HIGHWAYS DEPARTMENT

HIGHWAYS (HONG KONG) REGION

Final Environmental Impact Assessment Report

16 July 1997

Agreement No. CE 30/95
The Design & Construction of the Interchange at Pok Fu Lam Road and Sassoon Road Junction

The Design & Construction of the Interchange at Pok Fu Lam Road and Sassoon Road Junction
Agreement No. CE 30/95

ARUP
in association with
ERM & URBIS

INDEX:

1 INTRODUCTION

1.1 Preamble

Ove Arup & Partners (OAP) have been commissioned by the Highways Department (HyD) Hong Kong Government to undertake the Design and Construction of the Interchange at the Junction of Pok Fu Lam Road and Sassoon Road (Agreement No. CE 30/95) (hereafter called the Roadworks). ERM-Hong Kong, Ltd (ERM) are the environmental consultants to undertake the Environmental Impact Assessment (EIA) for the Roadworks.

A Preliminary Environmental Review (PER) was carried out under the Preliminary Project Feasibility Study (PPFS) for the junction improvement works. Following the recommendations of the PER, this EIA study has been undertaken mainly to assess potential noise impacts arising from the operation and construction of the proposed Roadworks and to recommend noise control requirements, based on the methodology agreed in the Final Inception Report.

1.2 Objective of The Environmental Impact Assessment

The objective of the EIA is to demonstrate the environmental acceptability of the proposed Roadworks based on the selected "Depressed Carriageway Scheme" (Scheme) in terms of potential noise impacts during construction and operation phases. Noise control measures are recommended for incorporation into the Preliminary Design and Contract Specifications where required to minimise environmental impacts to within the acceptable limits, as defined by the Hong Kong Government's environmental legislation and the Hong Kong Planning Standards and Guidelines (HKPSG). Construction waste management and ecological impact are also addressed in this report.

The Study Brief requires assessment of potential air quality impacts associated with noise mitigation measures such as full enclosures. Since direct technical remedies, including barriers and enclosures, are not recommended in this report (see Section 3.6), assessment of air quality impacts is not required. As agreed with the Environmental Protection Department (EPD), the Scheme will only have a small portion of the depressed carriageway, approximately 20m long, immediately underneath Sassoon Road Bridge (see *Figure 2.1a - 2.1d*), and therefore restricted dispersion of air pollutants and adverse air quality impact on air sensitive receivers is not expected; no assessment is required.

A summary from the separate Landscape and Visual Assessment Report as part of the Review Report is also provided in Section 6.

1.3 Study Area

The EIA Study Brief defines the boundary of the Study Area as a route corridor defined by a distance of 300m from the proposed road alignment (See *Figure 1.3a*).

1.4 Structure of The Report

In meeting the objectives set out above, the remainder of this Report is organised as follows:

- *Section 2* describes the main features of the Scheme of the road junction improvement works;
- *Section 3* discusses the noise impacts likely to occur during the construction and operational phases, together with appropriate recommendations for their mitigation;
- *Section 4* addresses the waste management issues arising from the construction of the Roadworks;
- *Section 5* assesses the ecological impacts associated with the Roadworks;
- *Section 6* summaries the Visual and Landscape issues arising from the Roadworks;
- *Section 7* summaries the EM&A requirements associated with the construction of the Roadworks; and
- *Section 8* presents the overall conclusions of the EIA.

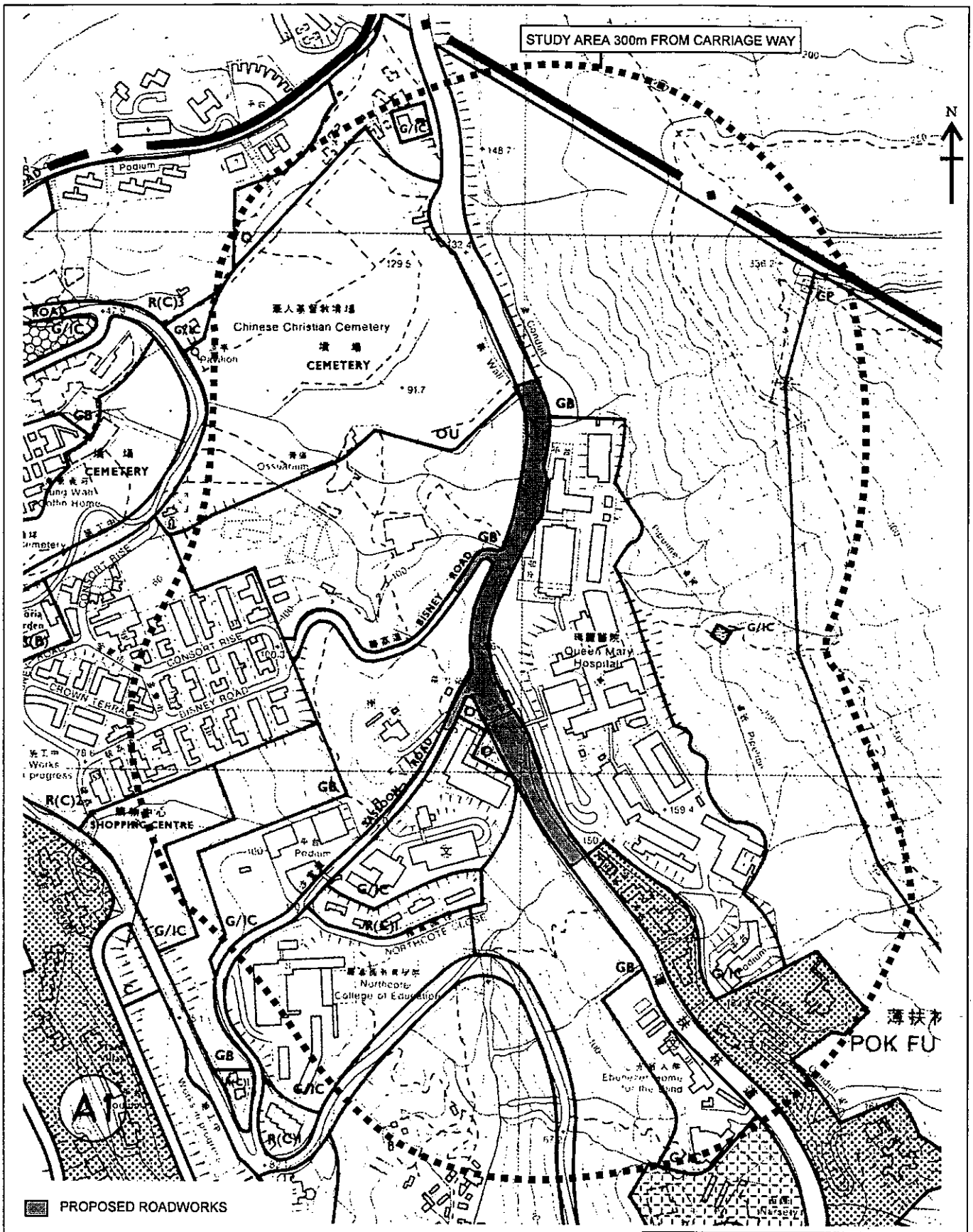

FIGURE 1.3a - STUDY AREA

EXTRACTED FROM HONG KONG PLANNING AREA NO. 10 - POK FU LAM -OZP (Ref : S/H10/5)

