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HONG KONG GOVERNMENT

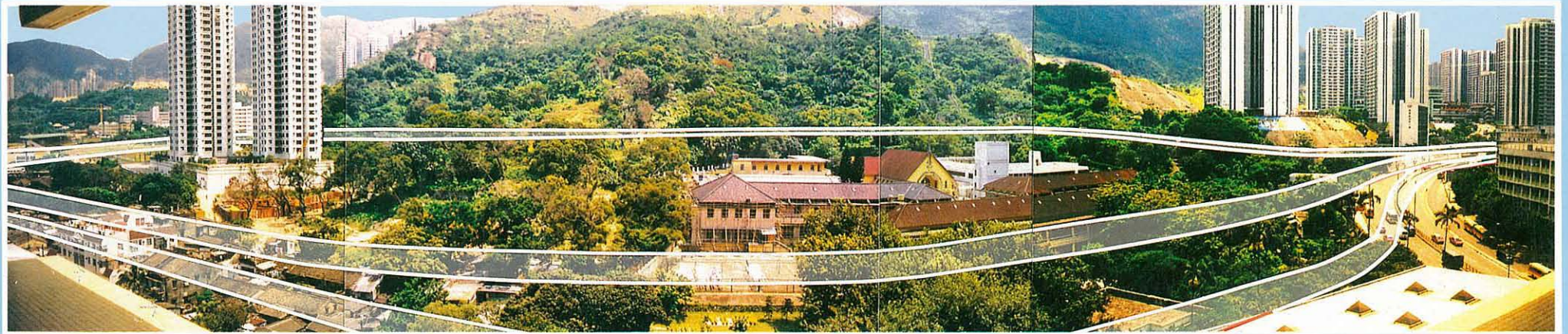
HIGHWAYS DEPARTMENT

PWP Item 454TH: Lung Cheung Road Flyover Focussed Environmental Impact Assessment

龍翔道天橋對環境影響評估



香港政府路政署



Executive Summary 工作概要

Peter Fraenkel BMT (Asia) Ltd.

in association with

Enpac Ltd.

Urbis Travers Morgan Ltd.

法蘭高寶萬通工程顧問有限公司（亞洲）

及協作公司

怡柏環境工程有限公司

雅邦茂景有限公司

EIA-01P-3/BC



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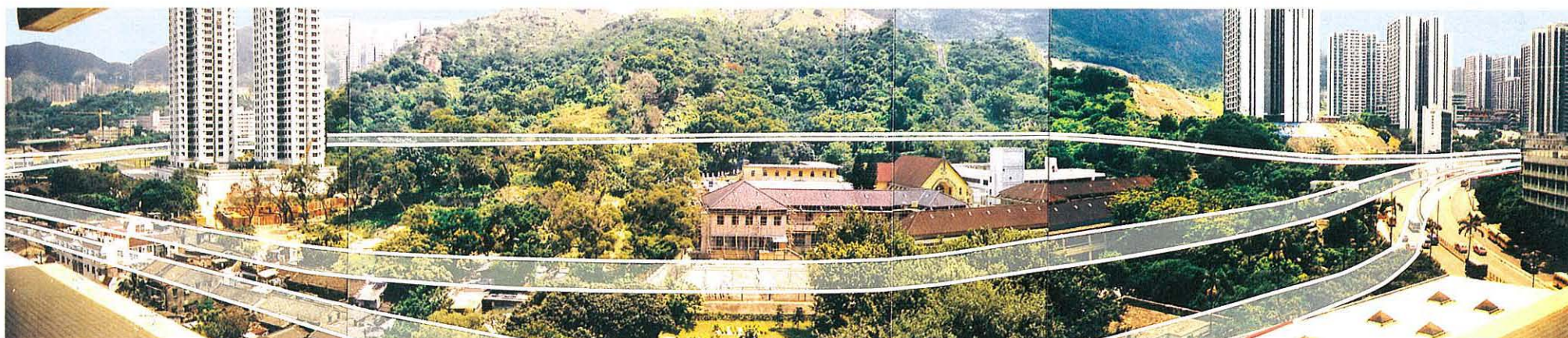
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1 INTRODUCTION

The Hong Kong Government's Second Comprehensive Traffic Study (1989) identified the need for a flyover linking Lung Cheung Road with the Clearwater Bay Road in Kowloon to ease present and improve future traffic movements in the area (Figure 1). A Project Steering Group (PSG) was convened by Government in 1991 to assist in planning this flyover and proposed three possible alignments which are referred to herein as Options A, B and C. Each alternative flyover is a two lane single carriageway road with a practical traffic capacity of 12,300 vehicles per day.

In keeping with the recommendations of the Environmental Protection Department a focussed environmental impact assessment (EIA) was proposed for each alignment to assist the PSG in reaching a conclusion on the optimum alignment.

Peter Fraenkel BMT (Asia) Ltd in association with Enpac Ltd and Urbis Travers Morgan Ltd were commissioned by the Highways Department, Kowloon Region, to undertake the EIA and produce a Final Report outlining its findings and recommendations.

This booklet summarises the Final Report and presents a comparative assessment of the adverse environmental impacts of the proposed alternative flyovers during both construction and operational phases. Appropriate mitigation measures are recommended for each phase. These assessments together with cost estimates lead to a recommendation as to the preferred options.

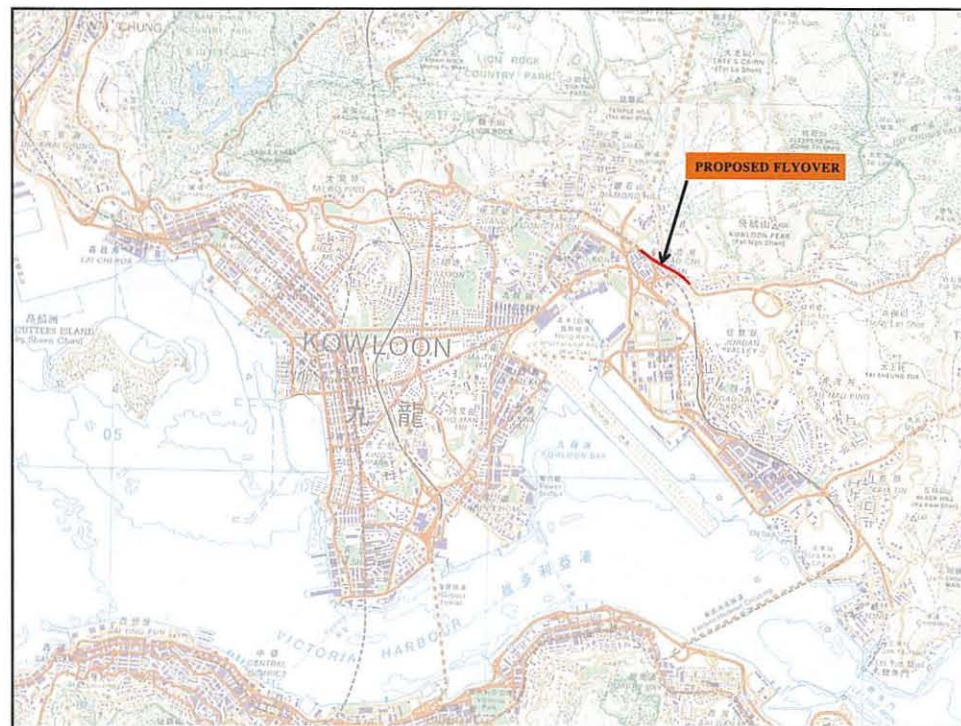


Figure 1 - Location Plan
圖一 - 工地位置平面圖

1 引言

香港政府在一九八九年完成的第二次香港整體交通研究報告 (CTS-2) 中指出，有需要於九龍興建一連接龍翔道和清水灣道的天橋，以舒緩該區現時及改善未來的交通情況 (圖一)。政府於一九九一年組成了一個工程指引小組 (PSG)，協助

籌劃興建此天橋，及提出了三條可行的路線，在此稱為方案“甲”、方案“乙”及方案“丙”。各方案均為一單程雙線行車道，可負荷每天12,300架次的流量。

為配合環境保護署作出的建議，各可行的路線均需經過一個對環境影響的評估，以協助PSG作最佳的選擇。

法蘭高工程顧問有限公司 (亞洲)、其協作公司怡柏環境工程有限公司和雅邦茂景有限公司已獲路政署九龍區委任，負責進行環境影響的評估，及為其調查結果和建議提交一份最後報告書。

本冊子概述最後報告書及對各方案在天橋興建期間和運作時對環境造成的不良影響作出一個比較評估，亦會為各階段可緩和及不良影響的方法作出建議，此評估加上有關成本估價，將可用作為選出較佳方案的指標。

