : 360.

Planning Prognosis : Permanent.

Extent and Proximity : As SR5.

Context of View : Existing : As SR5.
Planned : As SR5.

Overall Impact : MODERATE : In view of distance of view and context of Clear Water Bay Road.

SR8 and SR9 : Ping Shek Temporary Housing Area

The flyover would not be visible from this location and therefore the impact would be LOW.

SR10 : Sau Man House, Choi Wan Estate

Sensitive Receivers : Residents with south western facing views. Estimated population : 400.

Planning Prognosis : Permanent.

Extent and Proximity : The entire flyover is likely to be visible with the eastern portion (up to the USD market) being the most visually dominant section. The flyover will be viewed from a high level. Immediate views of eastern at grade section of the flyover at a proximity of 20 metres.

Context of View : Existing : Existing views enjoy a wide panorama encompassing the entire study area.

Planned : Views will become more urban as the Ngau Chi Wan village area is cleared and high rise developments constructed.

Overall Impact : LOW : In view of the distance and elevation of the viewpoints.

SR11 : St Joseph's Primary School

Sensitive Receivers : Occupants of school. Estimated population : 240.

Planning Prognosis : Permanent.

Extent and Proximity : Extent of view limited to eastern end of flyover where it joins Clear Water Bay Road. Immediate position views from elevated at distance of 18 metres.

Context of View : Existing : At present, the main elevation of the school overlooks the wooded slopes to the south of Clear Water Bay Road.

Planned : As existing.

Overall Impact : MODERATE : The flyover will follow the alignment of Clear Water Bay Road and will therefore there exert a moderate impact.

SR12 to SR16 : St Joseph's Home for the Aged

Sensitive Receivers : Residents and residential staff. Estimated population 170.

Planning Prognosis : Permanent.

Extent and Proximity : a) Immediate views to south facing facades, as flyover passes at a distance of 2 metres to nearest building at an elevation of 12 metres above ground level.

b) Slightly greater extent of view of flyover possible from the south-east and south-west facing facades.

Context of View :

a) Existing
Flyover route as it passes through the grounds will dramatically affect the predominantly rural context of view from an identified sensitive receivers. The impact being reduced only slightly from south-eastern facades where the background context of view is urban.

b) Planned
Context of views from south western facades will become urbanized by view developments.

Overall Impact : The impact from the close proximity of the view and its predominantly rural context result in a SEVERE overall impact.

SR17 to SR19 : Bayview Gardens

Sensitive Receivers :

a) Residents of south-western facades of all 3 tower blocks.
b) Residents of south-east facing facades of 2 tower blocks.

Estimated total affected population : 960.

Planning Prognosis : Permanent.

Extent and Proximity :

a) Extent of view from south-west facing facades limited to western section of route. The flyover would be viewed from an elevated position at a distance of 85 metres to the nearest tower block.

b) The central and eastern sections of the flyover would be visible from this location. The flyover would be clearly visible above the roof level of the adjoining village buildings.

Context of View :

Existing :
a) The flyover would be viewed in the context of the Lung Cheung Road flyover, Choi Hung Estate and squatter development in the foreground.

b) Predominantly urban including Ngau Chi Wan Village and Ping Shek Estate in the distance.

Planned :
a) The existing temporary structures would be cleared and redeveloped.

b) Increasingly urban context with clearance of village and build up of new high rise residential and commercial developments resulting in screening of the flyover.

Overall Impact : LOW : resulting from the distance and elevation of the view, its urban context and planned development.

SR20 : Hung Sean Chau College

The flyover would only be visible at great distance and from an oblique angle of vision and therefore the overall impact would be LOW.

SR21 : Hammer Hill Sports Complex

Sensitive Receivers : Users of sports complex.

Planning Prognosis : Permanent.

Extent and Proximity : The western portion of the flyover would be visible mainly from the rear of the tiered spectator stand on the west side of the stadium and from the grass football pitch.

Context of View : Existing : The flyover would be viewed in the context of the existing carpark, Lung Cheung Road corridor and Ngau Chi Wan village flanked by Bayview Gardens and Choi Hung Estate.

Planned : The existing carpark would be developed as a Leisure Pool Complex and the temporary structures would be cleared for development.

Overall Impact : LOW : In view of the lack of sensitivity of the viewers, the distance and context of view.

SR22 : Hammer Hill Leisure Pool Complex

Sensitive Receivers : Users of proposed leisure pool complex.

Planning Prognosis : Proposed permanent development.

Extent and Proximity : The ramped western end of the flyover would be visible within 20 metres of the complex.

Context of View : Existing : The flyover would be viewed in the context of the Lung Cheung Road corridor backed by Choi Hung Estate.

Planned : As existing.

Overall Impact : LOW - resulting from the elevation of road, its alignment with the existing Lung Cheung Road and the urban context of the view (existing and planned).

SR23 : Ngau Chi Wan Village : South of Lung Chi Path

Sensitive Receivers : Residents and commercial users with north facing facades. Estimated population : 200.

Planning Prognosis : Permanent.

Extent and Proximity : Immediate views as flyover passes at a distance of 6-20 metres to the

nearest facade and at an elevation of 12 metres above ground level.

Context of View : Existing : Low-rise, low density village environment.

Planned : Redeveloped village area with mixed residential commercial development.

Overall Impact : SEVERE : In view of close proximity of flyover.

SR24 to SR26 : Ngau Chi Wan Village : North of Lung Chi Path

Sensitive Receivers : Residents of village houses and temporary structures with south facing facades. Estimated total population : 500.

Planning Prognosis : The village would be cleared and redeveloped in accordance with the village layout plan.

Extent and Proximity : The flyover would run diagonally through the village requiring demolition of houses along its path. Views from the north of the road would be dominated by the overhead structure. The impact would be less severe on views from viewpoints in the northern sections of the village due to screening of intervening buildings.

Context of View : Existing : The flyover would be seen in the context of the existing low rise village housing to the south of Lung Chi Path.

Planned : Redeveloped village area with mixed residential commercial development to north of Lung Chi Path. Existing village houses to south.

Overall Impact : SEVERE : Severe impact on demolished properties and on viewers immediately adjacent to the road. Moderate impact on northern sections of the village.

SR27 : Hammer Hill

Sensitive Receivers : Walkers using footpaths on Hammer Hill.

Planning Prognosis : Permanent.

Extent and Proximity : The entire flyover would be visible at a distance of around 100-300m except where screened by Bay View Gardens.

Context of View : Existing : The flyover would be seen in the context of Ngau Chi Wan Village, Lung Cheung Road and Clear Water Bay Road corridor, with Choi Hung and Ping Shek Estates to the rear.

Planned : The context would become more urban as a result of redevelopment of Ngau Chi Wan village and the flyover would tend to be less visible as a result of screening by new high rise developments in the redeveloped village area.

Overall Impact : LOW : Due to the distance of the viewer, small population and urban context, particularly planned.

SR28 : Pak Fun House, Choi Wan Estate

Sensitive Receivers : Residents with west facing views. Estimated population : 550.

Planning Prognosis : Permanent.

Extent and Proximity : The eastern section of flyover would be seen from elevated positions from an approximate closest distance of 60 metres.

Context of Views : Existing : The flyover would be seen in the relatively rural context of the Home For The Aged with Ngau Chi Wan Village beyond.

Planned : Similar.

Overall Impact : LOW : Resulting from the elevation of the viewer and the urban context of the view (existing and planned).

SR29 : Planned FSD Quarters

Sensitive Receivers : Residents with south facing views. Estimated population : 1450.

Planning Prognosis : To be permanent.

Extent and Proximity : The central section of the flyover would be clearly visible from elevated view points and at a closest approximate proximity of 60m.

Context of View : Existing : Not relevant.

Planned : The road would be viewed in the context of the proposed GIC and open space developments planned to the north of Lung Chi Path and the existing village houses to the south.

Overall Impact : MODERATE : In view of the elevated viewpoint and urban context.

F3 - Option C
Detailed Assessment of the Impact on Each Relevant Sensitive Receiver

SR1 : Hung Ngok and Kam Hon House : Choi Hung Estate

Sensitive Receivers : Residents of Hung Ngok House with north facing views. Estimated population : 1,360.

Planning Prognosis : Permanent.