SCALE 1:5000

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2 PROJECT DESCRIPTION

2.1 Introduction

Pok Fu Lam Road is a primary distributor for the Southern District. The road serves, together with Aberdeen Tunnel, as the two major links between the Aberdeen area and other districts. Pok Fu Lam Road at its junctions with Sassoon Road currently provides two lanes in each direction. Taking into account the potential development in Aberdeen and the traffic demand generated or attracted by the opening of the Western Harbour Crossing, the existing signalized junction is unlikely to accommodate the increased traffic flow and therefore the need for the proposed Roadworks.

The Scheme comprises the 2-lane southbound and 3-lane northbound traffic running along the toe of existing retaining wall along Pok Fu Lam Road. There will be a Bridge over the depressed carriageways and links both existing J/O Pok Fu Lam Road/proposed northbound depressed carriageway. The existing Pok Fu Lam Road will become the 2-lane southbound carriageway. The re-aligned Bisney road is also a tall elevated flyover above the steep sloping terrain (see *Figure 2.1a - 2.1d*).

2.2 Construction Phase

The main construction activities of Roadworks comprise:

Bridge work;
At-grade road widening;
Road pavement; and
Retaining wall.

Details of the construction methods including plant and equipment are given in the noise assessment in *Section 3.5*.

General

Owing to the proximity of the sites to sensitive receivers including residential buildings, hospital and schools, percussive piling is not preferred. Therefore, bored piles have been assumed for the foundations of the elevated structures.

Plant has been assumed to consist generally of the following:

Bridge Work

- bored piling equipment consisting of a drilling rig and crane to guide/support the drill shaft..
- concrete mixer with a concrete pump.

At-Grade Road Widening

- excavator and vibrating drum roller to spread and compact material.
- grader to form road base required before commencing paving works.

Road Pavement

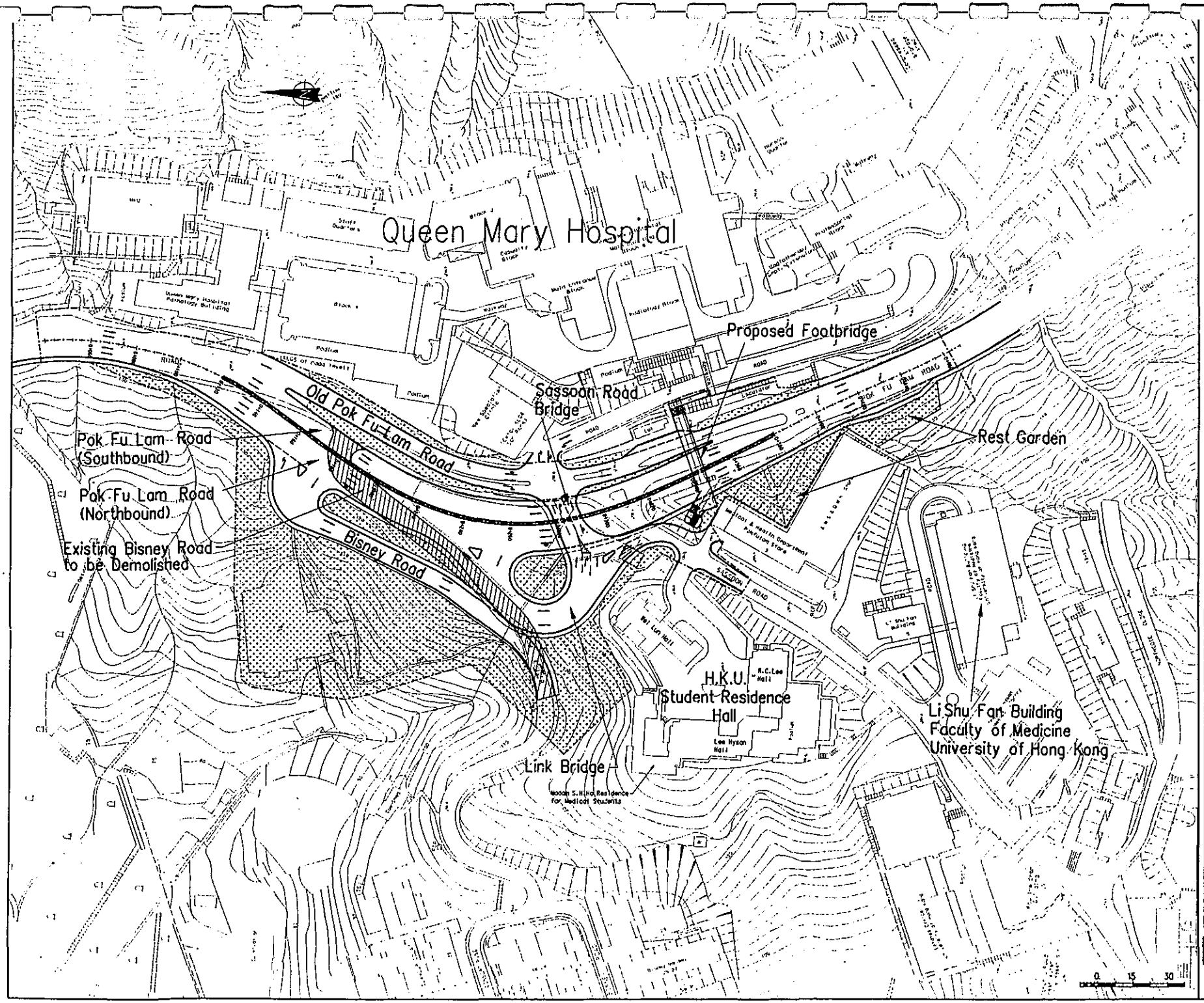
- dump truck for delivery of sub-base.
- mini backhoe to spread sub-base.
- roller to compact layers of sub-base and a grader to trim to levels required.
- hot mixer applicator to apply the final road surface.
- roller to finish the road surfacing.