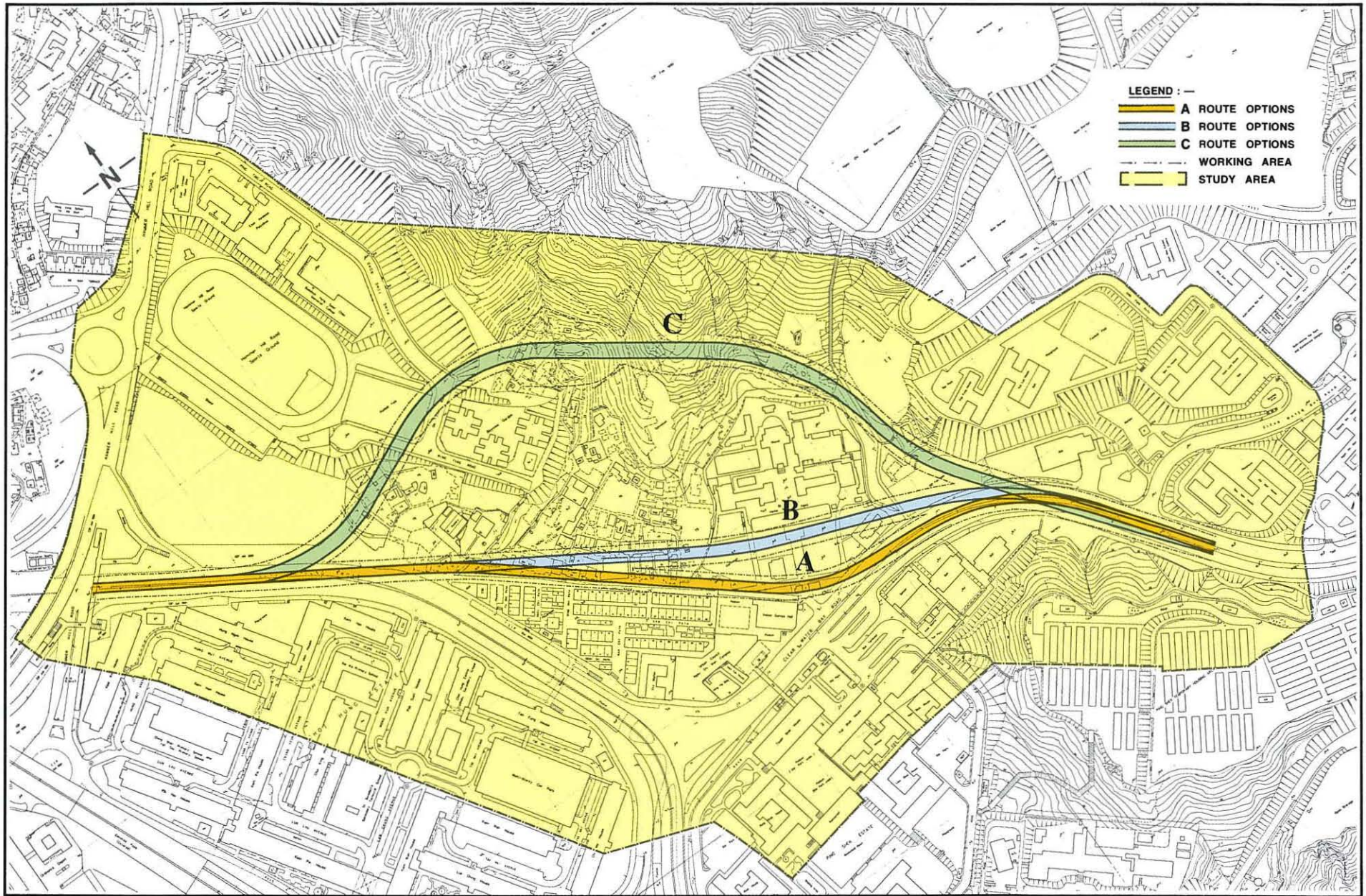


Figure 2 - Study Area
圖二 - 研究範圍

2 THE STUDY AREA

2.1 Site Description

The study area encompasses an Urban Area within the Wong Tai Sin District of East Kowloon including the Choi Hung and Ping Shek Estates and the south western section of the Choi Wan Estate.

The Lung Cheung Road and Clearwater Bay Road corridor bisects the study area in the east-west direction. Located to the north of the road corridor and in the western sector of the study area are the Hung Sean Chow College, the Hammer Hill Sports Complex and a site reserved for a future Urban Council (UC) Leisure pool complex. Ngau Chi Wan Village which is in the centre of the study area, comprises a mixture of residential structures with a component of commercial uses located mainly along the Lung Chi Path. A private residential development, Bayview Gardens, is set against the backdrop of Hammer Hill and lies north of the village. St. Joseph's Home for the Aged flanks the village on its east side, north of Lung Chi Path. A number of medium and high rise developments are located south of Lung Chi Path including the UC Ngau Chi Wan Complex. Ping Shek and Choi Hung

Estates are located to the south of the road corridor. Hammer Hill Green Belt is dominant to the north in the Study Area. Choi Wan tower block estate is visible to the northeast.

2.2 Site Constraints

Constraints which affect the flyover alignment options include:

- a central core of village houses and commercial outlets
- a Refuse Collection Point (RCP) and public Lavatory
- preservation of open spaces and existing trees
- a small sitting out area centred around a shrine
- the Home for the Aged
- MTR installations
- Proposed MTR redevelopment at Ping Shek estate
- a Water Supplies Department (WSD) pumping station
- a UC sports complex
- hillside green belt area

The Study Area and the route of Options A, B and C are shown on Figure 2.

2 研究範圍

2.1 工地描述

研究範圍位於東九龍黃大仙區內的市區，包括彩虹村、坪石村及彩雲村的西南部分。

建議中的龍翔道至清水灣道走廊將研究範圍平分為南北兩部分。走廊的北面及研究範圍的西面，包括佛教孔仙洲紀念中學、斧山道運動場、一個預留給市政局興建泳池館的地方，位於研究範圍中央沿著龍池徑的牛池灣村為商住兩用的建築物。位於該村北面，背靠斧山的是一个私人住宅建築物－威豪花園；而在龍池徑北面、牛池灣村東側的是聖約瑟安老院。龍池徑南面有數幢高層建築物，其中包括牛池灣文娛中心。在道路走廊的南面是坪石村及彩虹村；而在研究範圍北面，則大部分屬斧山的綠色地帶，從東北面則可看到彩雲村的樓宇。

2.2 工地限制

以下是將會影響天橋路線方案的各項工地限制：

- 中央核心的村屋及商業樓宇
- 垃圾收集站及公廁
- 保護空地及現有樹木
- 廟宇四周的休憩地
- 安老院
- 地下鐵路設施
- 提議中的坪石村地下鐵路重建計劃
- 水務署的泵水站
- 市政局的體育館
- 山邊的綠色地帶

圖二顯示研究範圍及方案“甲”、方案“乙”、方案“丙”的路線。

2.3 Route Description

All routes start and end at the same locations in Lung Cheung Road and Clearwater Bay Road. The three route alignments are specified and outlined in drawings supplied by the Transport Department as documents on which the EIA should be based.

Route Option A is 985 metres long and passes through Ngau Chi Wan Village and close to Lung Chi Path.

Route Option B is 983 metres long and similar in alignment to Option A except it veers further north when

passing through Ngau Chi Wan Village.

Route Option C is the longest route at 1090 metres and crosses the lower slopes of Hammer Hill and bypasses Ngau Chi Wan Village.

The alignments for Option A, B and C are as shown on plan in Figure 2 and pictorially in Figures 3, 5 and 6.

The estimated construction time is approximately 21 months for whichever option chosen.

2.3 路線描述

所有路線均以龍翔道及清水灣道上同一處作為起訖點。此三條路線均已詳述於運輸署所提供的圖則內，而對環境影響的評估亦須以此文件作為基礎。

方案“甲”路線全長985米，經過牛池灣村及靠近龍池徑。

方案“乙”路線全長983米，所經

地方與方案“甲”相近，唯在經過牛池灣村時，更接近北面。

方案“丙”路線最長，有1,090米，穿過斧山山坡和經過牛池灣村。

圖二顯示方案“甲”、方案“乙”及方案“丙”的路線平面圖。圖三、圖五及圖六則以圖畫形式顯示。

不論選擇任何一個方案，其預計施工期均為二十一個月。



Figure 3 - View: From Library: UC Ngau Chi Wan Complex (SR3)

圖三 - 俯瞰圖一

3 OBJECTIVES AND KEY ISSUES

This study identifies and evaluates the current and projected environmental impacts for the year 2011 due to existing and proposed roads and landuses. Likely environmentally 'sensitive receivers' are identified and mitigation measures where feasible are recommended for each Option.

A 'sensitive receiver' is a receiver considered sensitive to given impacts from changes in noise or air quality, vibration, landuse, visual or landscape impacts.

3.1 Objectives of EIA Study

The objectives of the EIA are as follows. It

- assembles information on the background to the Project.
- assesses the environmental impact should a flyover not be constructed.
- assesses the existing and future planned landuses and the implementation of Planning Policy.
- assesses the impact of constructing Options A, B or C on the basis of the Key Issues (see paragraph 3.2).
- evaluates and recommends

- mitigation measures where necessary.
- estimates the cost of constructing route Options A, B and C with or without mitigation measures.
- proposes an optimum alignment and the recommended mitigation measures.

3.2 Key Issues

The Study Brief outlines the Key Environmental Issues requiring consideration in the assessment.

These key issues are:

- Noise
- Air Quality
- Vibration
- Landuse
- Visual Impact
- Landscape Impact

3.3 Assessment

In this EIA the key issues are evaluated for each route by assessing the environmental effect on 'sensitive receivers' both during construction and operational phases. The degree of impact is assessed as low, moderate or severe and is given a rating of 1, 2 or 3 respectively. Where the degree of noise and air quality impact exceeds predetermined limits, mitigation measures which could reduce the impact are considered. Reassessment then yields

3 目標及主要問題

此項研究對現時及建議中的道路和土地運用在目前及預計在2011年所造成的環境影響作出鑑定和估計。研究亦將指出那些可能對環境影響有特別反應的“敏感接收點”，以及就各方案提供可以緩和環境影響的各種可行方法。

“敏感接收點”是指那些會對空氣質素、震盪、土地運用、視覺或地理環境上的改變特別敏感的地方。

3.1 此份環境影響評估報告的研究目標

環境影響評估報告的目標是：

- 為工程搜集背景資料。
- 評估不興建天橋對環境造成的影響。
- 評估現有和將來的既定土地運用和規劃政策的執行。
- 根據主要問題（見下面3.2段）評估施行方案“甲”、方案“乙”及方案“丙”所造成的影響。

- 在有需要時，估計及提出能夠緩和環境影響的方法。
- 估計在包括或不包括施行緩和環境影響方法的情況下，執行方案“甲”、方案“乙”及方案“丙”所需的成本。
- 提出最恰當的天橋路線及所應施行的緩和環境影響的方法。

3.2 主要問題

研究摘要略述在評估中應該考慮的主要環境問題，包括：

- 噪音問題
- 空氣質素問題
- 震盪問題
- 土地運用
- 視覺影響
- 地理環境影響

3.3 評估

在這環境影響評估報告中，每條路線的主要問題都是根據在其施工階段及運作時對“敏感接收點”造成

a set of values for comparison of the impacts with proposed mitigation measures in place. The impact ratings with and without mitigation are entered in a decision matrix illustrated in Figure 13.

The criteria on which each of the Key Issues were assessed are as follows:

Noise:

Sensitive receivers exposed to traffic of construction noise were first identified. Future traffic noise was then assessed, based on peak hour traffic flows predicted by Transport Department's CTS-2 transport model for the year 2011. Noise from construction was assessed on the basis of assumed requirements for construction equipment.

The assessment for each Option was based on the affected population and degree to which predicted facade noise levels exceed both maximum levels recommended by Hong Kong Planning Standards and Guidelines (HKPSG) and the levels predicted if the flyover were not built.

Where HKPSG Standards are exceeded due to traffic on existing roads, direct technical remedies to reduce further deterioration of the noise environment have been

recommended, in line with the Exco directive, "Equitable Redress for Persons exposed to Increased Noise Resulting from the Use of New Roads".

Air Quality:

Dust concentrations during construction were predicted and hourly concentrations of carbon monoxide (CO), nitrogen dioxide (NO₂) and particulates from vehicle emissions during operation were assessed. The assessment was based on the population affected and the extent to which NO₂ concentrations (as representative of vehicle pollution levels) would exceed both those predicted should a flyover not be constructed, and the Hong Kong Air Quality Objectives (HKAQO) maxima.

Vibration:

It was agreed by the Study Working Group that the effects of vibration need only be considered at construction stage. The Study found that detailed design can reduce the effects to an acceptable level for all Options by requiring compliance with criteria in the Mass Transit Railway Protection Ordinance. Vibration does not therefore affect the choice of the Option.