Extent and Proximity : The western end of the flyover pass within 20 metres of the nearest section of the block at grade and rises as it moves eastwards away from the block. Western sections of the flyover would be visible from high levels beyond Fairview Gardens.

Context of View : Existing : View dominated by existing Lung Chung Road Corridor, adjacent car park, storage area and squatter site. The Hammer Hill Sports Complex and Bayview Gardens dominate the middle distance with a distant view of Hammer Hill.

Planned : View will remain dominated by Lung Cheung Road. The existing carpark will be developed as an outdoor leisure pool complex. The squatter area will be cleared and developed.

Overall Impact : SEVERE at low level particularly in Hung Ngok House, MODERATE elsewhere.

SR2 : Tan Fung House, Choi Hung Estate

Sensitive Receivers : Residents of Tan Fung House with north facing facades. Estimated population : 1,360.

Planning Prognosis : Permanent.

Extent and Proximity : The full extent of the flyover would be visible from higher floors but only at considerable distance.

Context of View : Existing : Predominantly urban context comprising Lung Cheung Road corridor, Ngau Chi Wan Village and Hammer Hill beyond.

Planned : Context of view to change as a result of the planned redevelopment of Ngau Chi Wan Village with high level residential and commercial developments.

Overall Impact : LOW : Low overall impact in view of the distance of the view and the planned high rise development.

SR3 : NgauChi Wan Market Complex

Sensitive Receivers : a) Users of library.
b) Users of rooftop children's play area.

Planning Prognosis : Permanent.

Extent and Proximity : a) Flyover visible from the eastern side of Bay View Gardens to the eastern side of the Home for the Aged. The flyover would be seen at an elevated position some 130 to 220 metres from the complex.

b) Limited extent of route visible. Despite distance, highly visible elevated 12-19 metres above the existing hillside.

Context of View : Existing : The flyover would be seen against the backdrop of Hammer Hill with Ngau Chi Wan Village and the Home for the Aged in the foreground.

Planned : Views of the flyover to the west of the Home for the Aged would be influenced by proposed high rise development in the village area. Views of the flyover beyond the Home for the Aged would remain unchanged.

Overall Impact : Despite the distance of the route, the overall impact would be MODERATE resulting from impact on the rural backdrop of Hammer Hill.

SR4 : Ping Shek Estate

Sensitive Receivers : Residents with north/north westerly facing facades (above 15 floors in height where low level blocks exist between the viewer and the flyover).

Estimated total affected population : 1,740.

Planning Prognosis : Permanent.

Extent and Proximity : Extensive distant view from high level floors except where screened by intervening high rise development.

Context of View : Existing : Predominantly rural backdrop of Hammer Hill with Ngau Chi Wan, the Home for the Aged and Bay View Gardens in the middle distance.

Planned : Context becoming more urbanized with redevelopment of the village area resulting in increased obstruction of the backdrop of Hammer Hill.

Overall Impact : MODERATE : Despite the distance of the view, the impact on the backdrop of Hammer Hill results in a moderate overall impact.

SR5 : Ping Shek Estate Catholic Primary School

Sensitive Receivers : Occupants of school. Estimated population 360.

Planning Prognosis : Permanent.

Extent and Proximity : Extent of view limited to oblique distant views of eastern end of the flyover.

Context of View : Existing : Flyover would be viewed beyond a foreground of Clear Water Bay Road, the Home for the Aged and an area of trees adjoining Clear Water Bay Road.

Planned : As existing.

Overall Impact : LOW : Only distance views possible.

SR6 : Yau Kan School

Sensitive Receivers : Occupants of school. Estimated population : 240.

Planning Prognosis : Permanent.

Extent and Proximity : Existing : As SR5.

Planned : As existing.

Overall Impact : LOW : As SR5.

SR7 : St Joseph's Primary School

Sensitive Receivers : Occupants of school. Estimated population : 360.

Planning Prognosis : Permanent.

Extent and Proximity : Flyover route visible from a closest distance of 40 metres.

Content of View : Existing : Clear Water Bay Road Corridor and WSD Pump House with trees behind. Cut slopes of Choi Wan Estate beyond.

Planned : As existing.

Overall Impact : MODERATE : Close proximity but in context of Clear Water Bay Road.

SR8 and SR9 : Ping Shek Temporary Housing Area

Sensitive Receivers : a) Residents of north eastern facade.
b) Estimated population : 400.

Planning Prognosis : Permanent.

Extent and Proximity : Flyover only visible at distances on lower slope of Hammer Hill.

Context of View : Existing : Hammer Hill.

Planned : As existing.

Overall Impact : LOW : Resulting from distance of view.

SR10 : Sau Man House, Choi Wan Estate

Sensitive Receivers : Residents with west facing views. Estimated population : 400.

Planning Prognosis : Permanent.

Extent and Proximity : Only the eastern portion of the flyover is likely to be visible. The flyover will be viewed from a high level. Immediate views of eastern at grade section of the flyover at a proximity of 20 metres.

Context of View : Existing : Existing views enjoy a wide panorama encompassing the entire study area. Foreground dominated by Clear Water Bay Road.

Planned : As existing.

Overall Impact : LOW : The visible section of the flyover will largely follow the alignment of Clear Water Bay Road. Views of the structure will mostly be from high levels.

SR11 : St Joseph's Primary School

Sensitive Receivers : Occupants of school. Estimated population : 240.

Planning Prognosis : Permanent.

Extent and Proximity : Extent of view limited to eastern end of flyover route. Immediate views at a distance of 16 metres at an elevation of 14 metres above ground level.

Context of View : Existing : At present the school overlooks Clear Water Bay Road to the wooded slopes to the south.

Planned : As existing.

Overall Impact : MODERATE : The flyover will largely follow the alignment of Clear Water Bay Road and will be viewed from elevated positions.

SR12 to SR16 : St Joseph's Home for the Aged

Sensitive Receivers : Residents and residential staff. Estimated population : 170.

Planning Prognosis : Permanent.

Extent and Proximity : a) Views from north facing facades : Extent of view is largely immediate as flyover passes over hillslope at elevations of 12 metres above ground level increasing to 18 metres at its closest point (20m distance) to the northern facade of the home.

b) Views from north western facing facades are more distant as the flyover passes at an elevated level over the hillside.

c) Views from eastern facades : Immediate views as flyover passes at a distance of between 18 and 50 metres from the Home, at an elevation

of 18 metres above ground level.

Context of View : Existing : Rural context from north facing facades. Largely rural context from north-west facing facades. Views of cut slopes but heavily vegetated.

Planned : North views : As existing.

West views : Increasingly urban with redevelopment of village with high level residential and commercial developments.

East views : As existing.

Overall Impact : SEVERE : resulting from the close proximity of the flyover, its elevation above the Home, the impact on the rural context and sensitivity of the receivers.

SR17 to SR19 : Bay View Gardens

Sensitive Receivers : Residents with south-west, west, north and north-east facing views. Estimated total affected population : 1,200.

Planning Prognosis : Permanent.

Description of View : Immediate views to north-east and north-west as flyover passes within 10 metres of closest facade at an elevation of 8 metres above ground level. Views from north eastern facades are more extensive as flyover passes over existing landform to rear. Degree of impact aggravated by extent of land formation required to construct this route.

Context of View : Existing : Views to west: predominantly open panorama dominated by Hammer Hill Sports Complex with carpark area and squatter camp in foreground, views to the north of the planted cut slopes above Ping Ting Road.

Views to east : View onto heavily vegetated valley and hillside. Northern sections of Ngau Chi Wan provide foreground to the east

Planned : Views to west : existing context would improve with redevelopment of carpark.

Views to east : upper hillslopes unchanged. Lower hillslopes cleared and leveled for village development.

Overall Impact : SEVERE : resulting from the very close proximity of the flyover, the large sensitive population and impact on largely rural context.

SR20 : Hung Sean Chau College

Sensitive Receivers : Students with south-west facing facades of floors above 2nd floor.

Estimated population : Not Known.

Planning Prognosis : Permanent.

Extent and Proximity : Flyover visible as it climbs up from Lung Cheung Road towards Bayview Gardens.

Context of View : Existing : The Hammer Hill Sports Complex dominates the view. Squatter development forms the middle distance to the south with the Lung Cheung Road and Choi Hung Estate to the rear.

Planned : Context of view becoming more urbanized as squatter development is cleared.

Overall Impact : LOW : Overall impact reduced to some extent by distance and angle of view and largely urban context.