Retaining Wall

- mini backhoe to excavate footings.
- concrete mixers pouring concrete following formwork erection and steel fixing.

2.3 Operation Phase

It has been agreed with the Transport Department that the 2011 year AM peak hour traffic forecasts represents the worst case year within 15-year period upon commencement of the operation of the proposed Roadworks. For the purpose of this EIA, the traffic forecasts for the year 2011 are used as the worst case traffic scenario. The existing traffic data and the 2011 traffic forecasts are presented in *Figures 2.3a & b* respectively.



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ARUP
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Agreement No. CE 30/95

Design and Construction of Flyover at the Junction of Pok Fu Lam Road and Sassoon Road

GENERAL LAYOUT PLAN
Figure 2.1a

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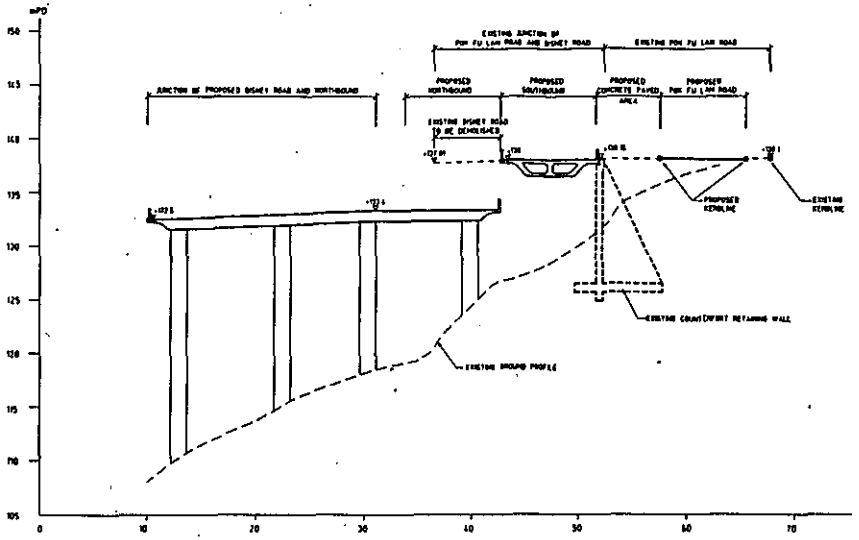

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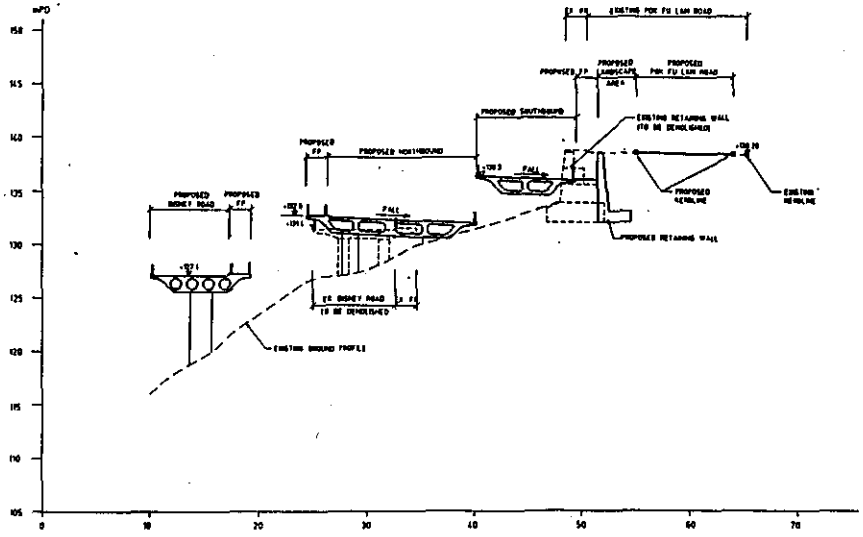

SECTION AT CHAINAGE 0+220

NOTES:

1 THE PROPOSED LEVELS IN METRES SHOWN ON THE DRAWING ARE APPROXIMATE AND ABOVE PRINCIPAL DATUM

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file no.	14.10
project no.	22152
project title	Agreement No. CE 30/95 INTERCHANGE AT POK FU LAM ROAD AND SASSOON ROAD JUNCTION
drawing title	**Figure 2.1b** SECTIONS AT CHAINAGE 0+180 & 0+220
drawing no	22152/P/011
drawn S YU	date MAR.97
check A P	passed C L
scale 1 : 250	Rev.
	Status

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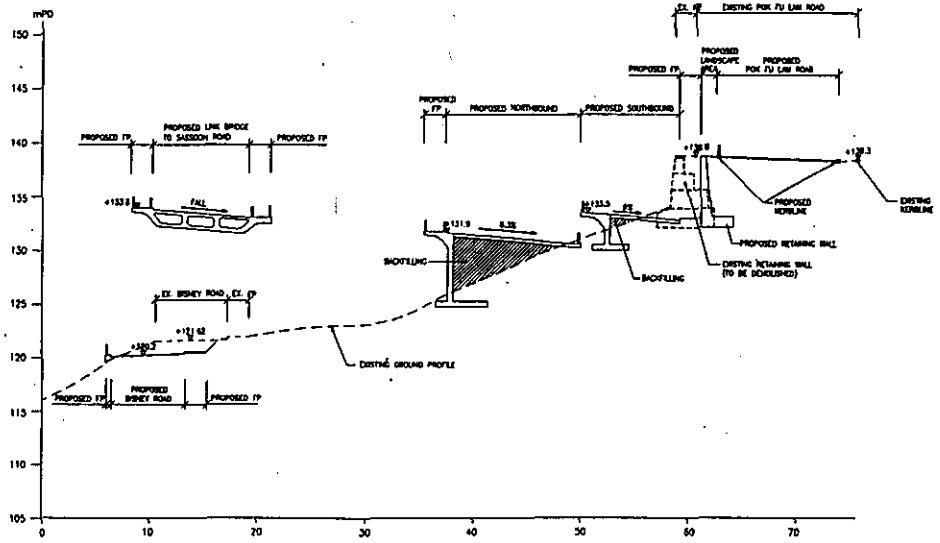