的環境影響作出評估。影響程度劃分為輕度、中度及嚴重，並分別以1、2、3級來表示。假如噪音及空氣質素的影響程度超過指定限制，則會考慮施行緩和措施。採取緩和措施前後所得出來環境影響的評估數據將會互相比較；而所得的影響等級亦已在圖十三中以方陣形式列出。

用作評估各主要問題的標準如下：

噪音影響：

最先確定的是受交通噪音和建築噪音影響的敏感接收點，將來的運輸噪音將根據運輸署為2011年繁忙時間交通流量所作的CTS-2交通模式作出評估。建築工程產生的噪音則會根據假定所需的建築機械作為評估基礎。

各方案的評估是根據受影響居民的數目，以及預期表面噪音水平較香港規劃標準與準則(HKPSG)所定的最高限制及沒有天橋時的噪音水平所高出的程度而作出的。

為遵照行政局“對受新道路不斷增加的噪音影響的居民應予公平賠償”的指示，但凡現有道路的交通噪音超過 HKPSG 所定的標準，建議施行可直接防止加深影響的技術性解決方法。

空氣質素影響：

評估了的項目包括由工程施工所引起的灰塵濃度及路線運作時每小時由行駛中車輛所排出的一氧化碳、二氧化氮、灰塵微粒濃度。

評估標準包括受影響居民的數目及氧化氮濃度（代表由車輛引起的污染程度）超過不興建天橋時預算水平及香港空氣質素指標(HKAQO)的最高限制的程度。

震盪影響：

研究工作小組同意只需在工程施工期考慮震盪的影響。假如根據地下鐵路保障條例的標準作出詳細的設計，則各方案所引起的影響均會維持在可接受的水平下。因此震盪這個因素不會影響選擇方案的決定。

Landuse:

Future land use has been determined with reference to the Ngau Chi Wan Outline Zoning Plan (OZP), the Outline Development Plan (ODP) and the Village Layout Plan. The assessment considered the direct landuse impact on sites within the construction corridor for each route and the indirect impact arising from incompatibility of the flyover with adjoining landuses. Impact has been assessed with reference to landuse compatibility, proximity of the route, the size of populations affected, the future planning prognosis and land ownership.

Visual:

From site visits and desk top studies a Zone of Visual Influence (ZVI) defined as the area from within which the road structure would be visible was identified for each route. The following criteria were applied to assess the overall impact:

- the extent and proximity of the view of the flyover
- the sensitivity of each type of receiver
- the population or number of receivers
- the planning policy and degree of permanence of each group of receivers

- the context of the view in which the road would be seen.

Landscape:

Landscape elements which were considered in the assessment include areas of hillside, open spaces and existing trees in the study area. The assessment was based on evaluating the degree of disruption, the relative value of each affected landscape component, the degree of permanence of that element and the degree to which impact on the landscape could be mitigated.

4 PRINCIPAL FINDINGS

4.1 Construction Phase

Noise:

During the construction period the majority of the sensitive receivers will be significantly affected by construction works for all route alignment options. Noise levels will tend to exceed desirable maximum levels.

Construction noise impacts at each end of the alignment are similar under all options.

Under Options A and B, sensitive receivers in Ngau Chi Wan Village

土地運用的影響：

將來的土地運用是根據牛池灣區分區計劃大綱圖、發展大綱圖及農村地形圖而定出的；而作出評估時已考慮到各路線對建築走廊工地所引起的直接土地運用的影響，及因天橋與鄰近用地不協調所引起的間接影響。評估是根據土地運用的相容性、與天橋路線的相近情況、受影響居民的數目、將來的計劃及土地擁有權而作出的。

視覺影響：

實地觀察和案上研究已為每一路線確定了一處可以看到道路結構的地域，名為視覺影響區(ZVI)。整體影響則以下述標準作評估：

- 天橋的可見程度和遠近程度
- 每一類接收點對影響的敏感程度
- 接收點的數目
- 規劃政策及各類接收點的永久性

- 天橋可見範圍內的所有景物

地理環境影響：

在作出評估時所考慮到的地理環境因素包括研究範圍內的山邊地區、空地及現有樹木。評估的進行是根據地理環境受損程度、各受影響地理元素的相對價值、各因素的永久性及其對地理環境造成影響的可緩和程度。

4 主要調查結果

4.1 施工期

噪音影響：

各方案的路線在施工期內將對大部分敏感接收點造成重大影響，工程產生的噪音將超過可接受的最高水平。

三個方案的路線兩端的施工工程所產生的噪音影響將會大同小異。

方案“甲”及方案“乙”的工程將

and St. Joseph's Home for the Aged would be particularly affected by works, but the impact would be somewhat less severe for these receivers under Option C.

Primary schools in Ping Shek and Chai Wan Estates are currently protected from ambient noise by glazing and air conditioning.

Air Quality:

The nature of the construction works is such that there will be some increase in dust concentrations for all Options.

The assessed impact of dust transmission in constructing Option B is expected to be slightly greater than that for Option A due to the route's relative proximity to the Home for the Aged and Choi Wan St. Joseph's Primary School. Dust concentrations for Option C would be greater than those for Options A or B due to the additional earthworks required in its construction. In general dust concentrations are not expected to exceed the HKAQO.

Landuse:

Impact during construction would be two fold. Direct impact within the Works site would arise from

resumption and clearance of existing buildings, clearance of vegetation and land formation, resulting in a permanent change of use. Indirect impact would result from disruption or loss of amenity to adjoining landuses including:

- Disruption to Traffic
- Restriction on Access
- Visual Impact
- Noise Pollution
- Air Pollution

The direct impact would be permanent and would therefore persist throughout the operational phase. The indirect impact would be temporary and similar to the indirect impact of the flyover in the operational phase.

Visual:

The construction of Options A and B would result in similar levels of visual impact summarised as follows:

- Views of the construction works within the Lung Cheung Road and Clearwater Bay Road corridors.
- Visual impact caused by the clearance of existing properties within Ngau Chi Wan principally affecting adjoining village houses and views from surrounding high level developments.

特別影響牛池灣村及聖約瑟安老院範圍內的敏感接收點。不過，方案「丙」的工程對其的影響則較少。

現時，坪石村及彩雲村的小學均設有隔音玻璃及空調設備，可免受周圍的噪音騷擾。

空氣質素影響：

三個方案的施工過程均會令空氣中的灰塵含量有所增加。

評估結果顯示，由於方案“乙”較接近安老院及彩雲聖約瑟小學，因此工程所產生的灰塵影響預期將較方案“甲”的稍高；而方案“丙”因在施工過程中需要額外的土方工程，因此空氣中的灰塵含量會較方案“甲”及方案“乙”的為高。在一般情況下，空氣中的灰塵含量不可超過香港空氣質素指標。

土地運用的影響：

各方案在施工期間對土地運用的影響將可分為直接及間接兩方面。工地內現有建築物的收回及清拆，樹

木砍伐以及土地開拓均會造成用地永久改變的直接影響；而由於對鄰近用地造成干擾或虧損之處而產生的間接影響則包括：

- 交通受擾
- 通道受阻
- 視覺影響
- 噪音影響
- 空氣污染

直影響將為永久性，並會在整個路線運作期持續；而間接影響則只為暫時性，與天橋在運作期內所產生的間接影響類同。

視覺影響：

方案“甲”及方案“乙”的工程將會產生相類的視覺影響，摘要如下：

- 龍翔道及清水灣道走廊範圍內施工程的外觀。
- 因清拆牛池灣內的現有建築物所產生的視覺影響，主要包括

- Visual impact of the construction works in progress also affecting adjoining village houses and surrounding elevated viewpoints.

The construction of Option C would result in similar visual impact to Options A and B at its eastern and western ends. Visual impact on village houses within Ngau Chi Wan would be less than that of Options A and B. Overall, the impact of Options C would be greater than that of Options A and B for the following reasons:

- The greater length and elevation of the route would result in far greater visibility of the construction works throughout the study area.
- Construction of Route C would require clearance and earthworks over a considerable area a hillside resulting in significant long term scarring of the existing green backdrop.

Landscape:

The construction of Options A and B would result in the clearance of existing trees within Ngau Chi Wan Village and the Home for the Aged. Option B would involve the felling of fewer trees within the village but would affect a greater area of the

grounds of the Home for the Aged and an area of tree planting to the east of the WSD pumping station. But since many of the trees within the village would also be felled as a result of the implementation of planning policy, the apparent advantages of Option B are outweighed by the lesser impact on the landscape of the grounds of the Home for the Aged and therefore Option A is preferable.

The extensive site clearance and formation of cuttings in the natural hillside and green belt required for Option C is in stark contrast to planning policy (Figure 4). The disturbance to landform and vegetation would result in a long-term severe impact and therefore, of the three routes, Option C is the worst option.

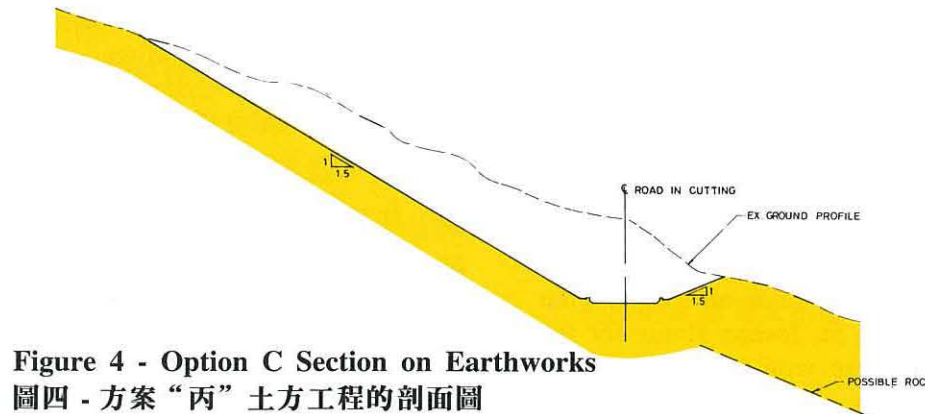


Figure 4 - Option C Section on Earthworks
圖四 - 方案“丙”土方工程的剖面圖

影響鄰近村屋以及從周圍高層建築物取得的景觀。

- 進行中的工程對鄰近村屋及周圍地勢較高的俯視處所產生的視覺影響。

方案“丙”東西兩端在施工方面的視覺影響將與方案“甲”及方案“乙”的相類似；而對牛池灣內的村屋所構成的視覺影響則較方案“甲”及方案“乙”的為少。總體而言，方案“丙”的視覺影響將較方案“甲”及方案“乙”的為大，原因如下：