SR21 : Hammer Hill Sports Complex

Sensitive Receivers : Users of sporting facilities.

Planning Prognosis : Permanent.

Extent and Proximity : The flyover would be visible from its junction with Lung Cheung Road to a point north of Bayview Gardens. The flyover would pass within 65m of the main spectator stand and over-sail an existing grass football pitch.

Context of View : Existing : The flyover would be seen with the existing car park in the foreground and Choi Hung Estate, Ngau Chi Wan and Bayview Gardens beyond.

Planned : The car park would be redeveloped a Leisure Pool Complex which would form the foreground of future views of the western end of the flyover. The western portion of Ngau Chi Wan would be redeveloped in accordance with the Village Layout Plan.

Overall Impact : MODERATE : Only moderate impact in view of the relative lack of sensitivity of the users of the complex.

SR22 : Hammer Hill Leisure Pool Complex

Sensitive Receivers : Users of proposed leisure swimming pool complex to Hammer Hill.

Planning Prognosis : Planned permanent development.

Extent and Proximity : Immediate views on flyover running along the southern boundary of the leisure pool complex. The flyover would be elevated 8m above ground level.

Context of View : Existing : Lung Cheung Road Corridor to the south with Choi Hung Estate beyond. Ngau Chi Wan squatter area and Bayview Gardens to the south-east and east respectively.

Planned : As existing.

Overall Impact : SEVERE impact in view of immediacy of views and elevation of flyover.

SR23 : Ngau Chi Wan Village : South of Lung Chi Path

Sensitive Receivers :	Residents and commercial users with north facing views. Estimated population : 200.
Planning Prognosis :	Permanent.
Extent and Proximity :	The flyover would only be visible at a distance of over 150m.
Context of View :	Existing : The flyover would be visible in the distance against the backdrop of Hammer Hill. Planned : As existing but views of the flyover would be screened by future high rise development in Ngau Chi Wan.
Overall Impact :	LOW : In view of distance of view and degree of screening at present and planned.

SR24 to SR26 : Ngau Chi Wan Village : North of Lung Chi Path

Sensitive Receivers :	Residents of village houses and temporary structures with north facing facades. Estimated total affected population : 400.
Planning Prognosis :	The village would be cleared and redeveloped in accordance with the Village Layout Plan.
Extent and Proximity :	The flyover would be visible from the main village area at a distance of around 90m. The flyover would be elevated above the village as it passes over the lower slopes of Hammer Hill. The flyover passes immediately overhead of a few temporary structures to the north-east of Bayview Gardens.
Context of View :	Existing : The flyover would be seen in an elevated alignment against the backdrop of Hammer Hill. Planned : As the village is cleared and high rise developments completed the flyover would be increasingly visible from high level north facing windows.
Overall Impact :	The impact on the existing village would be Low in view of the distance and angle of view and in view of future clearance. Impact on planned uses would tend to increase as a result of high level viewpoints. The overall impact is MODERATE.

SR27 : Hammer Hill

Sensitive Receivers :	Recreational users of Hammer Hill.
Planning Prognosis :	Zoned Green Belt : proposed as an Urban Fringe Park.
Extent and Proximity :	The flyover would be visible from footpaths with a southerly aspect. The road would cut across the lower slopes of the hill. Views would

be influenced by large areas of earthworks.

Context of View : Existing : Lower slopes of Hammer Hill. Ngau Chi Wan beyond.

Planned : As existing.

Overall Impact : The overall impact is considered MODERATE due to the confinement of disruption to the lower slopes of Hammer Hill and the largely urban context of views beyond.

SR28 : Pak Fun House, Choi Wan Estate

Sensitive Receivers : Residents with west facing views. Estimated population : 550.

Planning Prognosis : Permanent.

Extent and Proximity : Immediate views on flyover passing within 40 metres at an elevation of 17 metres above ground level.

Context of View : Existing : The flyover would be viewed predominantly in the context of the Home For The Aged, Ngau Chi Wan and Hammer Hill.

Planned : The existing view would change as the northern section of Ngau Chi Wan is developed.

Overall Impact : SEVERE: In view of proximity of road and impact on hillside.

SR29 : Planned FSD Quarters

Sensitive Receivers : Residents with north facing views. Estimated population : 1,450.

Planning Prognosis : Proposed permanent development.

Extent and Proximity : The flyover would be visible at a distance of around 50m as it passes over the lower slopes of Hammer Hill. The view would be significantly affected by the earthworks required to construct this option. Flyover to pass within 80 metres at elevations with the route predominantly in cut on the lower hillslopes of Hammer Hill, with more distant views but at higher elevations as it covers off hillside to the south-east.

Context of View : Existing : The flyover would be visible against the back drop of Hammer Hill.

Planned : As existing.

Overall Impact : SEVERE impact resulting from close proximity, size of population and elevation of road.

Table F1
Visual Impact Assessment
Route Option A

Sensitive Receivers	Type	Population (Where Relevant)	Planning Policy	Degree of Impact (Construction Phase)	Degree of Impact (Operational Phase)	Ability to Mitigate (Construction Phase)	Ability to Mitigate (Operational Phase)	Overall
SR1 Hung Ngok House and Kam Hon House	Residential	1670	Permanent	3	2/3	3	3	3
SR2 Tan Fung House	Residential	1360	Permanent	2	1	3	3	2
SR3 UC Ngau Chi Wan Complex (Library + Children Play)	Educational		Permanent	3	3	3	3	3
SR4 Ping Shek Estate	Residential	2810	Permanent	1	1	3	3	1
SR5 Ping Shek Estate Catholic Primary School	Educational	360	Permanent	3	3	3	3	3
SR6 Yan Kau School	Educational	240	Permanent	3	3	3	3	3
SR7 St John's Primary School	Educational	360	Permanent	3	3	3	3	3
SR8]Ping Shek Temporary SR9]Housing Area	Residential		To be Cleared	1	1	3	3	1
SR10Sau Man House	Residential	400	Permanent	1	1	3	3	1
SR11Choi Wan St Joseph's Primary School	Educational		Permanent	2	2	3	3	2
SR12] SR13] SR14]St Joesph SR15]Home for the Aged SR16]	Residential	170	Permanent	3	2	3	2	3
SR17] SR18]Bay View Gardens SR19]	Residential	960	Permanent	1	1	3	3	1
SR20Hung Sean Chow Memorial College	Educational		Permanent	1	1	3	3	1
SR21U.C Hammer Hill Sports Complex	Recreational		Permanent	1	1	3	3	1
SR22U.C Hammer Hill Proposed Leisure Pool Complex	Recreational		Proposed Permanent Development	1	1	3	2	1
SR23South of Lung Chi Path	Residential/Commerical	200	Permanent	3	3	3	3	3
SR24] SR25]North of Lung Chi Path SR26]	Residential	500	To be Cleared	3	2/3	3	2	3
SR27Hammer Hill	Recreactional			1	1	3	3	1
SR28Pak Fung House	Residential	550	Permanent	1	1	3	3	1
SR29Proposed F.S.D Quarters Development	Residential		Proposed Permanent Development	1	2	3	3	1/2
			Overall	2	2	3	3	2
				1 Low 2 Moderate 3 Severe		1 Good 2 Moderate 3 Poor		1 Low 2 Moderate 3 Severe