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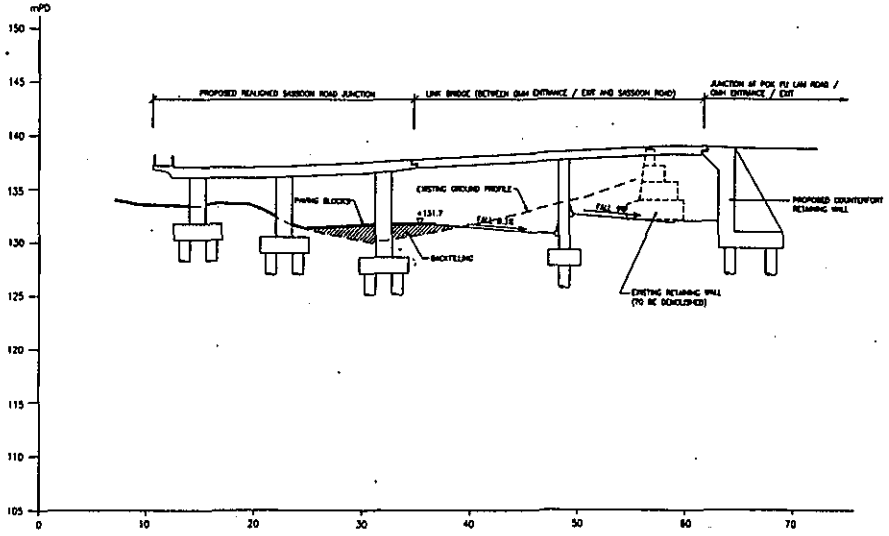

SECTION AT CHAINAGE 0+286

NOTES:

1. THE PROPOSED LEVELS IN METRES SHOWN ON THE DRAWING ARE APPROXIMATE AND ABOVE PRINCIPAL DATUM

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drawing title	**Figure 2.1c** SECTIONS AT CHAINAGE 0+264 & 0+286
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job no. 22152

Last File No. : 2152P012.DWG

FIGURE 2.1d - A SKETCH OF THE ROADWORKS

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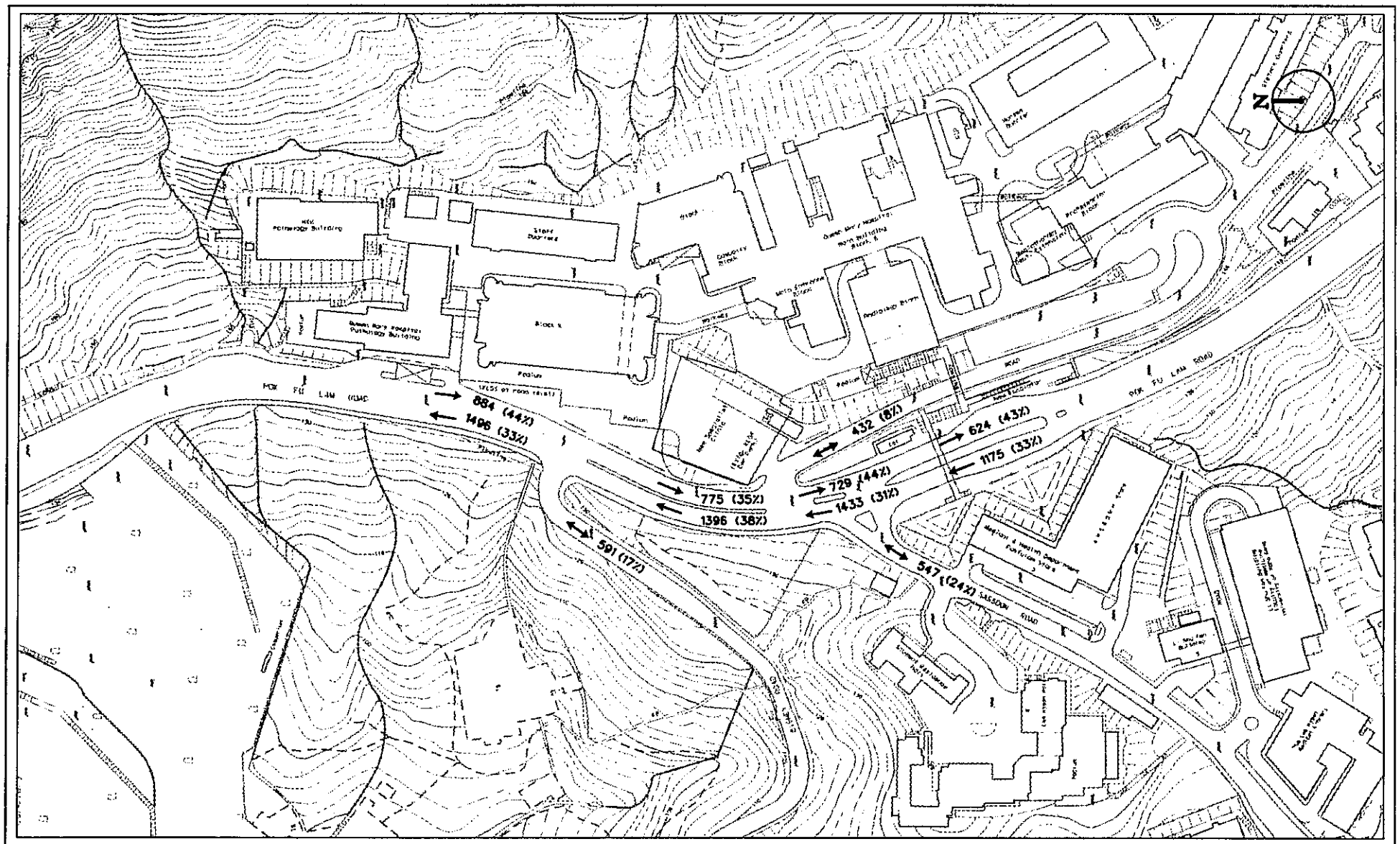

FIGURE 2.3a Traffic Flow for Existing 1996

Date : 24 April 97	Drawing No. /Contract/C1563/C1563_4
Sources :	

Prepared by ERM's GIS & MAPPING Group

KEY

→ AM Peak No. of Vehicles
(% Heavy Vehicles)