- 方案“丙”的路線較長及位置較高，因此施工工程在整個研究範圍內的可見度十分高。

- 路線“丙”的工程需要在山邊相當大的範圍內進行清拆工作及土方工程，因此會對現時山景的外觀造成長時間的損毀。

地理環境影響：

方案“甲”及方案“乙”的工程均需砍伐牛池灣村及安老院內的現有樹木。雖然方案“乙”在牛池灣村內需要砍伐的樹木數目較少，但工程將影響到安老院內較大的土地及水務署泵站東面的一片林木，而且村內大部分的樹木均會因計劃政策的實施而需要砍伐，因此方案“乙”的優點便不足以抵消此方案對安老院土地景觀的影響，因而方案“甲”將是較理想的選擇。

方案“丙”需要在天然山邊地區及綠帶內進行大量的工地清理及切削工程，此舉與規劃政策完全相反（參看圖四）。有關工程對土地及樹木造成的破壞將有長遠的影響，因此，方案“丙”是最不理想的一個選擇。

4.2 Operational Phase

Noise:

Noise levels due to traffic on existing roads in the Study Area are already high, and frequently exceed HKPSG maxima, particularly in the Housing Estates. There are some shielded areas such as Ngau Chi Wan Village and parts of St. Joseph's Home for the Aged and some facades which face away from existing roads where traffic noise levels are lower and within HKPSG standards. Flyover Option A or B would have little effect on sensitive facades already exposed to high levels of noise from traffic on Lung Cheung Road or Clearwater Bay Road, but would increase noise levels in previously shielded areas such as Ngau Chi Wan Village. Options A and B would also affect potential future highrise developments in Ngau Chi Wan. Option C has a greater effect, however, by introducing road traffic noise to areas previously shielded, as well as at facades that previously faced away from traffic, such as north facing facades in Bayview Gardens. Option C also affects potential future high rise developments in Ngau Chi Wan Village.

Air Quality:

Option A would be expected to have the greatest air quality impacts, followed by Option B. Option C would have the least impact. The differences in expected impacts among the three Options are small, particularly between Options A and B. Of the nineteen assessed receiver points, six exceeded the AQO maximum for NO₂, under Options A and B. Five of these exceedances are at facades near existing Lung Cheung Road and Clearwater Bay Road, and are due in large part to traffic on these roads.

Landuse:

Both Options A and B follow similar alignments at their western and eastern ends and have similar direct and indirect impacts on the Lung Cheung Road and Clearwater Bay Road corridors, the residential blocks of Choi Hung Estate to the south of Lung Cheung Road and the four schools adjoining Clearwater Bay Road. Both options would result in direct impact due to the clearance of a corridor of land through the centre of Ngau Chi Wan Village, the north of Lung Chi Path, and across the grounds of St. Joseph Home for the Aged. There would be an indirect impact on existing and planned

4.2 運作期

噪音影響：

研究範圍內現有道路上由交通所產生的噪音水平已經很高，並已超過HKPSG的最高標準，尤其是屋村範圍內的。部分有屏蔽設備的地區，如牛池灣村及聖約瑟安老院部分地方，以及不是正面面向現有道路的地方，其交通噪音水平較低，並符合香港規劃標準與準則。方案“甲”或方案“乙”的天橋將對已受龍翔道或清水灣道上嚴重噪音影響的敏感建築物造成較少的影響，但會增加牛池灣村等有屏蔽設備地區的噪音水平。此外，方案“甲”及方案“乙”亦會影響牛池灣內未來的高層建築物。至於方案“丙”則不但會令有屏蔽設備地區的交通噪音水平有所增加，而且更會對不是正面面向現有道路的地方構成噪音影響，如威豪花園向北的正門；同時，方案“丙”亦會影響牛池灣內未來的高層建築物。

空氣質素影響：

方案“甲”對空氣質素造成的影響預期會較大，方案“乙”次之，方案“丙”則最少，但三者之間的差距相去不遠，尤其是方案“甲”及方案“乙”。在十九個評估接收點中，方案“甲”及方案“乙”分別有六個接收點的二氧化氮標準超出空氣質素指標(AQO)的規定，其中五處位於接近現時龍翔道及清水灣道的正門，主要是由兩道路繁忙的交通所造成。

土地運用的影響：

方案“甲”及方案“乙”東西兩端的路線相近，對龍翔道及清水灣道走廊、龍翔道南面的彩虹村住宅樓和鄰近清水灣道的五間學校所造成的直接及間接影響均大同小異。兩個方案均會因有需要修築一條穿過牛池灣村中心沿龍池徑北面跨過聖約瑟安院的走道而造成直接影響，並會間接影響牛池灣現有及計劃中建築物及牛池灣文娛中心。

properties in Ngau Chi Wan and on the Ngau Chi Wan UC Complex.

The indirect impact of Option B would be marginally less than Option A due to its greater distance from Lung Chi Path, the Ngau Chi Wan complex and the schools to the south of Clearwater Bay Road. Option B would not affect the sitting area and shrine located along Lung Chi Path or the gate house at the entrance to the Home for the Aged, both of which be would be affected by Option A. Option B has however been found to have a greater permanent direct impact for the following reasons:

- More existing village houses would need to be cleared in Ngau Chi Wan.
- More private land would need to be resumed within the village.
- The future pattern of land usage shown on the Village Layout Plan would need to be revised.
- More land would be resumed or affected by a wayleave in the grounds of the Home for the Aged and the route would impact on an existing building within the grounds.

- The route alignment conflicts with an existing WSD pumping station on Clearwater Bay Road.

As a result of the greater direct impact of Option B, of the two options, Option A is considered preferable.

Option C would have a lesser direct impact on the Lung Cheung Road and Clearwater Bay Road corridors and lesser indirect impact on the residential blocks of Choi Wan Estate to the south of Lung Cheung Road and the three schools to the south of Clearwater Bay Road.

By contrast, Option C would have a direct impact on:

- The UC Hammer Hill Sports Complex football pitch.
- The lower slopes of Hammer Hill which is designated as green belt. A significant area of land would be affected, in addition to a corridor 25m wide necessary for construction.
- A lodge to the east of St. Joseph Home for the Aged and an adjoining area of dense tree planting.

Option C would also have a wide

方案“乙”構成的間接影響稍稍少於方案“甲”，原因是方案“乙”的路線距離龍池徑、牛池灣文娛中心及清水灣南面的學校較遠。方案“乙”將不會影響龍池徑旁的休憩地及廟宇或安老院大門的門衛室，但方案“甲”則會對兩者造成影響。不過，結果顯示方案“乙”的永久直接影響較大，原因是：

- 需要清拆現時牛池灣內更多的村屋。
- 需要收回村內更多私人土地。
- 需要更改村屋分佈圖內所顯示的未來用地模式。
- 更多土地會受安老院內土地的通行權影響及需要收回，而且方案“乙”的路線將影響安老院內一幢現有建築物。
- 方案“乙”的路線與清水灣道現時的水務署泵站有所抵觸。

由於方案“甲”及方案“乙”兩者以後者的直接影響較大，因此方案“甲”是較理想的選擇。

方案“丙”對龍翔道及清水灣道走廊構成的直接影響，以及對龍翔道南面的彩雲村住宅樓宇及清水灣道南面的三間學校所造成的間接影響均較少。

相比之下，方案“丙”會對下列項目構成直接影響：

- 市政局斧山道運動場的足球場。
- 設計為綠帶的斧山道山腳。除需要為工程修築一條25米闊的走廊外，還有相當大的面積將受影響。
- 聖約瑟安老院東面的門衛室及鄰近一片茂密林木。

方案“丙”亦將對鄰近用地造成主要的間接影響，包括：

spread indirect impact on adjoining landuses principally including:

- The future UC Leisure Pool Complex.
- The Hammer Hill Sports Complex.
- Bayview Gardens.
- Future high rise residential developments zoned on the OZP in the area of Ngau Chi Wan including future quarters for Fire Services Department.
- St. Joseph's Home for the Aged.

The main advantage of Option C is the avoidance of direct impact on Ngau Chi Wan (Figure 5); but the significance of this factor is diminished by consideration of the eventual clearance and redevelopment of the village as shown on the OZP and the resultant indirect impact of Option C on the planned high rise development.

In view of the wide spread direct and indirect impact of Option C on landuses which would not otherwise be affected by the implementation of planning policy, Option A has been selected as the preferred option in landuse terms.

- 未來的市政局泳池館
- 斧山道運動場
- 威豪花園
- 牛池灣分區計劃大綱圖 (OZP) 內將會興建的高層住宅建築物，包括消防員宿舍。
- 聖約瑟安老院

方案“丙”的主要優點是可避免對牛池灣造成直接影響（參看圖五），然而此點不足以抵消最終需要清拆及重建分區計劃大綱圖內顯示的村屋以及會對計劃中的高層建築物造成間接影響的缺點。

在考慮過規劃政策的實施不會影響土地運用；而方案“丙”卻會對用地規劃構成廣泛影響後，方案“甲”將是這方面的較理想選擇。



Figure 5 - View 2: From Roof Top of Choi Wan St Joseph's Primary School (SR11)

圖五 - 俯瞰圖二：從彩雲聖約瑟小學頂樓下望 (SR11)

Visual:

The impact of Options A and B would be very similar. Option A would have slightly more impact on the village houses to the south of Lung Chi Path and the three schools to the south of Clearwater Bay Road because it would be closer to them. Option B would have a significantly more severe impact on the Home for the Aged and on the existing village houses north of Lung Chi Path prior to redevelopment in this area. Option A is therefore the preferred option of the two.

Option C would have a lesser impact on the existing Ngau Chi Wan Village but a greater impact on planned high rise development in this area. The longer length and higher elevation of Option C would result in more wide spread visual impact throughout the Study Area and permanent scarring of the green backdrop of hills which would otherwise remain undisturbed if Option C were not considered. Option C would therefore have the most severe impact of the three routes.

Figure 6 indicates the possible visual impact of Option C viewed from Ping Shek Estate.

Landscape:

The landscape impact of either of the three route options would take place at the construction stage when the road corridor is cleared. Impact would tend to diminish in the operational phase as landscape is restored by the provision of new open space and replanting of vegetation. The impact of Option C would be more prolonged due to the permanent scarring of the natural landform and the long term impact on vegetation cover and is therefore the least favoured option.