Table F2
Visual Impact Assessment
Route Option B

Sensitive Receivers	Type	Population (Where Relevant)	Planning Policy	Degree of impact (Construction Phase)	Degree of impact (Operational Phase)	Ability to Mitigate (Construction Phase)	Ability to Mitigate (Operational Phase)	Overall
SR1 Hung Ngok House and Kam Hon House	Residential	1670	Permanent	3	2/3	3	3	3
SR2 Tan Fung House	Residential	1360	Permanent	2	1	3	3	2
SR3 UC Ngau Chi Wan Complex (Library + Children Play)	Educational		Permanent	3	2	3	3	3
SR4 Ping Shek Estate	Residential	2810	Permanent	1	1	3	3	1
SR5 Ping Shek Estate Catholic Primary School	Educational	360	Permanent	3	2	3	2	3
SR6 Yan Kau School	Educational	240	Permanent	3	2	3	2	3
SR7 St John's Primary School	Educational	360	Permanent	3	2	3	2	3
SR8]Ping Shek Temporary SR9]Housing Area	Residential		To be Cleared	1	1	3	3	1
SR10Sau Man House	Residential	400	Permanent	1	1	3	3	1
SR11Choi Wan St Joseph's Primary School	Educational		Permanent	2	2	3	3	2
SR12] SR13] SR14]St Joesph SR15]Home for the Aged SR16]	Residential	170	Permanent	3	3	3	3	3
SR17] SR18]Bay View Gardens SR19]	Residential	960	Permanent	1	1	3	3	1
SR20Hung Sean Chow Memorial College	Educational		Permanent	1	1	3	3	1
SR21U.C Hammer Hill Sports Complex	Recreational		Permanent	1	1	3	3	1
SR22U.C Hammer Hill Proposed Leisure Pool Complex	Recreational		Proposed Permanent Development	1	1	3	2	1
SR23South of Lung Chi Path	Residential/Commerical	200	Permanent	3	3	3	2	3
SR24] SR25]North of Lung Chi Path SR26]	Residential	500	To be Cleared	3	2/3	3	2	3
SR27Hammer Hill	Recreactional			1	1	3	3	1
SR28Pak Fung House	Residential	550	Permanent	1	1	3	3	1
SR29Proposed F.S.D Quarters Development	Residential		Proposed Permanent Development	1	2	3	3	1/2
			Overall	2	2	3	3	2
				1 Low 2 Moderate 3 Severe		1 Good 2 Moderate 3 Poor		1 Low 2 Moderate 3 Severe

Table F3
Visual Impact Assessment
Route Option C

Sensitive Receivers	Type	Population (Where Relevant)	Planning Policy	Degree of Impact (Construction Phase)	Degree of Impact (Operational Phase)	Ability to Mitigate (Construction Phase)	Ability to Mitigate (Operational Phase)	Overall
SR1 Hung Ngok House and Kam Hon House	Residential	1670	Permanent	3	2/3	3	3	3
SR2 Tan Fung House	Residential	1360	Permanent	2	1	3	3	2
SR3 UC Ngau Chi Wan Complex (Library + Children Play)	Educational		Permanent	2	1/2	3	3	2
SR4 Ping Shek Estate	Residential	2810	Permanent	2	2	2	2	2
SR5 Ping Shek Estate Catholic Primary School	Educational	360	Permanent	1	1	3	2	1
SR6 Yan Kau School	Educational	240	Permanent	1	1	3	2	1
SR7 St John's Primary School	Educational	360	Permanent	2	2	3	2	2
SR8]Ping Shek Temporary SR9]Housing Area	Residential		To be Cleared	1	1	3	3	1
SR10Sau Man House	Residential	400	Permanent	1	1	3	3	1
SR11Choi Wan St Joseph's Primary School	Educational		Permanent	2	2	3	3	2
SR12] SR13] SR14]St Joesph SR15]Home for the Aged SR16]	Residential	170	Permanent	3	3	3	3	3
SR17] SR18]Bay View Gardens SR19]	Residential	1200	Permanent	3	3	2	2	3
SR20Hung Sean Chow Memorial College	Educational		Permanent	1	1	3	3	1
SR21U.C Hammer Hill Sports Complex	Recreational		Permanent	2	2	3	2	2
SR22U.C Hammer Hill Proposed Leisure Pool Complex	Recreational		Proposed Permanent Development	3	3	3	2	3
SR23South of Lung Chi Path	Residential/Commerical	200	Permanent	1	1	3	3	1
SR24] SR25]North of Lung Chi Path SR26]	Residential	400	To be Cleared	3	1	3	3	3
SR27Hammer Hill	Recreactional			3	2	2	2	3
SR28Pak Fung House	Residential	550	Permanent	3	1	2	3	3
SR29Proposed F.S.D Quarters Development	Residential		Proposed Permanent Development	3	3	2	3	3
			Overall	2/3	2/3	3	2/3	3
				1 Low 2 Moderate 3 Severe		1 Good 2 Moderate 3 Poor		1 Low 2 Moderate 3 Severe

APPENDIX G - COMMENTS ON DRAFT FINAL REPORT AND RESPONSES

	DEPARTMENT/OFFICE	DATE RECEIVED	COMMENTS		DATE ACCEPTED
			NO	YES	
1.	Ag. SEPO(EA) 1, EPD	28.11.92		X	
2.	STP/K, PLAN.D	05.11.92		X	10.12.92
3.	DLO/KE, BLD	04.11.92		X	10.11.92
4.	PDD/USD	04.11.92	X		24.11.92
5.	SWD (WTS/SK District)	NIL RETURN			
6.	CTE/K, TD	19.10.92 11.11.92		X	23.11.92
7.	DO/WTS	03.11.92	X		
8.	DO/KT	NIL RETURN			
9.	PLANNING DIV. HD	12.11.92	X		12.11.92
10.	CLEARANCE DIV. HD	NIL RETURN			
11.	PM/UA, TDD	NIL RETURN			
12.	RED/MTRC*	NIL RETURN*			
13.	CHE/Str. HyD	07.11.92		X	10.12.92
14.	FSD	NIL RETURN			
15.	Arch. SD	09.11.92		X	10.12.92
16.	RHE/KLN	09.11.92		X	10.12.92

* Refer to CTE/K, TD

Item No.	Department/Letter Ref. EPD	Comment	Response
1.	11 November 1992	Reference of tables and figures in the main report should be included in the content or first part of the report for easy reference.	Noted. A List of Tables has been provided.
		Para 2.4.1.2 (a) The assumed speed in the noise assessment should be indicated.	(a) The assessment of traffic flow was based on traffic flows and speeds predicted by Transport Department's CTS-2 traffic model. Speeds vary throughout the study area, but are generally about 25 to 30 kph.
		(b) As many of the existing and planned/future noise sensitive landuses are/would be high rise, more representative floors than the top and 1/F should be included in the assessment. For medium and high rise landusers, assessment on at least every 5 floors would be required.	(b) The use of ground level and top storey facades to assess noise impacts was expressly stated in the discussion paper (¶3.2) tabled in the Second Working Group Meeting held 3 August 1992. The minutes of that and subsequent Working Group Meetings do not show any that further requirement was expressed by EPD. This information is usually useful to identify the elevation at which facades lose the protection of a barrier; however, in this study, where existing mid-rise and high-rise receivers are generally well exposed to high noise levels from traffic on existing roadways, the elevation at which the parapet walls of the flyover cease to offer protection is obscured by the prevailing high noise level.
			Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.		(c) Traffic noise impact upon the future/planned noise sensitive landuses shall also be assessed.	(Cont'd) (c) Noise contours shown in Figures 23-27 provide this information by showing expected noise levels over the study area for a high-rise receiver (assuming worst-case facade orientation). Since specific heights and orientations of future receivers are not known, a more specific assessment cannot be performed.
		In para 3.2.1, classification should be made in the description to identify the existing flyover from the proposed Lung Cheung Road Flyover to avoid confusion.	Noted. Text has been amended.
		Para 6.2.5 and Table 6.2 (a) Is there any attenuation factor	(a) The linear nature of the construction site results in a temporary exposure of almost all selected receivers to unshielded construction noise (disregarding the negligible shielding effect of construction hoarding) at some point in the construction schedule. The assessment has indicated the noise level that can be expected from that exposure, and thus includes no barrier effect. This is a worst-case situation, but one that can be expected to be of limited duration. [See Figure 14 for expected durations.]
		(b) The quoted construction noise & figures in ¶6.2.5 and Table 6.2 (c) are considered extremely high and should be revised. Unrealistic construction noise figures would frighten the reader. The degree of impact should be indicated: e.g., the estimated magnitude and duration of noise exceed the mentioned 75 dB(A) limit.	(b) It is agreed that the figures & are high, since they are (c) based on simultaneous use of all equipment for a particular activity. The text called attention to this fact in ¶8.2 when discussing possible construction noise mitigation measures.