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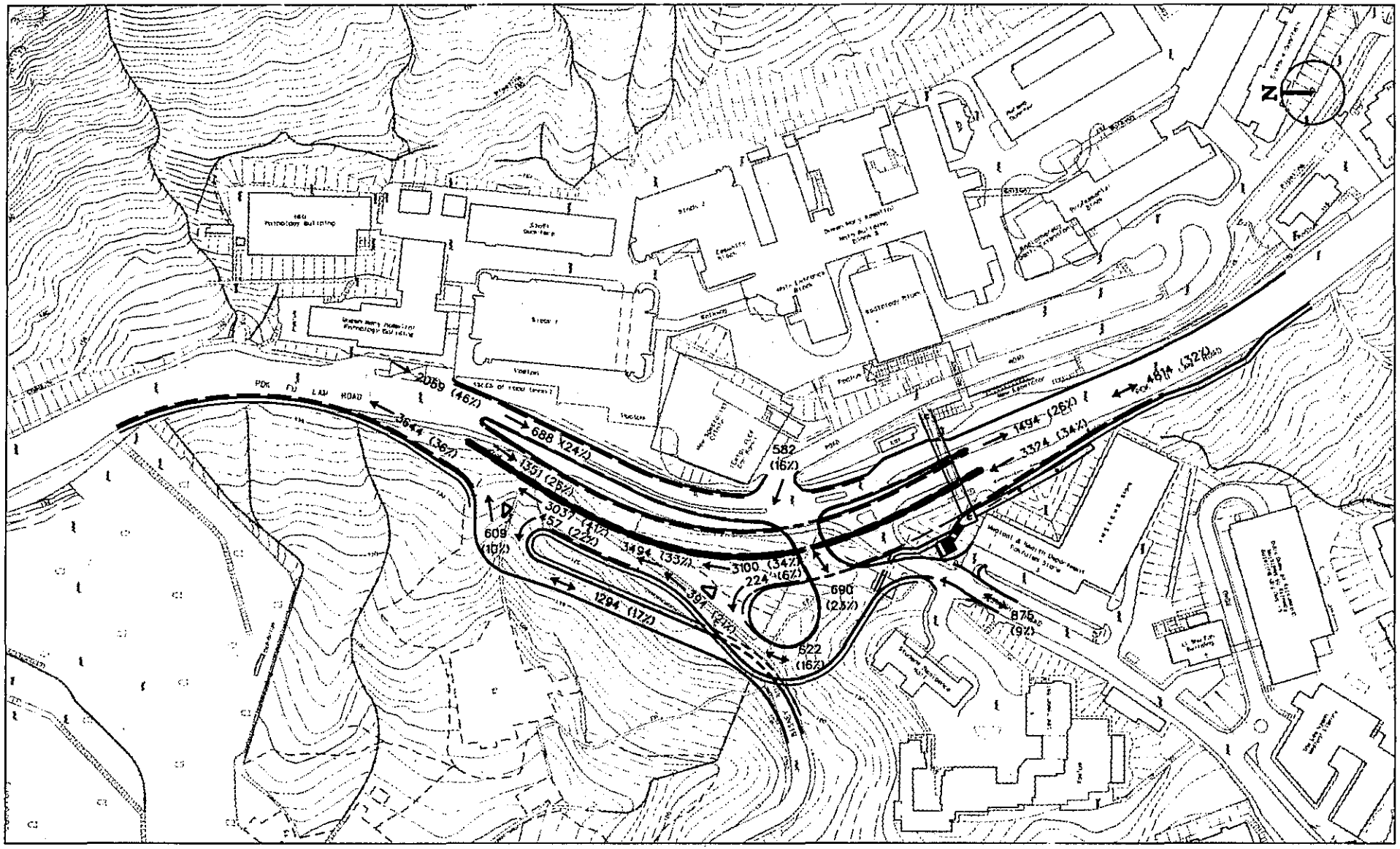

FIGURE 2.3b Traffic Flow for 2011 Future Traffic Forecast

Date : 24 April 97	Drawing No. /Contract/C1563/C1563_3
Sources :	
Prepared by ERM's GIS & MAPPING Group	

KEY

→ AM Peak No. of Vehicles
(% Heavy Vehicles)

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3 NOISE IMPACT

3.1 Introduction

Noise impacts associated with the construction and operation of the proposed Roadworks are expected to be the key environmental issues. This section assesses the potential noise impact associated with construction and operational phases. In addition, practical mitigation measures are recommended where the nearby noise sensitive premises are being affected by unacceptable noise levels.

3.2 Government Legislation and Guidelines

Construction Phase

In Hong Kong the control of construction noise other than percussive piling during restricted hours (1900-0700 and all day on Sundays and Public Holidays), is governed by the Noise Control Ordinance (NCO) and the subsidiary technical memoranda namely Technical Memorandum on Noise From Construction Work Other Than Percussive Piling (TM1). The control of percussive piling (at all times) is governed by the Technical Memorandum on Noise From Percussive Piling (TM2). These technical memoranda prescribe the permitted noise levels for construction work depending upon working hours and the existing noise climate.

A subsidiary technical memorandum, Technical Memorandum on Noise from Construction Work in Designated Areas (TM3), applies to Construction Works during restricted hours, within designated areas, including Hong Kong Island, as defined by the Noise Control (Construction Work Designated Areas) Notice, Legal Supplement No. 2 to Gazette No. 2/1996, 12 January 1996.

TM3 covers the use of the following specified powered mechanical equipment: hand-held breaker; bulldozer; concrete lorry mixer; dump truck; and hand-held poker vibrator. The prescribed construction works are: erection or dismantling formwork or scaffolding; loading, unloading or handling of rubble, wooden boards, steel bars, wood or scaffolding material; and hammering. As the project site is within the noise control designated area, TM3 will be applicable in the event of evening and night-time working.

The construction activities of the proposed Roadworks should be planned and controlled in accordance with the NCO. Works requiring the use of powered mechanical equipment (PME) during restricted hours will require a Construction Noise Permit (CNP) and will need to achieve the applicable

ANL. The ANL is derived from the Basic Noise Levels (BNL) determined in TM1 by applying corrections for the duration of the works and the effect of any other nearby sites operating under a CNP. For this assessment, current information indicates that these corrections are negligible and so have been set to zero. As a result, the ANLs are equal to the BNLs. The ANLs for the construction work other than percussive piling and for the construction work in designated areas are shown in *Table 3.2a* & b below.

Table 3.2a Acceptable Noise Levels for Construction Noise Other than Percussive Piling ($L_{eq, 5\ min}$ dB(A))

Time Period	ASR "A"	ASR "B"	ASR "C"
All days during the evening (1900-2300) and general holidays (including Sundays) during day and evening (0700-2300)	60	65	70
All days during the night-time (2300-0700)	45	50	55

Table 3.2b Acceptable Noise Levels for Construction Noise in Designated Areas ($L_{eq, 5\ min}$ dB(A))

Time Period	ASR "A"	ASR "B"	ASR "C"
All days during the evening (1900-2300) and general holidays (including Sundays) during day and evening (0700-2300)	45	50	55
All days during the night-time (2300-0700)	30	35	40

It is anticipated that the construction works will be undertaken within the period of 0700 to 1900 hours, ie normal working hours. There are currently no legislative standards in Hong Kong for the control of construction activities during normal working hours. A limit of $L_{eq, 30min}$ 75 dB(A) for dwellings and 70 dB(A) for educational institutions (65 dB(A) during examination period) have been proposed in the Practice Note for Professional Persons - Noise from Construction Activities - Non-statutory Controls, Environmental Protection Department, June 1993 (ProPECC PN2/93) for Noise Sensitive Receivers (NSRs). This limit has been applied on major construction projects, and is now generally accepted in Hong Kong. This limit has therefore been adopted in this assessment in order to protect NSRs to an appropriate extent.