視覺影響：

方案“甲”及方案“乙”在視覺方面的影十分相近。由於方案“甲”的路線與龍池經南的村屋及清水灣道南面的三間學校較接近，因此影響稍大；而方案“乙”則在該區重建前對安老院及現時龍池徑北面的村屋會有較嚴重的影響。因此方案“甲”是其中較理想的選擇。

方案“丙”對現時牛池灣村的影響會較少，但對區內計劃興建的高層建築物則有較大的影響。由於方案“丙”路線較長、位置較高，因此對整個研究範圍有較廣泛的視覺影響，同時亦會對山景的外觀造成永久性損毀。假如不採用方案“丙”，山景便不會受到影響。因此，在三條路線中，方案“丙”在視覺效果上的影響最大。

圖六顯示從坪石村高處鳥瞰方案“丙”可能出現的視覺影響。

地理環境影響：

在開拓道路走廊後，工程進入施工期時，三個方案的路線均會在地理環境上構成影響。不過在運作期間，由於提供了新的空地及重新種植林木，地理環境影響將會逐漸減少。其中方案“丙”由於會對自然地形造成永久損毀以及長期影響綠林區，因此是最不理想的選擇。

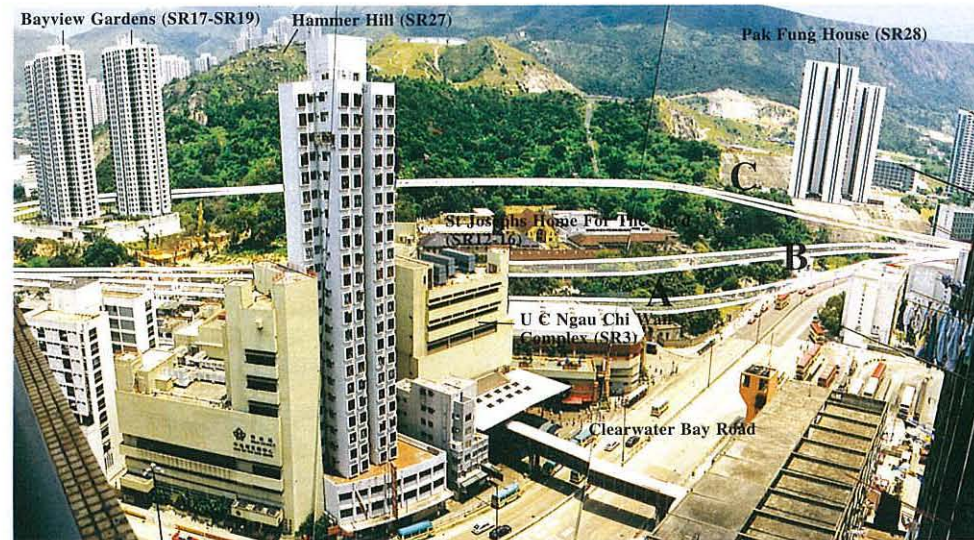


Figure 6 - View 3: From Top Floor of Hung Shek House, Ping Shek Estate (SR4)

圖六 - 俯瞰圖三：由坪石村紅石樓頂樓下望 (SR4)

The choice between Options A and B 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. From consideration of these factors Route A emerges as the preferred option.

4.3 Mitigation Measures

Measures to mitigate adverse environmental impacts are desirable both during construction and upon completion during the operational phase of the flyover. Adequate supervision is required throughout the construction phase to ensure compliance with the specified measures. Measures to reduce impact in the operational phase can be applied by careful consideration at planning and design stages. The applicability of a variety of measures has been considered as follows.

Construction Phase:

The most effective noise mitigation measure is to control the noise at its source. Noisy plant and processes can be made quieter by using mufflers on generators, pneumatic breakers and power units and

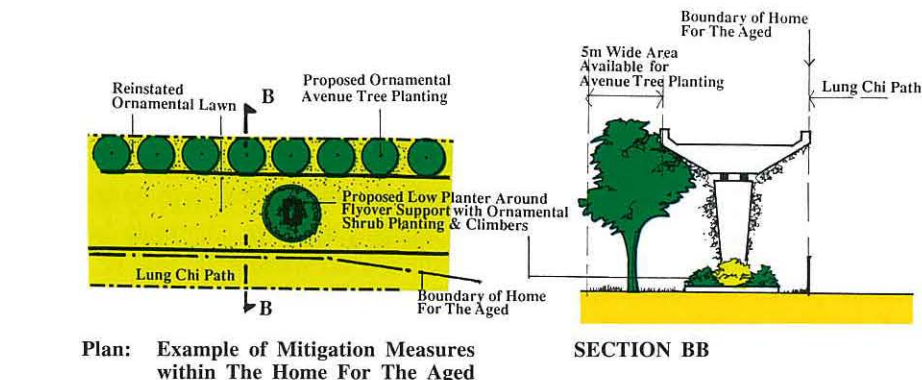


Figure 7 - Option A Mitigation Measures
圖七 - 方案“甲”的緩和措施

ensuring that they are properly maintained and used. The power units of non-electric stationary plant and earth-moving plant can be quietened by vibration isolation and by partial or full acoustic enclosures for independent noise generating components. Temporary noise barriers may be used to screen specific sources.

Recommended construction noise mitigation measures, including construction noise limits, will be incorporated as contract requirements.

In controlling dust generation and transmission, watering is the most common control method adopted. Hoardings also serve to contain some of the dust raised during construction activities.

至於方案“甲”及方案“乙”，主要決定於兩條路線影響的樹林多少，樹木會因將來規劃政策的實施而獲得永久保留的可能性，以及在施工期後可緩和影響的可能性。考慮到以上原因，方案“甲”將是較理想的選擇。

4.3 緩和措施

最好能在施工期內及天橋工程竣工後的運作期中，實施各種緩和措施以減低對環境造成的不良影響，整個施工期均需備有足夠的監管措施，以確保與各項特定標準相符。假如能在工程籌劃及設計階段中詳

細策劃，將有助於運作期內實施各種可減低不良影響的措施。以下是各種適用的緩和措施：

施工期：

緩和噪音影響的最有效方法就是控制噪音的來源。在發電機、風動碎石機及機動設備上裝上消聲器，及確保這些機械妥善維修及使用，便可減低機械及工序所發出的噪音。此外，透過隔震設備的使用及為發出噪音的獨立組件部分或完全蓋上隔聲覆蓋物，亦可減低非電力操控的固定設備及運土設備產生的噪音，又或使用臨時隔音設備以隔離個別的噪音來源。

建議的施工噪音緩和措施，包括施工噪音管制，將構成合同條件的一部分。

要控制產生灰塵及塵土飛場的情況，灑水是最常用的方法。此外，圍板亦可用以控制部分在工程進行期間產生的灰塵。

Direct landuse impact may be limited by allowing the retention of existing significant landuses such as the RCP, sitting area and shrine in Ngau Chi Wan, and the entrance gateway to the Home for the Aged (for Option A). This would be achieved by designing the flyover to span over them. Indirect impact can be reduced by minimising noise and dust, as discussed above, and careful management of construction works to provide for continuing traffic movements and access to adjoining areas. Visual impact can be reduced by the provision of hoardings or higher screens within the village area, for Options A and B. This measure would be of limited benefit for Option C due to the higher elevation of the route.

Mitigation measures against landscape impact in constructing Options A or B may be in the form of reprovisioning of disturbed open spaces together with the protection and preservation of trees around the works area. Trees may also be transplanted to holding nurseries and then replanted at the completion of the construction process.

The landscape input of Option C can be reduced by forming more of the route on elevated structure rather than earth embankment.

Other measures which can be applied include hydroseeding and replanting the affected areas as early as possible.

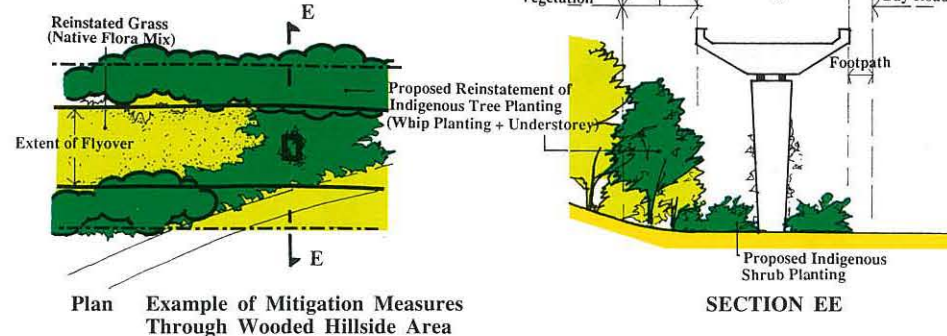


Figure 8 - Option B Mitigation Measures I

圖八 - 方案“乙”的緩和措施一

Operational Phase:

The study has shown that for all Options noise levels at most sensitive receivers will continue to exceed the HKPSG standards irrespective of the mitigation measure adopted. This is primarily due to noise from traffic

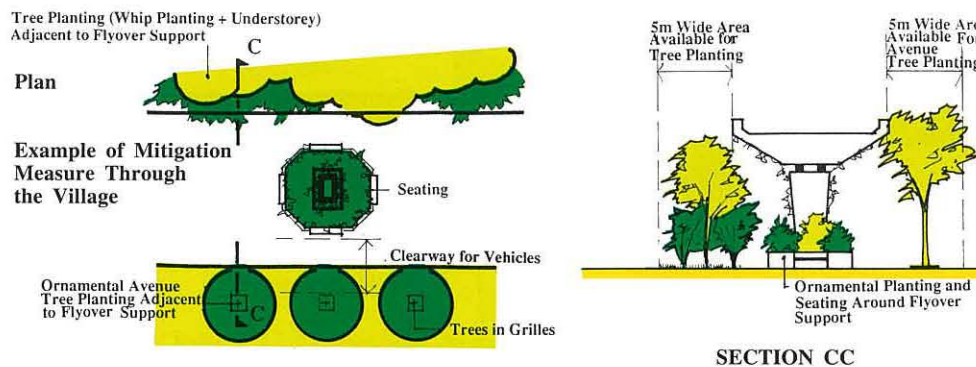


Figure 9 - Option B Mitigation Measures II

圖九 - 方案“乙”的緩和措施二

保留方案“甲”內現有的垃圾收集站、牛池灣的休憩地及廟宇，以及

及通往鄰近地區的交通方便，亦可減少其中的間接影響。方案“甲”及方案“乙”則可透過在村屋範圍內使用圍板及較高的圍柵改善視覺效果，但此舉對方案“丙”則沒有太大效用，因為方案“丙”的路線位置較高。

有關方案“甲”或方案“乙”在地理環境影響方面的緩和措施則包括重新提供受破壞的空地，以及保護和保留工地周圍的樹木。此外，亦可將樹木移至苗圃，然後在工程竣工後再移植回原地。

安老院大門門衛室等重要用地，可減少對土地運用模式產生的直接影響，例如將天橋設計為橫跨此等用地便可。此外，透過先前提及的減低噪音及灰塵產生的方法，以及小心管制工程的進行以確保交通暢順