Cont'd...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.			(Cont'd) As the primary purpose of the study was to obtain a *comparative* assessment of alignment options, a utilisation factor to reflect probable actual numbers of equipment in use at one time was not applied. Such a factor would apply equally to all options, and thus would not affect the comparison of options. However, it is agreed that the figures are high and could cause alarm; thus, a utilisation factor has been estimated and construction noise re-evaluated. For example, pile cap construction noise has been reduced by 5 dB(A). Revised construction noise levels are provided in the text, but do not alter the comparative assessment or reduce the need for mitigation measures. The probable duration of each construction activity is already provided in Figure 14.
		Para 7.2 The predicted traffic noise figures at different NSRs should be tabled in the main report.	Traffic noise at NSRs are tabulated in Tables 7.1 to 7.4. These tables summarise more complete information contained in Figures 15 to 17, which were specifically requested by EPD in its Guideline for Traffic Noise Assessment for this project. In the interests of simplifying the presentation of information and keeping the bulk of the report down, only the more significant information from the Figures was selected for inclusion in the Tables.

Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.		Figures 15, 16 and 17 (a) In Figures 15 to 17, is the existing situation referring to the measured existing level or the predicted existing level?	(Cont'd) (a) For consistency, all noise levels in Figures 15-17 are calculated noise levels; calculated and measured noise levels agree to within 1 dB(A).
		(b) Some of the NSRs are shielded by existing buildings, shielding effect should therefore be applied. The quoted existing levels e.g. in R1, R2, R17 and R23, appears unreasonably high.	(b) R1 and R2 are facades facing directly onto Lung Cheung Road, and have no shielding buildings between themselves and either existing roads or the proposed flyover. The shielding effect of intervening buildings was included in the noise assessments for R17, R23, and other shielded receivers. It appears that the discrepancies between EPD's findings and the consultant's findings are due to differing assumptions concerning road speeds. The consultants used both speeds and flows predicted by the CTS-2 speed-flow model, with the result that their assumed peak-hour speeds were significantly slower than the 50-kph uniform speed assumed by EPD. The consultant stands by the findings as presented in the Draft Final Report.
		(c) Theoretically, double the traffic flow volume would increase the traffic noise by 4 dB. It is sceptical that the future traffic noise would increased far from this basics.	(c) Differences in traffic noise were attributable not only to changes in traffic flow, but also to changes in accompanying traffic speeds and the proportion of heavy vehicles.

Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.		(d) For example, in Figure 10, there would be less traffic flow in the existing roadworks outside Choi Hung (R1 and R2) and would be slightly less than double outside Tsuen Shek House (R4). However, the quoted noise levels were significantly higher than the measured existing levels! Please elaborate.	(Cont'd) (d) The consultant cannot agree that quoted (assumed to be future) noise levels at R1 and R2 are "significantly higher" than existing (1991) levels: Figures 15-17 show that they are identical in 8 cases, decrease in 1 case, and increase by a small amount (1 dB(A)) in 3 cases. The consultant *can* agree that future and present noise levels outside Tsuen Shek House are significantly different. The reason lies in the combination of factors listed in the response to (c) immediately above. Specifically, though traffic flows outside Choi Hung Estate decrease, CTS-2 predicted speeds are expected to be low (possibly due to congestion on adjacent road links); the net effect of these conflicting tendencies will be little change in the noise level. Outside Tsuen Shek House, traffic flows increase while speeds decrease, so the increase in noise is predictable.
		(e) Traffic noise impact upon the future/planned noise sensitive landuses shall also be assessed.	(e) See response to para 2.4.1.2(c) above (page G.2).
		(f) Noise assessments upon NSRs R5, R6 and R7 as indicated in the Working Group Meeting 25.8.92 by the Consultant should be included in the main report (Figures 15-17 and ¶9.2.1).	(f) These receivers (three primary schools) were initially included as noise-sensitive receivers because they relied on opened windows facing Clearwater Bay Road for ventilation. As stated in ¶3.2.1 of the DFR, over the summer break (and subsequent to the start of this study), all of these receivers installed air conditioning in the
			Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.			(Cont'd) (f) windows facing Clearwater Bay Road. Thus, by the Notes accompanying Table 4.1 in the HKPSG, HKPSG noise standards do not apply to these facades. The use of air conditioning will permit windows facing Clearwater Bay Road to be closed, so that interior noise levels in classrooms will be greatly reduced. The consultant apologises for not reporting this change in the status of these 3 receivers to the Working Group. If EPD would like to obtain the predicted facade noise levels, the consultant will readily provide them, but their inclusion in the report may mislead the reader.
		Para 7.2.2.2 The traffic noise contribution from different roads/flyovers should be quantitatively assessed and presented in the main report for reference.	It was agreed in subsequent discussions with EPD that this information would be selectively calculated for Receivers R1, R4, R14, and R17, so that the relative contribution of the proposed flyover could be assessed. Results are presented in the revised text.
		Para 7.2.2.4 As R17 and R19 are further away from Lung Cheung Road, contribution from the proposed flyover upon these NSRs would be higher than those from the existing roads if the flyover is unenclosed. Noise from Lung Cheung Road would have some contribution, but unlikely to be the dominant source (¶7.2.2.4, ¶7.2.5.4, and ¶9.2.1.4).	In fact, because R17 blocks the angle of view of R19 toward the east, the segments of Lung Cheung Road and proposed flyover visible from R19 are generally at the same distance. Lung Cheung Road traffic dominates because its flow is more than double that of the flyover. It is agreed, however, that R17 has a greater exposure to flyover traffic, particularly over a segment where Lung Cheung Road traffic is shielded by buildings. For this receiver, noise from Lung Cheung Road may not be dominant, and the text has been amended to reflect this. Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.		Para 7.2.5.4 (a) It should be noted that the measured traffic noise level in the Home for the Aged implied that the existing shielding effect is reasonably effective resulting a L10 of 60-62 dB(A). The last sentence of ¶7.2.5.4 would presume be valid for those facades fronting Clear Water Bay Road. Please rephrase the wording to avoid misleading the reader.	(Cont'd) Noted. Text will be amended.
		Para 7.2.5.6, 7.2.5.7 and 7.2.5.8 I have great reservation on the validity of the noise contours (¶ 7.2.5.6, 7.2.5.7, 7.2.5.8, and 9.2). I was surprised by the high reduction ratio indicated in the contours around Choi Hung and Ping Shek Estates. e.g., the indicated L10 near the facade of Tsuen Shek House would be 65 dBA in Figure 22, 80 dBA in Figure 23, and 65 dBA in Figure 24 and ... Please elaborate.	The purpose of the contours is to show probable future noise levels in R-zoned lands subject to *future* development, *on the basis of assumed building heights and orientations (assumptions must be made since no plans for future development were available at the time of the Study)*. Thus, the emphasis in modelling was to ensure that the contours in these areas, which lie north of Options A and B, were accurate. The contours in the *existing* housing estates were of secondary importance, since receivers in the estates were already individually assessed on the basis of *known* heights and orientations (Figures 15 to 17). Since the contours within the housing estates reflect a situation (in terms of building heights, disposition, and orientation) that does not exist, it was perhaps misleading to include them in Figures 22 to 27, and they will be deleted from the revised figures. The suspect reduction ratios mentioned are due to the rather imprecise location assigned to a "barrier" during modelling, the "barrier" being roadside estate buildings that shield the interior of the estates. Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.			(Cont'd)
		Para 8.2 Some forms of noise pollution control clauses should in incorporated in the contract document to minimise the impact to the practically minimum while flexible enough for the Resident Engineer to enforce and manipulate.	Agreed. Amendment to the text (¶8.2) will mention this.
		Para 9.2 (b) A general introduction and description of the proposed mitigation measures would be necessary to brief the reader.	(b) An extended description of two possible measures that were not considered practical (friction course and barrier) was not included in the interests of brevity. The chosen mitigation measure (total enclosure) was described in ¶9.2, and a possible configuration provided in Figure 35.
		(c) What is the rationale behind of enclosing the shaded portion of the flyover? It appears that the Homes for the Aged in the east and the future/planned noise sensitive receivers were not taken into consideration against the traffic noise impact from the proposed flyover.	(c) Detailed calculations show that, at Receiver R14, the contribution to facade noise levels from Clearwater Bay Road is 81 dB(A), and from the parapet-shielded flyover 66 dB(A); i.e., relative to traffic on Clearwater Bay Road, flyover traffic is negligible in terms of noise contribution. For this reason, the flyover's parapet was considered to be adequate for shielding the low-rise receivers in the Home for the Aged. Note, however, that the preliminary design for the noise enclosure, shown in Figure 34, includes a stepped barrier leading from/to the enclosure, so that receivers will be additionally shielded. Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.			(Cont'd)
		(d) In ¶9.2, the descriptive wording "total enclosure" has been used many times. It may mislead some readers that the whole length of the flyover will be enclosed! Please rephrase the wording.	(d) The description "total enclosure" was used to distinguish this measure (which utilises barriers at both sides of the roadway as well as over the top) from "noise barriers" (which utilise only barriers at the sides). ¶9.2 states that the actual length of the total enclosure is limited, and refers the reader to a graphic depiction of the assumed lengths in Figures 26 and 27.
		Para 9.2.1.3 With reference to ¶9.2.1.3 (Option A), note Figure 10 indicated that the traffic flow volume in the existing roadworks would be less than the existing by year 2011. Noise contribution from the proposed flyover upon R1 was estimated to have measurable contribution to the overall cumulative noise levels in the range of 1-2 dB.	The disaggregated contributions to facade noise levels at Receiver R1 (top storey) are 83 dB(A) from Lung Cheung Road and 78 dB(A) from the proposed flyover *without total enclosure.* The combined level is 1 dB(A) above that from Lung Cheung Road alone. The total enclosure shown in Figure 26, with the stepped barrier leading to/from it shown in Figure 34, will reduce the contribution from the proposed flyover at Receiver R1.
		Tables 9.1, 9.2, 9.3 and 9.4 The quoted noise impact in Tables 9.1, 9.2, 9.3 and 9.4 for Receivers R4, R12, R14, R23, and R28 are considered unreasonably high.	Discussions between EPD and the Consultant have revealed that the basis for differences in the predicted noise levels obtained by EPD and the Consultant can be attributed, at least in part, to different assumptions of traffic speed. The Consultant has utilised CTS-2 predictions for both traffic flows and speeds, while EPD has used only CTS-2 peak-hour flows with an assumed speed of 50 kph. The expected low traffic speeds on Clearwater Bay Road, resulting from expected high levels of congestion, are the basis for the high traffic noise estimates obtained by the Consultant. Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.		Table 9.4 If Option C is to be totally enclosed as Figure 27, the noise contribution from the proposed flyover would be insignificant to most NSRs. While traffic flow along the existing roadworks would be reduced or not significantly higher than existing as indicated in Figure 10, there would be definitely a traffic noise improvement from Option C. The traffic noise impact under Option C column in Table 9.4 should logically less than the D-N scenario. The quoted noise level for Option C are logically not right. Para 11.2.1(ii) (a) It should be noted that noise from the flyover would have measurable effect upon the cumulative noise climate in NSRs such as R12, R13, R14, R17, R19, R23, and R28. Depends on the length involved, the proposed flyover enclosure would probably have mitigative effect upon these NSRs. (b) The indicated length of enclosure in Figures 26 is considered not an effective measure. Many NSRs would expose to traffic noise exceed the HKPSG's limit as well as the prevailing traffic noise levels. Further direct technical remedy should be explored.	As shown in Figure 10, the traffic flow along existing Clearwater Bay Road is expected to be significantly higher under Option C (7570 vehicles) or the Do-Nothing Scenario (6490 vehicles), compared to existing flows (4850 vehicles), contrary to EPD's observation. Concerning the logic shown in Table 9.4: as just indicated, traffic flows on Clearwater Bay Road are expected to *increase* with the presence of the flyover. Such an increase in Clearwater Bay Road traffic would account for the increase in traffic noise levels under Option C, despite the total enclosure of the flyover. While it is agreed that one would not normally expect Clearwater Bay Road traffic to increase with the introduction of the flyover, it is not agreed that Table 9.4 is logically not right, since it accurately reflects the increase in noise due to increased Clearwater Bay Road traffic. (a) These issues have been dealt with in Responses to Paras 7.2; 7.2.2.2; 8.2. (b) As demonstrated in Figures 15-17 and Tables 7.1-7.4, traffic noise exceeds HKPSG standards for most receivers under present (1991) and future conditions, irrespective of whether the proposed flyover is built. The same figures and tables indicate that, without the construction of the flyover (i.e., the "Do-Nothing" scenario), NSRs will continue to be exposed to traffic noise exceeding the prevailing traffic noise levels. The flyover has the potential to introduce new traffic noise to previously shielded areas such as Ngau Chi Wan village; where this is so, appropriate mitigation has been proposed. Cont'd ...