Operational Phase

Traffic noise impacts are assessed against the Hong Kong Planning Standards and guidelines (HKPSG) noise levels of $L_{10, peak\ hour}$ 70 dB(A) for residential area, $L_{10, peak\ hour}$ 65 dB(A) for education institutions and $L_{10, peak\ hour}$ 55 dB(A) for diagnostic rooms and wards of hospitals, as the target levels for all 'direct' forms of mitigation (i.e. those that can be applied to the road itself). Any predicted levels exceeding the HKPSG levels are considered to constitute significant impacts and practicable direct mitigation measures will be recommended in order to alleviate the noise impact to acceptable levels. In cases where practical direct mitigation measures cannot be designed, residual impacts for residential area are assessed against a second criterion to consider if, as a last resort, the affected NSR should qualify for noise insulation. This criterion would have to be exceeded (when rounded to the nearest 0.1 dB) for the NSR to qualify for insulation. This 'noise insulation criterion' embodies the conditions specified in paragraph 6 of the UK CRTN methodology as applied to Hong Kong under the ExCo directive "Equitable Redress for Persons Exposed to Increase Noise resulting from the use of New Roads", such that the assessment criterion would be exceeded if all three of the following conditions are met.

The eligibility of noise insulation for education institutions should also be assessed against the three criteria as stated below:

i) The predicted overall noise level from the new road together with other traffic noise in the vicinity must be above the specified noise levels ($L_{10, peak\ hour}$ 65 and 70 dB(A) for educational institutions and residential dwellings respectively);

ii) The predicted overall noise level is at least 1.0 dB(A) more than the 'prevailing traffic noise level', ie the total traffic noise level existing before the works to construct were commenced; and

iii) The contribution to the increase in the predicted overall noise level from the new or altered road is at least 1.0 dB(A).

For the purpose of this Study, all roads are described as either:

- 'existing' which are unchanged by the proposed project except for possibly taking additional traffic; or
- 'new' which in the context of this report describes all roads that are completely new or are substantially altered by the proposed project (eg the location of the road has altered or has been widened substantially).

The 'new' road adopted for this Study are shown in *Figure 3.2a.*

3.3 Baseline Conditions

A site visit and noise survey was conducted on 20 March 1997. Background noise levels were measured with an integrating sound level meter, Brüel &Kjær Type 2236. The meter conforms with the IEC Publication 651:1980 and 804:1985 for Type I precision sound level meters. The equipment was calibrated before and after each measurement with a Brüel & Kjær Type 4231 acoustic calibrator. The weather conditions were recorded as cloudy with light winds during the measuring period.

The locations of the measurement points are shown in *Figure 3.3a.* Noise measurements were taken at a level approximately 1.2 m above the ground and 3 m from the kerb side. Noise measurements were made in A-weighting and fast response settings. The recorded noise levels and observed peak hour traffic flows are shown in *Table 3.3a & b* below.

Table 3.3a Noise Survey Results (dB(A))

Location of Measurement	Time of Measurement	L_{A10} (15min.)	L_{A90} (15 min)	L_{Aeq} (15min.)	Sources of Noise
Pok Fu Lam Road - Location A	08:30 - 08:45	78.0	62.5	74.2	Road traffic
(free field)	08:45 -09:00	79.5	63.0	76.2	Road traffic
Pok Fu Lam Road - Location B	09:15 - 09:30	80.5	70.0	77.3	Road traffic
(free field)	09:30 - 09:45	79.0	66.0	76.1	Road traffic

Table 3.3b Traffic Flows for Peak Hour

Location	Time	No. of Vehicles (15 min.)	No. of Heavy Vehicles (15 min.)	% of Heavy Vehicles
Pok Fu Lam Road - Location A	08:30 - 08:45	479	170	35
	08:45 - 09:00	422	165	39
Pok Fu Lam Road - Location B	09:15 - 09:30	498	240	48
	09:30 - 09:45	462	195	42

These measurements indicate that the existing environment around the study area is already noisy and dominated by the road traffic.