方案“丙”的路線可將建築在土堤上的部分盡量改以高架構築物支承，以減低對地理環境造成的影響。

其他可採用的措施還包括盡早為受影響的地方進行噴草及重新種植林木。

運作期

根據研究報告顯示，無論採用任何緩和措施，各方案中影響大部分敏

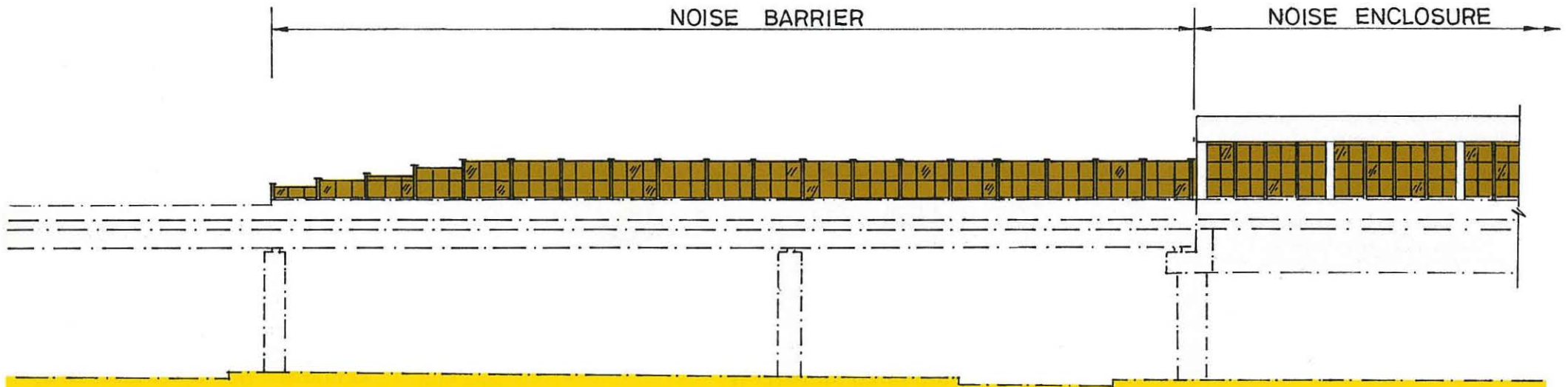
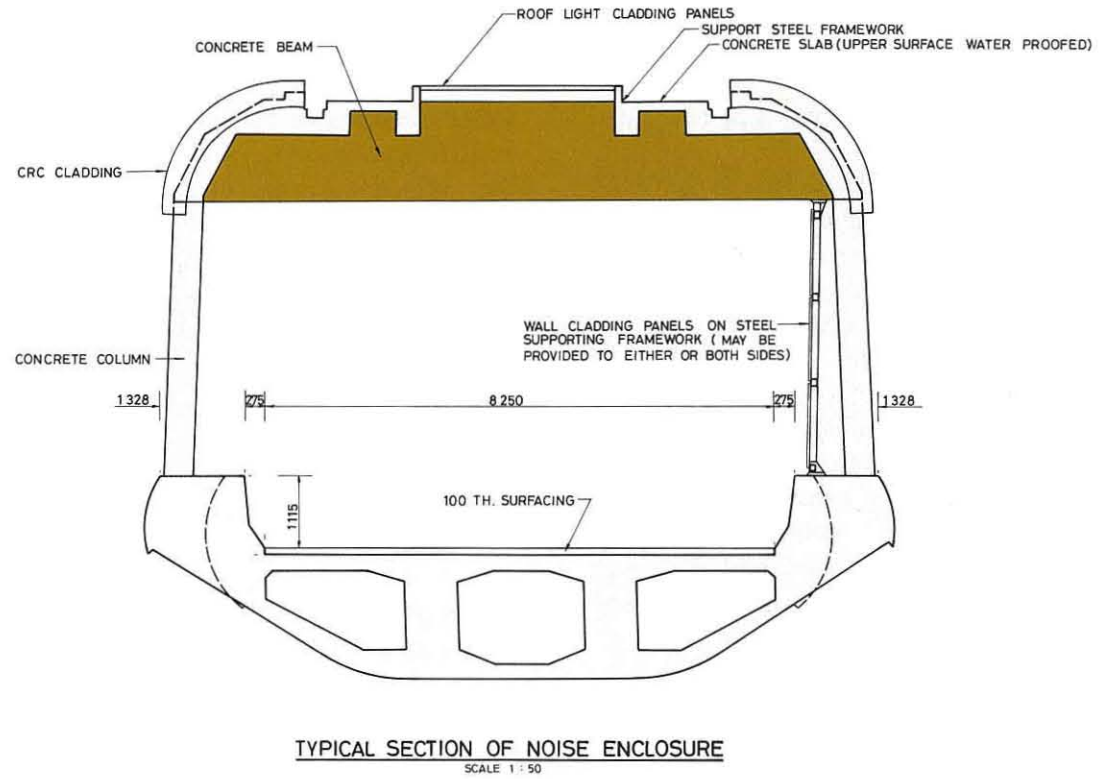
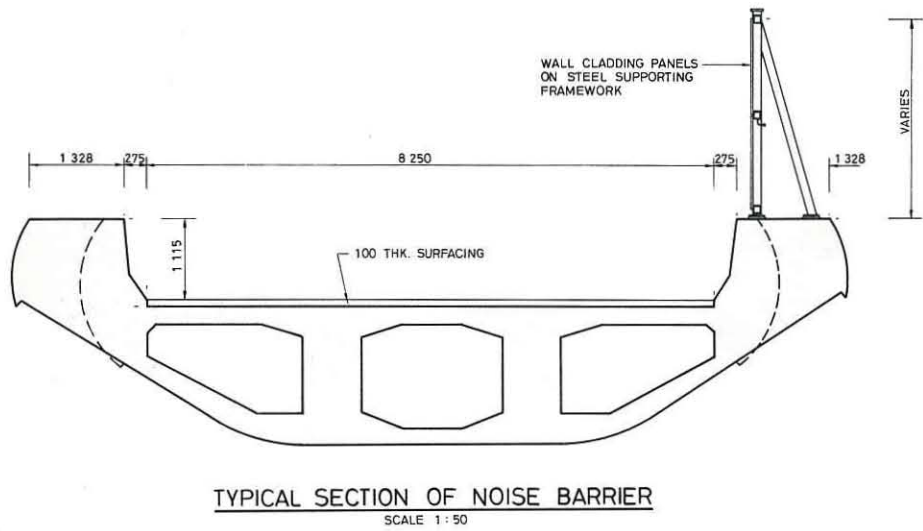


Figure 10 - Noise Barrier and Enclosure Elevation
圖十 - 隔音屏障及隔音覆蓋物立視圖

flows along existing major roads.

Noise mitigation measures recommended include the use of friction course on the proposed flyover, noise barriers, and a total enclosure. Where existing and future highrise dwellings are nearby, a total enclosure over a section of the flyover would be the only effective measure to block the transmission of noise. A form of total enclosure is shown in Figure 10, and the section for which it is recommended is shown in Figure 14. Those segments of the flyover that are not enclosed should be paved with a friction course material, both to improve the skid resistance of the surface, and to help reduce the incremental increase in traffic noise for all exposed receivers. In addition, a 2-m barrier is recommended along the northern side of the flyover where it passes in front of the Home for the Aged. Assessment of the eligibility for indirect technical remedies was conducted and the findings indicated that no noise sensitive receiver along the proposed flyover would be eligible for the provision of such indirect measures.

Along the north side of the flyover's western end there are currently no existing or planned highrise receivers. It is possible that this area may be developed in the future.

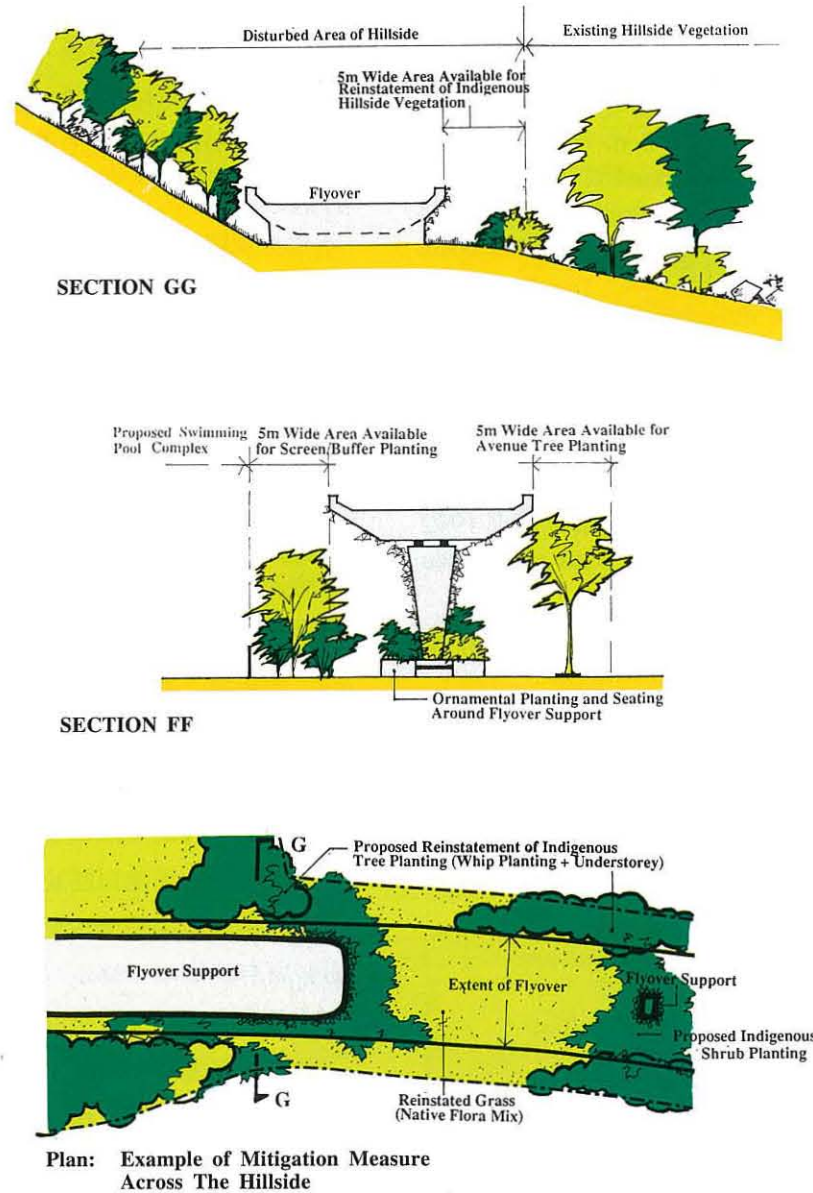


Figure 11- Option C Mitigation Measures
圖十一 - 方案“丙”的緩和措施

感接收點的噪音水平將會繼續超過香港規劃標準與準則。主要是因為沿著現有主要道路行駛的車輛會不斷產生噪音。

提議可減低噪音的方法包括在擬建天橋上使用多孔面層、隔音屏障以及一個密封覆蓋物。假如鄰近有現存的及將會出現的高層住宅，則需在天橋的相若部分興建一個全面的包圍上蓋，這是唯一能夠阻隔噪音的有效方法。圖十所示為全面的包圍上蓋的形狀，而圖十四所示則為擬興建上蓋的天橋部分。那些沒有上蓋的天橋部分應該鋪上多孔面層物料，藉此增加路面的防滑功能，以及幫助減少所有接收點所承受的大量交通噪音。再者，由於天橋將經過聖約瑟安老院前面，故此建議在天橋北面興建一塊兩米高的屏障。研究報告亦曾經評估過是否有需要進行非直接的技術補救，結果顯示並無需要為擬建的天橋附近的噪音敏感點提供此等非直接的補救。

天橋西端的北面並無現存或計劃興建的高層大廈。將來這範圍有可能進行開發。

If highrise receivers are planned at the detailed design stage of the flyover, noise barriers or a full enclosure at the western end should be provided for.