Item No.	Department/Letter Ref. **EPD**	Comment	Response
1.		Para 11.3 (a) In ¶11.3, a "tick" is preferred than the "X" in the table. (b) Comments in Table 9.4 is relevant. Please elaborate the statement quoted. (c) While both sides of alignment A and B have/would have NSRs, it appears that north of alignment C have no NSRs between the school (R20) and Pak Fun House (R28). This would benefit Option C over A and B on ventilation requirement and practicality of the mitigation works. (d) In view the enclosure length and the residual noise impact of the present Option A is not satisfactory, further assessment is required to determine which would be the favourable option. (e) Consideration should also be given to extend the length of full enclosure of Option A or other effective mitigation measures to further protect the future and planned noise sensitive sites and the Homes for the Aged in the East and its implication to the overall cost.	(Cont'd) (a) Please see Response to Comments from Planning Department (i). (b) Please see Response above. (c) The absence of sensitive receivers along parts of the proposed alignments was mentioned in the DFR text (¶9.2). Where no sensitive facades are present, one side of the total enclosure may be opened, thus aiding natural ventilation. (d) Provision will be made in the design of the flyover to permit future use of noise barriers at the ends of the flyover, leading from and to the total enclosure. (e) This comment was dealt with in response to para 8.2 above. Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.		It is a good case to show to our colleagues in Highway Dept or other relevant departments that vehicular emission control alone cannot protect our air environment from the impacts of the ever-increasing traffic flow. They can help achieve an acceptable air environment by incorporating environmental considerations in their search for the transportation infrastructure to meet the traffic demand. The approach of looking into the environmental factors after the transportation infrastructure is fixed cannot work because the associated environmental problems may have no practicable mitigation measures. This is particularly so if more roads/flyovers are built in an area already saturated with vehicular emissions. In this case, we can, though subject to the satisfactory response from the Consultants to our comments, agree that the alignment of the flyover will have no significant influence in the local air quality. We can also agree that the air problems are mainly associated with the receptors close to the two existing roads -- Lung Cheung Road and Clearwater Bay Road -- and they are due to the increase in traffic flow. However, we cannot agree to the Consultants' recommendation that emission control is the only viable mitigation measure for the identified air impacts because emission control has technological limits and cannot solve, on its own, the air quality problems. It has to be supplemented by proper transportation infrastructure. Indeed, the emission factors that were used by the Consultants in the impact assessment have already included the foreseeable emission control measures that will be brought into Hong Kong in the coming years.	(Cont'd) See response to para 7.3.2.3 below. Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.		There are no certainties on the further controls that can be implemented and whether these controls are adequate to mitigate the predicted air impacts to an acceptable level. As far as we can see, the only possible way to solve the identified air quality problems is to look for a better transportation infrastructure to meet the increase in traffic flow and see whether there is any redevelopment opportunity to put in place the required buffers between the roads and their abutting developments. We are not sure whether this case needs to go to the DB. Should it have to, how to solve the air quality problems will surely need to be answered. We are concerned that the absence of background air quality considerations and large height difference between the elevated receptors may lead to under-estimating the air impacts at elevated receptors. Consequently, the need for mitigation measures (air) at the flyover may not have been properly assessed.	(Cont'd) EPD's "Guideline for Air Pollution Assessment in the Environmental Assessment Report" for this study requests the consultant to "assess the air pollutants levels at the sensitive receptors due to the proposed project...". While it is agreed that the background pollution levels are important for the determination of appropriate mitigation measures, they are less significant in this study, where the *comparative* impacts of three different alignment options are being considered. In this case, a constant figure would be added to all predicted findings, and would not change the comparative assessment. The consultant therefore performed the air quality assessment according to EPD's stated guideline. The consultant has demonstrated that significant numbers of receivers in the study area are affected by excessive levels of air pollution due to local traffic alone. Cont'd ...