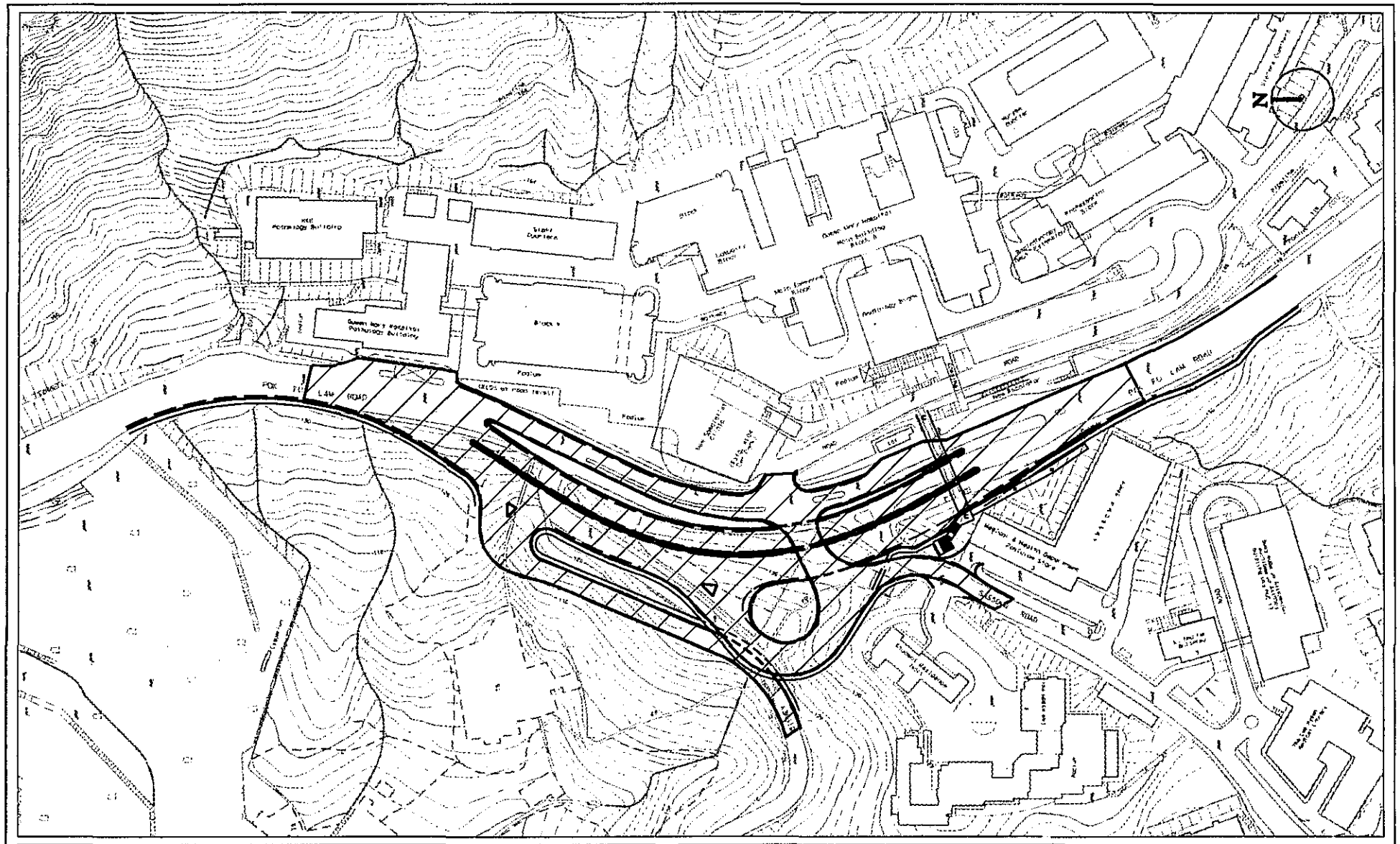

FIGURE 3.2a Locations of "New" Road

Date : 24 April 97	Drawing No. /Contract/C1563/C1563_6
Sources :	

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New Road Layout

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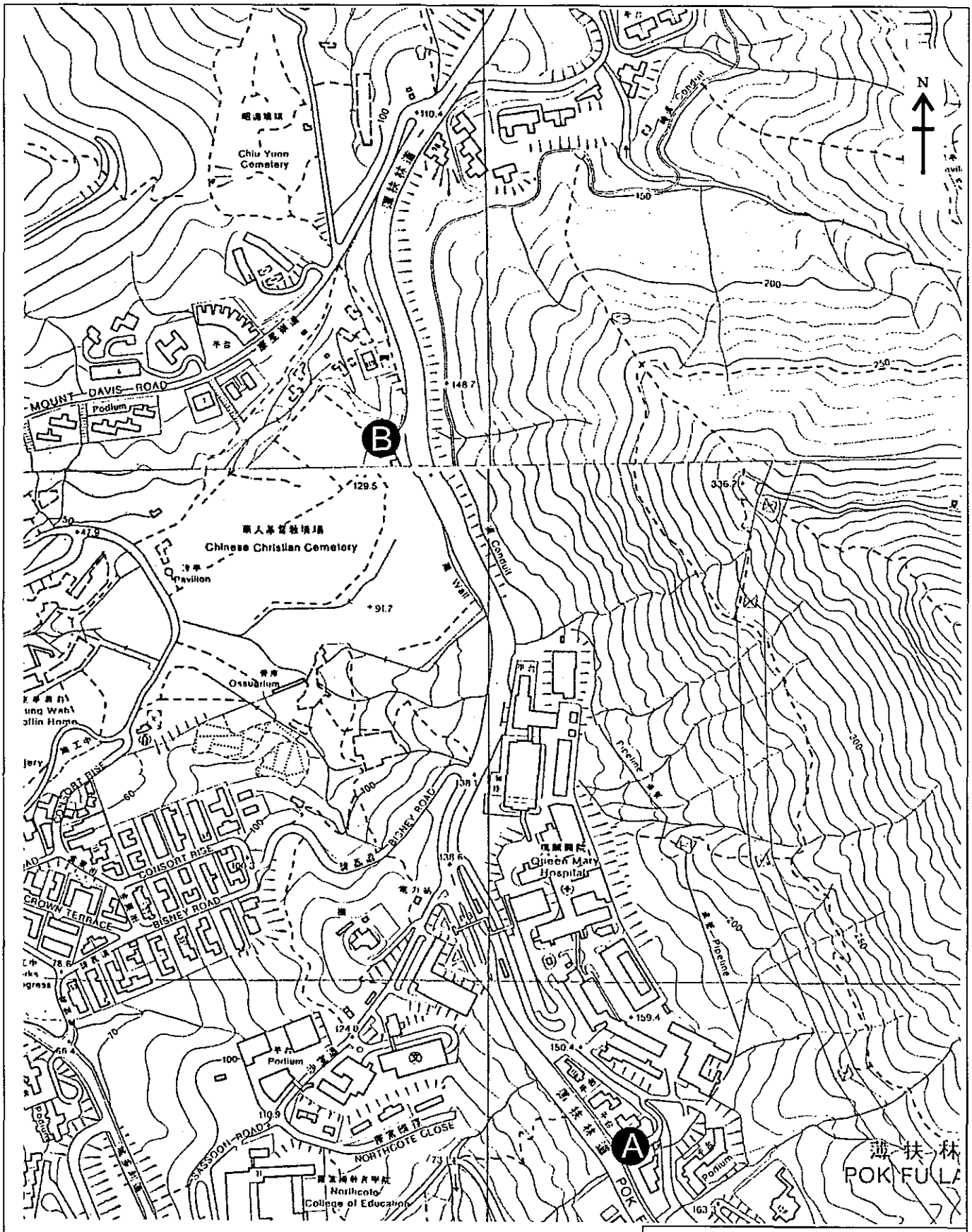

FIGURE 3.3a - LOCATION OF BASELINE NOISE MEASUREMENTS

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A MEASUREMENT POINT

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3.4 Identified Noise Sensitive Receivers

Noise sensitive receivers within the Study Area as defined by the HKPSG have been identified (see *Table 3.4a*) based on Final Environmental Inception Report and recent site visit. *Figure 3.4a & b* shows the location of the NSRs.