No local measures to control air pollution from vehicles on existing and proposed roads can be implemented. Control of vehicle exhaust requires territory-wide measures and effective planning of infrastructure.

Possible mitigation measures to reduce landscape and visual impacts are illustrated in Figures 7, 8, 9 and 11.

The reduction of direct landuse impact would be limited to the retention of existing landuses within the road corridor as described in the recommended mitigation measures for the construction phase and also in zoning unsensitive uses underneath the completed structure.

Indirect landuse impact could be reduced by minimising factors such as noise and air pollution, discussed above, and by rezoning adjoining planned landuses to avoid incompatibility. Landscape impact would be reduced by retaining existing trees along the edge of the construction corridor, the transplanting

of affected trees and replanting of trees on completion of construction either in the urban area in the case of Options A or B or on the hillside in the case of Option C. Open spaces affected by Options A and B could be reprovisioned in the redevelopment of the village area. Visual impact could be reduced by careful design of the road structure and by the planting of trees to provide visual screening.

4.4 Costs

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

- Construction
- Land Resumption
- Reprovisioning
- Environmental Impact Mitigation
- Operating and 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:-	
Option A	293.05
Option B	307.62
Option C	359.08

若有高層大廈在天橋進入詳細的設計階段後才開始計劃興建，天橋西端應提供隔音屏障或包圍上蓋。

不能在現時及建議中的道路施行地區性的空氣污染管制措施，管制汽車廢氣需要採取全港性的措施以及詳細地帶規劃基建設備。

圖七、圖八、圖九及圖十一顯示出可減低地理環境及視覺影響的辦法。減少直接的土地運用影響只限於保留那些在建議的施工期緩和措施中所指明的土地用途，此外亦會在完成的天橋下區劃不敏感用地。

如上所述，將空氣及噪音污染減至最低及區劃鄰近用地以防止不協調現象都可以減低間接的用地影響。保留天橋旁原有的樹木、移走受影響的樹木以及在完成工程後重新種植樹木都能夠將地理環境影響減低；方案“甲”及方案乙的樹木將會種在市區；而方案“丙”中重新種植的樹木則會種在山邊。受方案“甲”及方案“乙”影響的空地可以在鄉村範圍重新發展後

重新闢設。仔細設計道路結構以及藉栽種樹來提供視覺屏障都可以減低視覺影響。

4.4 成本

成本是以1992年的有關價格計算。考慮的成本項目如下：

- 工程施工
- 收回土地
- 補給
- 環境影響緩和措施
- 運作及維修

各方案的預算成本如下：

不包括緩和措施：—	
	港元（以百萬計）
方案“甲”	238.00
方案“乙”	252.58
方案“丙”	270.88
包括緩和措施：—	
方案“甲”	293.05
方案“乙”	307.62
方案“丙”	359.08

5 CONCLUSION

Unsurprisingly, the environmental impacts of Options 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 (Figure 12).

The choice in environmental terms thus falls to be made between Options A and C with regard to Noise, Air Quality, Landuse, Visual and Landscape Impacts.

After adopting noise mitigation measures the choices between Options A, B and C on the basis of noise are equal. Without mitigation Option C has the most impact.

Because traffic on existing roads has the greatest impact on air quality, the three Options are similar in terms of their contribution to pollution levels. However, Options A and B have slightly greater impacts than Option C.

Future high rise development in Ngau Chi Wan Village will result in the visual impact of Option C increasing proportionally.

The Ngau Chi Wan Village Layout Plan already includes a high level road on the route of Option A.

There is a clear choice against Option C on grounds of Landscape Assessment.

Option C is 23% more expensive than A and 17% more expensive than B when provision is made for noise mitigation.

Recommended measures taken in both Option A and C to mitigate noise impacts make the noise impacts of A and C similar.

A is the preferred option on the grounds of Landuse, Visual and Landscape impacts and is cheaper than Option C.

Option A is therefore the preferred choice.

	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	X	X
With Mitigation	X	X

Figure 12 - The Preferred Choice
圖十二 - 理想選擇

5 總結

正如所料，方案“甲”及方案“乙”對環境有相類似的影響，但因為方案“乙”對牛池灣村及聖約瑟安老院有較大的影響，故其可接受程度較方案“甲”為低。在整個評估中，方案“乙”沒有任何絕對有利的條件（參看圖十二）。

現需從環境方面考慮有關噪音、空氣質素、土地運用、視覺及地理環境的影響，從而決定選擇方案“甲”或“丙”。

採用減低噪音的方法後，選擇方案“甲”、方案“乙”或方案“丙”所受的噪音影響大致一樣。若不採用減低噪音的方法則方案“丙”的影響會最大。

由於現有道路上的交通對空氣質素影響最大，所以三個方案所造成的空氣污染大致相同。然而方案“甲”及方案“乙”會較方案“丙”有比較大的影響。

將來牛池灣村的高層建築物會使方案“丙”所造成的視覺影響相應退增。

牛池灣村的發展藍圖已包括在方案“甲”的路線上興建一條高架道路。

在評估地理環境影響時，方案“丙”明顯受到反對。

在提供了緩和噪音影響的設施後，方案“丙”的成本分別較方案“甲”及方案“乙”的高出23%及17%。

建議在方案“甲”及方案“丙”施行的改善噪音辦法使方案“甲”及方案“丙”所造成的噪音影響大致相若。

在土地運用、視覺及地理環境影響方面，方案“甲”都是較可取的選擇，而且其成本較方案“丙”的為低。

因此，方案“甲”是較適合的選擇。

6 RECOMMENDATION

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

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

Existing facilities such as the RCP, the public latrine, the entrance to the Home for the Aged and the shrine on Lung Chi Path should be preserved by designing the flyover to cross over them.

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

It is recommended that a total noise enclosure be provided at detailed design stage over the length indicated in Figure 14. Pervious macadam paving at the non enclosed ends of the flyover and a 2m high noise barrier on the northern side of the flyover to protect the Home for the Aged should also be provided. 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.

6 建議

建議的天橋應根據方案“甲”興建。

興建方法須符合香港地下鐵路公司的要求，尤其是工程的地基要將震盪減至最低。

現有設施如垃圾收集站、公廁、聖約瑟安老院的入口以及龍池徑的廟宇均需保留，故天橋的設計必須橫跨上述地方。

在興建期間需要採取適當的緩和措施將噪音及空氣質素的影響減至最少。

建議在天橋進入詳細設計階段後於圖十四所示之處提供一個全面的隔音上蓋。此外，並須在天橋兩端無上蓋處鋪設碎石路以及在天橋北面裝設用來保護聖約瑟安老院的兩米高隔音屏障。當天橋進入詳細設計階段後，若天橋西端的北面出現或可能出現敏感接收點，那麼便需再次進行評估，以決定局部或全面隔音上蓋的範圍。

LUNG CHEUNG ROAD FLYOVER: FOCUSED EIA DECISION FRAMEWORK

1. ASSESSMENT OF DECISION ISSUES:
NOISE / AIR QUALITY / LAND USE
VISUAL/LANDSCAPE

2. COMPARISON OF DECISION ISSUES

3. COMPARISON OF
OPTIONS

4. ROUTE
SELECTION

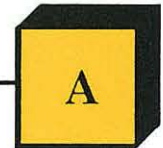
TYPICAL ASSESSMENT TABLE				
RECEIVERS		ASSESSMENT CRITERIA		OVERALL ASSESSMENT
R1	Hung Ngok House Kam Hon House			
R2	Tan Fung House			
R3	UC Ngau Chi Wan Complex (Library + Childrens Play)			
R4	Ping Shek Estate			
R5	Ping Shek Estate Catholic Primary School			
R6	Yan Kau School			
R7	St Johns Primary School			
R8+9	Ping Shek Temporary Housing Area			
R10	Sau Man House			
R11	Choi Wan St Josephs Primary School			
R12-16	St Josephs Home For The Aged			
R17-19	Bayview Gardens			
R20	Hung Sean Chow Memorial College			
R21	USD Hammer Hill Sports Complex			
R22	USD Hammer Hill Proposed Swimming Pool Complex			
R23	Lung Chi Path			
R24-26	Ngau Chi Wan Village			
R27	Hammer Hill			
R28	Pak Fung House			
R29	Area Zoned For Future FSD Quarters			
OVERALL ASSESSMENT				1 / 2 / 3

1 = Low
2 = Moderate
3 = Severe

OPTIONS	DECISION ISSUES + ASSESSMENT FOR EACH 1=LOW 2=MODERATE 3=SEVERE
ROUTE A	NOISE* [1] AIR QUALITY [1] LAND USE [2] VISUAL [2] LANDSCAPE [2]
ROUTE B	NOISE* [1] AIR QUALITY [1] LAND USE [2] VISUAL [2] LANDSCAPE [2]
ROUTE C	NOISE* [1] AIR QUALITY [1] LAND USE [2] VISUAL [3] LANDSCAPE [3]

OPTIONS+OVERALL RANKING 1 ST /2 ND /3 RD
ROUTE A [1]
ROUTE B [2]
ROUTE C [3]