Item No.	Department/Letter Ref. **EPD**	Comment	Response
1.		Page 2.3, Section 2.5.1.3 (a) Please explain the rationale of choosing 0.7 cm/s and 3.5 cm/s as the deposition velocity and settling velocity for TSP.	(a) The gravitational settling velocity was calculated using Eqn 2.42 of the ISC Users Guide (Bowers, et al, 1979), assuming one category of particle size (0-30 microns) and a particle density of 2500 kg/m^3. The resulting velocity was then used to estimate the reflection coefficient of the particles, using Figure 2-8 of the ISC Users Guide. On the assumption that the particles which are not reflected are absorbed by a surface, the deposition velocity was estimated, neglecting subsequent re-entrainment of the particles by air currents near the surface.
		(b) The Consultants have chosen the receptors at ground level, 20 m @G and 40 m @G for assessing the air impacts at elevated receptors. However, the maximum height of a flyover in CALINE4 can only be 10 m above ground. If the worst impact occurs somewhere between the ground level and the flyover or at similar elevation as the flyover, the model predictions at these receptors will underestimate the air impacts.	(b) As EPD has stated, the maximum height of a flyover in CALINE4 is 10 m above ground. Given the nature of the study area, it is therefore agreed that the exact elevation at which the worst impact occurs cannot be accurately determined. Thus, to determine the *height* at which each receiver will experience worst air quality impacts, CALINE4 would not be adequate; however, to determine the *worst concentration* at each receiver, CALINE4 is adequate. This study was concerned with the latter determination, and heights have been shown in the relevant Tables and Figures only to provide an indication of how pollutants can be expected to disperse with height.
		(c) The air quality in the Study area are also affected by the vehicular emissions outside the Study Area. However, the background air quality concentrations have not been included in the air impact assessment. Please review the air impact predictions with an appropriate background air quality concentrations.	(c) See response to General Comments above. Cont'd...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.			(Cont'd)
		Could the Consultants please include in the report the traffic emission factors and the traffic mix that were used in the impact assessment?	Noted and included in revised text.
		Page 5.1 Section 5.3.1,Figure 10 Under Option A, the indoor games hall in the study area is merely 6.5 m away from the flyover. Could the consultants please clarify whether the indoor games hall will be exposed to air quality worse than the AQO limits.	The Indoor Games Hall was included in the assessment as Receiver R3 (UC Ngau Chi Wan Complex). The specific area of the complex that was evaluated was the Games Hall, though this is incorrectly shown in Figure 2 (which will be amended). As shown in Tables 7.5 and 7.6, the Games Hall is anticipated to be subject to concentrations of CO and NO_2 within AQO standards.
		Page 5.3, Section 5.4.6 Under Option B, the flyover, between Chainage 770 and 950, is less than 2 m from a residential building. It is extremely undesirable to have a flyover coming to such a close distance to a residential building. We are glad that this option has somehow been rejected. However, it is a little surprising that the predictions of the Consultants did not indicate air quality problems at the residential building. Would the Consultants please check the reason behind.	Between Chainage 770 and 950, the Option B alignment passes through the St Josephs Home for the Aged. While it is true that the alignment passes within 2 m of an *existing* building in the Home, it has been pointed out in the DFR (¶6.4.3) that land would have to be cleared and resumed inside a 20-metre corridor along the flyover alignment. The residential building in question lies within this corridor, and thus would be assumed to be no longer standing at the time of the future flyover operation.
		Page 5.4, Section 5.5.6 Under Option C, the flyover, between Chainage 600 to 680, passes within 10 m of the most northerly block in Bayview Garden. Please confirm that the predictions do indicate the worst impacts to be experienced by the elevated receptors at the building.	Please see response above.
			Cont'd...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.		Page 7.10, Section 7.3.2.3 The Consultants have compared their TSP predictions with the daily AQO for TSP. However, the report has not provided the methodology of converting the TSP predictions based on hypothetical hourly meteorological conditions to the corresponding daily predictions. Could the Consultants explain how they have made the conversion?	(Cont'd) At EPD's request (in the "Guideline for Air Pollution Assessment in the Environmental Assessment Report for Lung Cheung Road Flyover"), the Consultant has provided the maximum hourly average for particulates though, as EPD has stated, there is no corresponding hourly AQO standard by which to evaluate it. As an approximate guide to the severity of the particulate problem, the Consultant has considered the average hourly particulate levels with regard to the AQO maximum daily average. No direct comparison with the AQO daily average has been made. Where hourly average levels exceed the daily allowable average, the Consultant has indicated a potential problem, since peak-hour traffic could be expected to contribute significantly to the 24-hour average concentration. Where hourly average levels are within the average daily standard, a problem is less likely, again since peak-hour traffic could be expected to contribute significantly to daily particulate concentration levels. Of course, in the latter case, non-traffic-related particulates, such as construction dust or atmospheric dust, could cause AQO standards to be exceeded. If EPD has a guideline by which they would prefer to evaluate the requested hourly TSP averages, the Consultant would be pleased to use it in the air quality assessment. Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.			(Cont'd)
		Figures 28, 29, 30 and 31 The air pollution contours in Figures 28-31 appear to be much worse than the predictions provided for individual receptors. Could the Consultant please explain how they have derived the contours?	The NO_2 contours shown in Figures 28-31 agree with individually-assessed air quality concentrations shown in Figures 18-20 with the exception of the contours around two receivers (R4 and R7). At these locations, resolution in the contour model is not fine enough to accurately show contours for some receivers very close to the roadways. A individually-assessed evaluation of air quality impacts at these receivers is provided in Figures 18 to 20. The contours are intended primarily to show air quality in areas zoned for future residential development, as stated in the Third Working Group Meeting.
		Page 9.2 Section 9.2 If noise barriers and total enclosure are proposed at the flyover, the Consultants should address their air quality implications.	The consultant feels that such an assessment would be more appropriate at a more advanced stage in the design process, since the emissions from the enclosure portal would be determined by the enclosure ventilation system, which will be specified at the detailed design stage. In addition, segments of the total enclosure may be naturally ventilated by side openings if future development permits. The length of the Option A enclosure is sufficiently short that air quality at the portals is not anticipated to be a problem.
			Cont'd ...

Item No.	Department/Letter Ref. EPD	Comment	Response
1.		Page 9.3 Section 9.3 The emission factors that the Consultants have used in the impact assessment have already included the vehicle emission control measures to be introduced in the coming years. Would the Consultants please elaborate what their "effective control measures to control pollution on a district-wide or territory-wide basis" are referring to. Would the Consultants consider measures such as putting in place the required buffer between the roads and the abutting developments during redevelopment and identifying the proper transportation infrastructure would be required to mitigate the air impacts in this case? If there are any receptors, which may be exposed to air impacts mainly due to vehicular emissions from the flyover, we consider that mitigation measures should be proposed by the consultants to mitigate the impacts.	(Cont'd) Besides controls to reduce lead and smoke emissions, other possible measures to reduce pollution levels due to road traffic include: □ use of alternative fuels such as methanol/ethanol, □ use of LNG/CNG natural gas fuel, □ use of alternative vehicles such as electrical cars, currently being actively explored by CLP. Alternative transportation infrastructure, specifically the expanded use of electrified rail, is currently being planned or proposed by MTRC and Kowloon Skyrail.

Item No.	Department/Letter Ref. **Planning Dept.**	Comment	Response
2.	(46) in K-C/OTH/75 VII 5 November 1992	(i) Page 11.5 It may look better if a 'tick' instead of a cross is used to reflect the preferred choice. A cross has a negative meaning. (ii) Page 11.6 Since the enclosure of the proposed flyover would not improve the traffic noise, why is it still recommended to enclose the flyover.	(i) This comment is noted and recognised that "a cross" may be interpreted as having a negative meaning however this is not intended in this section. (ii) It should be noted that under the Do Nothing Scenario noise levels for almost all the sensitive receivers are expected to significantly exceed HKPSG standards. The provision of an enclosure will reduce noise from flyover traffic to nil. In comparing Tables 7.2 and 9.2 it may be noted that a total enclosure reduces L_{10} levels at Tan Fung House, Bayview Gardens East and West, and Lung Chi Path. In addition, the total enclosure would shield future highrise receivers in the Residential-zoned areas north of Options A and B.

Item No.	Department/Letter Ref. Bldgs & Lands Dept	Comment	Response
3.	(30) in BLD 41/KRD/KE (II) 4 November 1992	The points raised in my earlier letter dated 9th October 1992 are still relevant. Option A alignment is acceptable only on engineering and environmental grounds as a result of your focused environmental impact assessment. However I am rather concerned with the possible villagers' objection and the non-professionally assessed resumption costs which may eventually lead to Option A be rejected upon gazetting of the road scheme. Note: Letter date 9th October 1992 refers to the following key points: (i) Resumption Costs (ii) Zoning and future action	The comments are noted and it is confirmed that Option A is preferred on engineering and environmental grounds. With regard to costs, the report states the basis on which they have been assessed. The assessment is considered to be within the intention of the Consultancy Brief. It is acknowledged that there may be objections when and if Scheme A is gazetted, as indeed that may be the case for any scheme. In respect of the earlier letter referred to, this comments on the apparent weight assigned by the Consultants on the Ngau Chi Wan Village Layout Plan. The comment that it is not a statutory document is agreed. However the Study Brief requires identification of all existing and future land uses and it is considered appropriate to refer to all planning documents including the Ngau Chi Wan Village Layout Plan. The Plan bears the following notes: "The use zoning set out in this plan conforms to the statutory plan" but shows more detail. From the land use point of view the critical factor is that the OZP, ODP and the Village Layout Plans show redevelopment of the village, north of Lung Chi Path, and therefore the impacts of Routes A and B have to be assessed in the light of the eventual clearance of the village in the 'Do Nothing Scenario'. Cont'd ...

Item No.	Department/Letter Ref. **Bldgs & Lands Dept**	Comment	Response
3.	(30) in BLD 41/KRD/KE (II) 4 November 1992		(Cont'd) Route A has been selected from the land use point of view, in preference to Route B, largely because of the increased resumption costs and disruption associated with Route B. The fact that the Village Layout Plan shows an elevated route along the alignment of Route A, and the adjoining land uses to the north of the road have been planned accordingly, increases the strength of argument, in favour of Route A, over Route B but is not a significant factor in the selection of Route A over Route C. With regard to the final comment regarding the course for further action it is noted from the Brief that the findings of this report are "to assist the PSG in reaching a conclusion with respect to the optimum alignment for the proposed flyover". It is therefore considered that no comment from the Consultants is required.

Item No.	Department/Letter Ref. **Transport Dept.**	Comment	Response
6.	KR 146/193/C-62 19 October 1992	(i) Though not being considered in the study as one of the 'environmental impacts', traffic disruption (i.e. loss of traffic lanes, loss of kerbside loading/unloading space, traffic congestion, etc.) during construction should be considered as an adverse factor in comparing the three options though it might not carry as much weight as the other factors. In such respect, Option A should be the less attractive one given its longest length of lane occupation along this already very congested section of Clear Water Bay Road.	(i) This comment is noted and accepted. The detailed design can be modified to alleviate potential traffic congestion on this particular section of road at construction stage by considering one of the following:- - realigning the pier supports to the down side thus increasing the width of access - using precast construction - providing a temporary cantilever platform from which the insitu deck can be constructed, thus allowing free movement around the piers under. Refer to paragraphs in Sections 4.3.2, 5.3.7 and 11.4 in the Final Report. It is further noted that the OZP includes a G/1C site which may be used for possible provision of a transport interchange. Such provision would mitigate the problem.
		(ii) I concur with the view of DLO/KE in para. (ii) of his letter to you (ref. (23) in BLDG 41/KRD/KE(II)) dated 9.10.92. The recommended option, if accepted by Government, should be effected by way of an amendment to the OZP to be processed by Planning Department so that the public could be informed of the Government's intention concerning land use in the subject area.	(ii) This comment is noted and is addressed in Item No. 3.

Item No.	Department/Letter Ref. **Transport Dept.**	Comment	Response
6.	(34) in KR 146/193/C-62 IV 6 November 1992	(i) Para 5.3.6 It was noted that the "latest draft proposals for the layout of the access ramp of Ping Shek Development envisage a 2 way ramp from the centre of Clearwater Bay road carriageway is proposed instead of the separate entry/exit ramps as depicted in the figure 10" For further details of updated layout refer to RED/MTRC.	(i) This issue was discussed at the Steering Group Meeting on 12 November 1992 and was recorded in the Minutes of the Meeting under Items 2.2 and 2.3. The Secretary noted that other Members of the Steering Group had not been informed previously of this new alignment of the ramp. The new arrangement might upset the environmental study already conducted in that neighbourhood, thereby affecting the recommendation for mitigation measures already proposed by the Consultants. A new environmental assessment study for this newly proposed access ramp might be necessary and such assessment exercise would be outside the scope of the present Study. The SWD and EPD's view on the necessity for such new assessment study should be consulted prior to the construction of this new ramp. Any mitigation measures thus proposed should be independent of and extra over those proposed under the present Study.
		(ii) Expresses "that from a traffic point of view, the Option A is the most undesirable option during construction".	(ii) This comment has been answered in comment (i). Letter KR 146/193/C-62 on 27 October 1992.

Item No.	Department/Letter Ref. **Highways Dept.**	Comment	Response
13.	(30) in STR/5/20/28 7 November 1992	(i) Section 2.6.2 (b) The third paragraph is suggested to read as "Mass Transit Railway Corporation prescribe any piling ....". The unit of the figure 103 in the fourth paragraph is presumably kJ per blow.	(i) This comment has been noted. In dealing with the subject matter the word "proscribe" has been used in it's correct context. The text has been amended to read "103kJ per blow".
		(ii) Section 4.1 The unit of the practical capacity of the road in the last sentence is suggested to change to "vehicles per hour" so that a direct comparison can be made between the practical capacity and the maximum capacity of the road.	(ii) This comment has been noted and the text has been amended in order to clarify the statement as follows:- "A two lane single carriageway road has a practical capacity of 12,300 vpd. However for the assessment of the environmental effects of the traffic, peak hour flows should be used and these have been obtained from the Transport Dept. This information is presented on Figures 10, 11 and 12".
		(iii) Section 4.3.5 Last paragraph refers. In which Figures are the typical piled foundations shown?	(iii) This comment has been noted and the text has been amended to read "Figure 14".
		(iv) Section 5.4.2 "Flyover Option A" of the table is suggested to read as "Flyover Option B".	(iv) Agreed.
		(v) Section 5.4.8 This paragraph is suggested to read as "The route is the same as for Option A (paragraph 5.3.8). Cross Section B8 refers.	(v) Agreed.
		(vi) Section 5.5.2 "Flyover Option A" of the table is suggested to read as "Flyover Option C".	(vi) Agreed.
			Cont'd ...

Item No.	Department/Letter Ref. **Highways Dept.**	Comment	Response
13.	(30) in STR/5/20/28 7 November 1992		(Cont'd)
		(vii) Section 6.2 The third sentence refers. "... is provided in Table 6.1" is suggested to read as "... as listed in Table 6.1".	(vii) Comment has been noted and the text has been amended to read "as provided in Table 6.1".
		(viii) Table 6.1 The equipment "vibratory poker" is suggested to be included in the "Equipment and Quantity" column for the activities Piling and Superstructure Construction. Consequently, Table 6.2 may need revision.	(viii) This comment has been acknowledged and accepted. Table 6.1 is amended to include for 2 No. and 3 No. vibratory pokers in the column for activities Piling and Superstructure Constructions, respectively. The other columns of this Table has been amended accordingly. On reassessing, Pile Cap Construction remains the loudest construction activity. Appendix C1 has also been amended to correspond with the revised Table 6.1.

Item No.	Department/Letter Ref. Highways (Kln)	Comment	Response
15.	ASD 3092 BF 9 November 1992	The following comments were incorporated in Arch. SD's memo relating to: (i) "self protecting" of South facing facades of the FSD Building. (ii) Physical measures being proposed for the reduction in noise levels.	The anticipated noise levels on the south facade of the FSD quarters would exceed those stipulated in the HKPSCT and we have therefore recommended that the building be self protecting. (Recommendations 11.4) although the method of protection are not stipulated. At 9.4.4 in assessing Route C, we have assumed that the design of the FSD Quarters was at s sufficiently early stage that the layout of the development could be changed to provide a degree of protection. As it would appear that the design is in effect fixed, we agree with ASD that the recommended protection would have to be achieved by the provision of "double glazing or other physical measures". The last sentence of the second paragraph of above 9.4.4 has been deleted accordingly.

Item No.	Department/Letter Ref. Highways (Kln)	Comment	Response
16.	( ) in KH(CM) 454TH/G II 9 November 1992	Para 11.1.2 Please add the word "current" before "5 years Public Works Programme, ..."	Text has been amended as requested.