SELECTED
OPTION



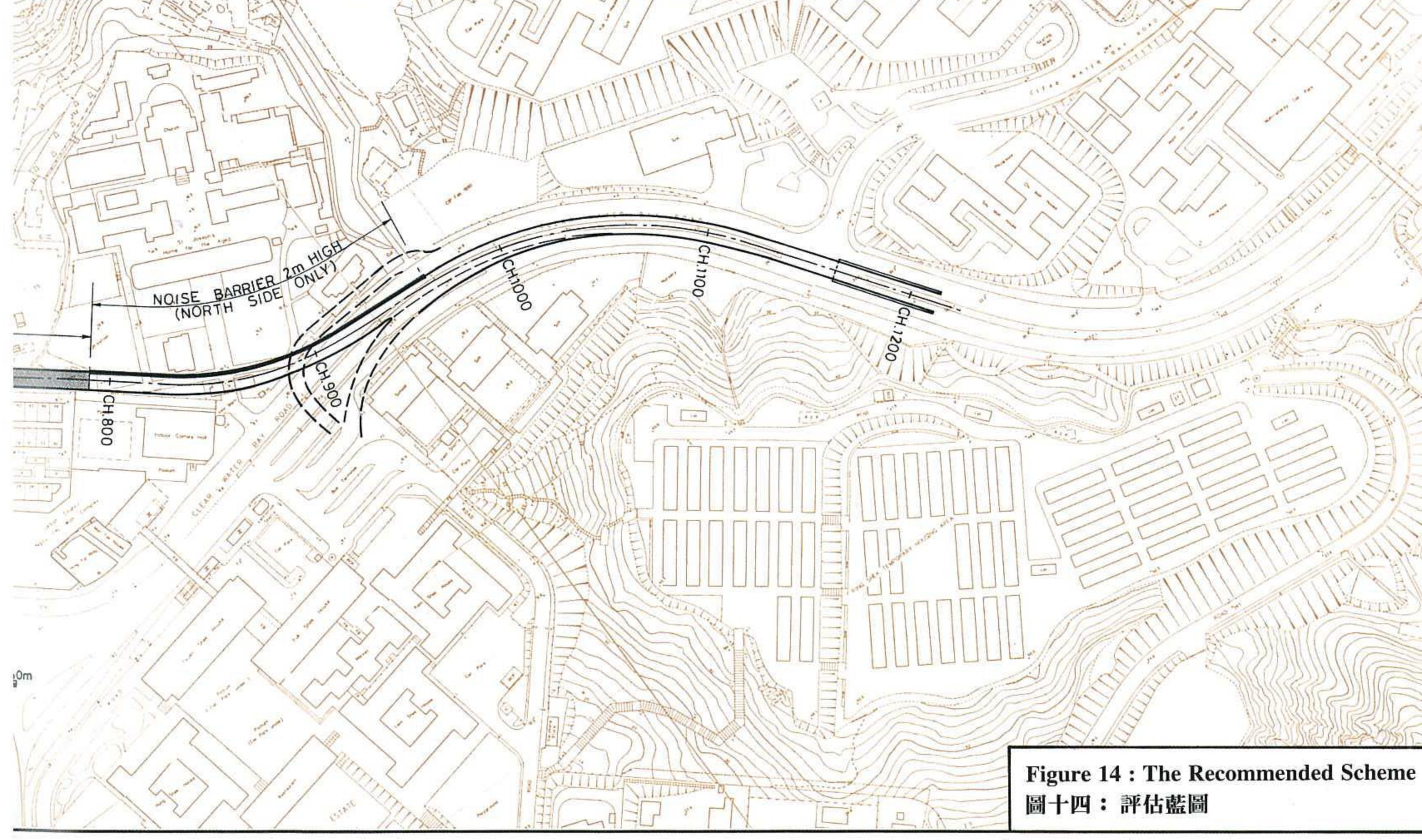
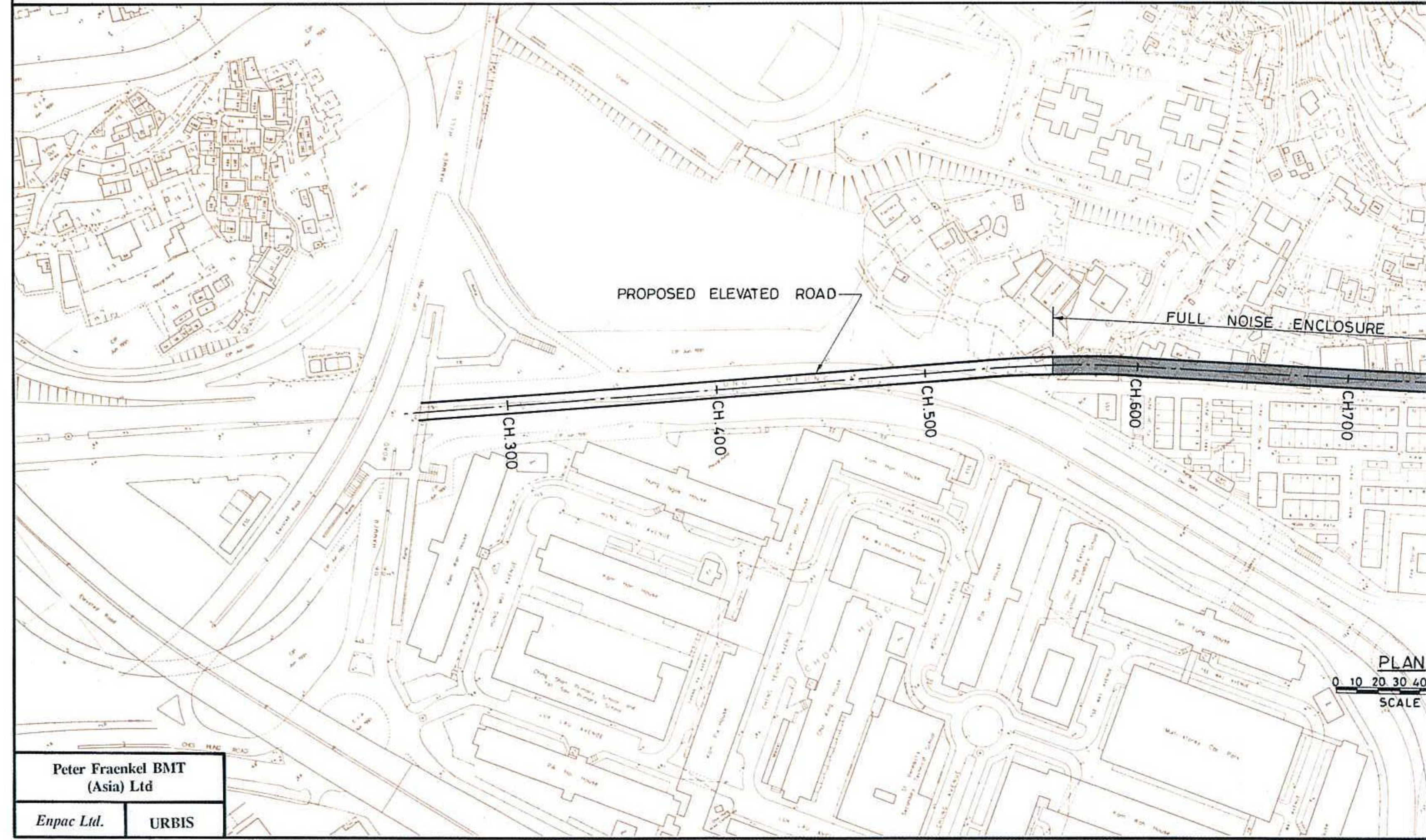
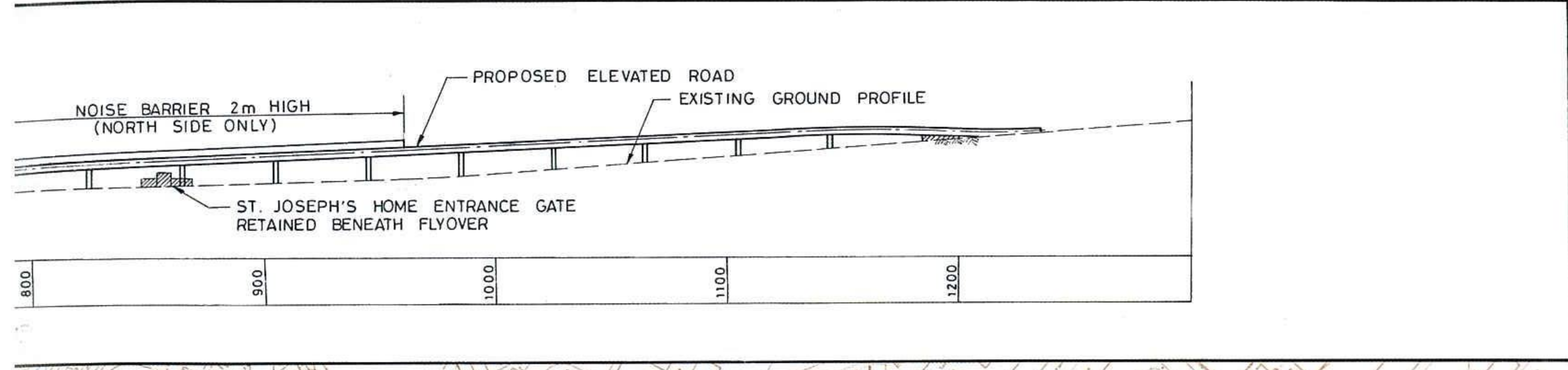
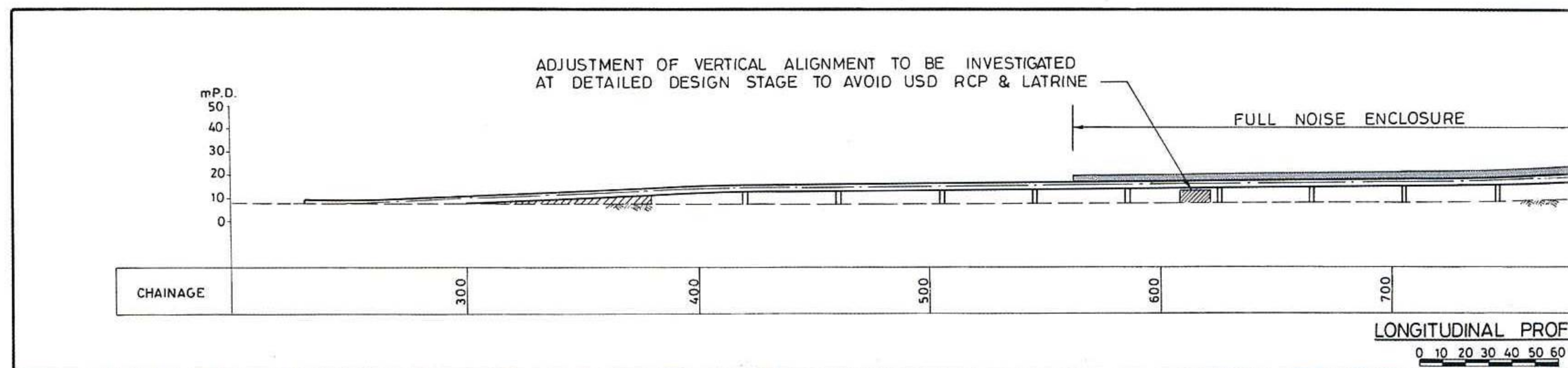
* WITH MITIGATION MEASURES

Peter Fraenkel BMT
(Asia) Ltd.

Enpac Ltd.

URBIS

Figure 13: The Decision Matrix
圖十三：方案選擇矩陣圖



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(Asia) Ltd

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Figure 14 : The Recommended Scheme
圖十四：評估藍圖