Table 3.4a Identified Noise Sensitive Receivers

NSRs		Sensitive Uses	With Air-conditioning System?
NSR1a	Queen Mary Hospital - Pathology Building	Hospital	✓
NSR1b	Queen Mary Hospital - Block K	Hospital	✓
NSR1c	Queen Mary Hospital - Radiology Block	Hospital	✓
NSR1d	Queen Mary Hospital - Professorial Block	Educational	✓
NSR1e	Queen Mary Hospital - Sister Quarters	Residential	✓
NSR2a	HKU - Wei Lun Hall	Residential	✗
NSR2b	HKU - R.C. Lee Hall	Residential	✗
NSR2c	HKU - Lee Hysan Hall	Residential	✗
NSR2d	HKU - S. H. Ho Hall	Residential	✗
NSR3	Northcote Close No. 13 - 15	Residential	✗
NSR4	Ebenezer Home for the Blind	Educational	✗
NSR5	Northcote College of Education	Educational	✗
NSR6a	Residential Buildings along Bisney Road	Residential	✗
NSR6b	Consort Rise No. 18 - 24	Residential	✗
NSR7	Dor Fook Mansion	Residential	✗
NSR8	Kai Ming Temple	Place of Worship	✗
NSR9	Royalton	Residential	✓
NSR10	HKU - Li Shu Fan Building	Educational	✓
NSR11	HKU - Patrick Mansion Building	Educational	✓
NSR12	HKU - Dexter H.C.Man Lab. Animal Unit	Educational	✓
NSR13	HKU - Estates Office	Offices	✓

Queen Mary Hospital (NSRs 1a, 1b and 1c), Royalton (NSR 9) and HKU educational and office buildings (NSRs 12 and 13) have already been provided with central air-conditioning systems. These NSRs are considered to be less sensitive to noise impact owing to existing insulation, and therefore are excluded from construction noise impacts assessment.

With reference to the notes of ESMG meeting dated 26 June 1997, the HKU - Li Shu Fan Building (NSR 10) and the Patrick Mansion Building (NSR 11) is scheduled to be reprovisioned to the new medical faculty complex at Northcote College (NSR 5) in the year 2001, ie similar period as when the Roadworks commence operation. Hence, Li Shu Fan Building and the Patrick Mansion Building are not expected to be affected by the operational traffic noise from the Roadworks. However, as NSRs 10 & 11 are existing NSRs, these have been included in the construction and traffic noise impact section (Sections 3.5 & 3.6).

3.5 Construction Noise Impacts

Assessment Methodology

A methodology for assessing construction noise other than percussive piling has been developed based on the TM1. In general, the methodology is as follows:

- locate NSRs that may be affected by the works;
- calculate distance attenuation to NSRs from notional noise source point;
- predict construction noise levels at NSRs in the absence of any mitigation measures;
- calculate the maximum total site sound power level (SWL) for construction activities such that noise levels at NSRs comply with appropriate noise criteria.

The distance correction for each NSR with respect to each construction activity is calculated from the distance between the NSR and the worksite notional point. The notional point is established in accordance with TM1.

The noise predictions consider the noise contribution from the various activities that may occur simultaneously in the working areas.

If the noise assessment criteria are exceeded at NSRs, mitigation measures must be considered. A re-evaluation of the total SWL for activities will be made assuming the use of practical mitigation measures such as silenced PME and movable barriers. If the criteria are still exceeded, additional mitigation measures such as reducing the number of noisy plant working simultaneously would be considered.

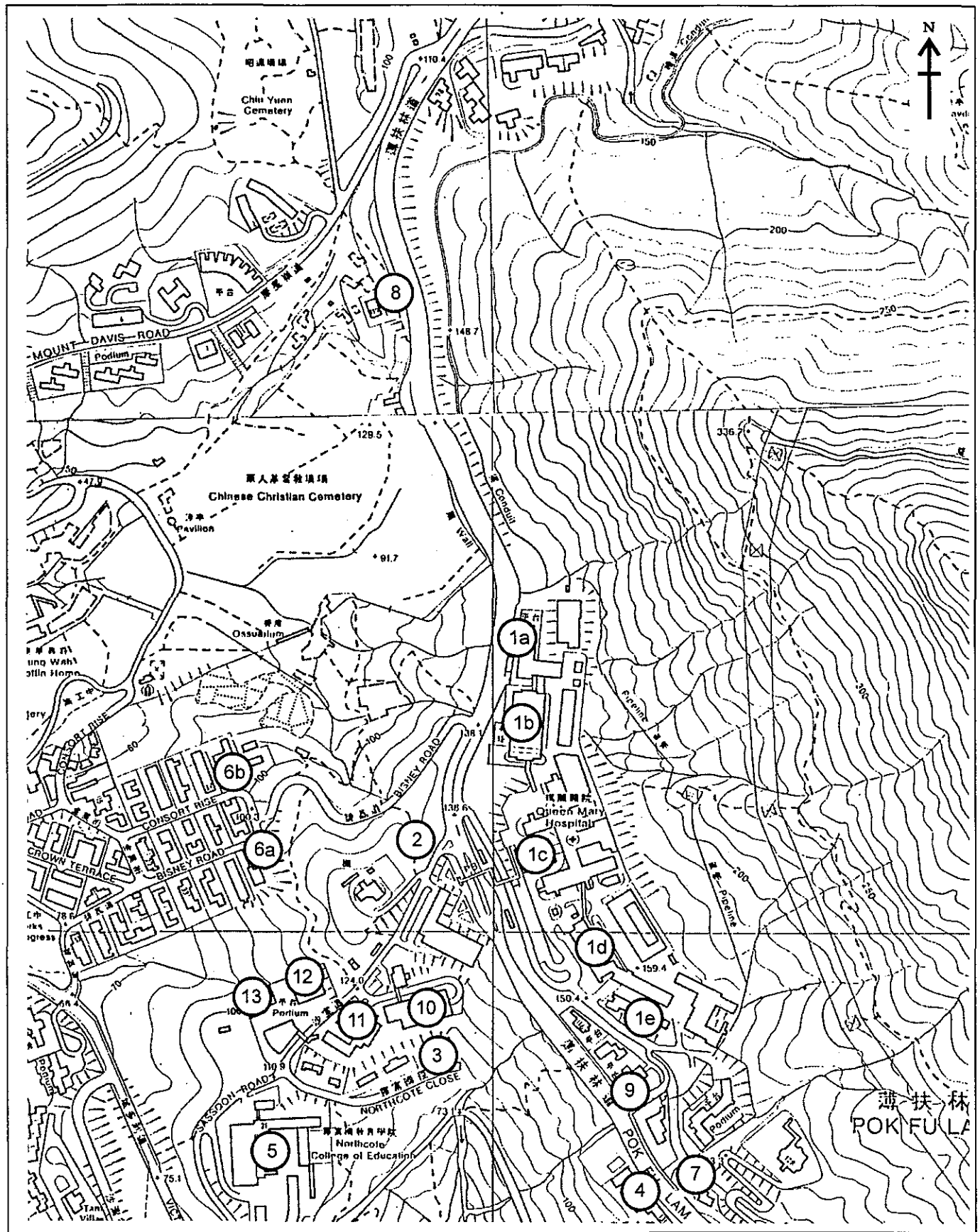

FIGURE 3.4a - LOCATION OF NSRS

KEY

(5) NSRS

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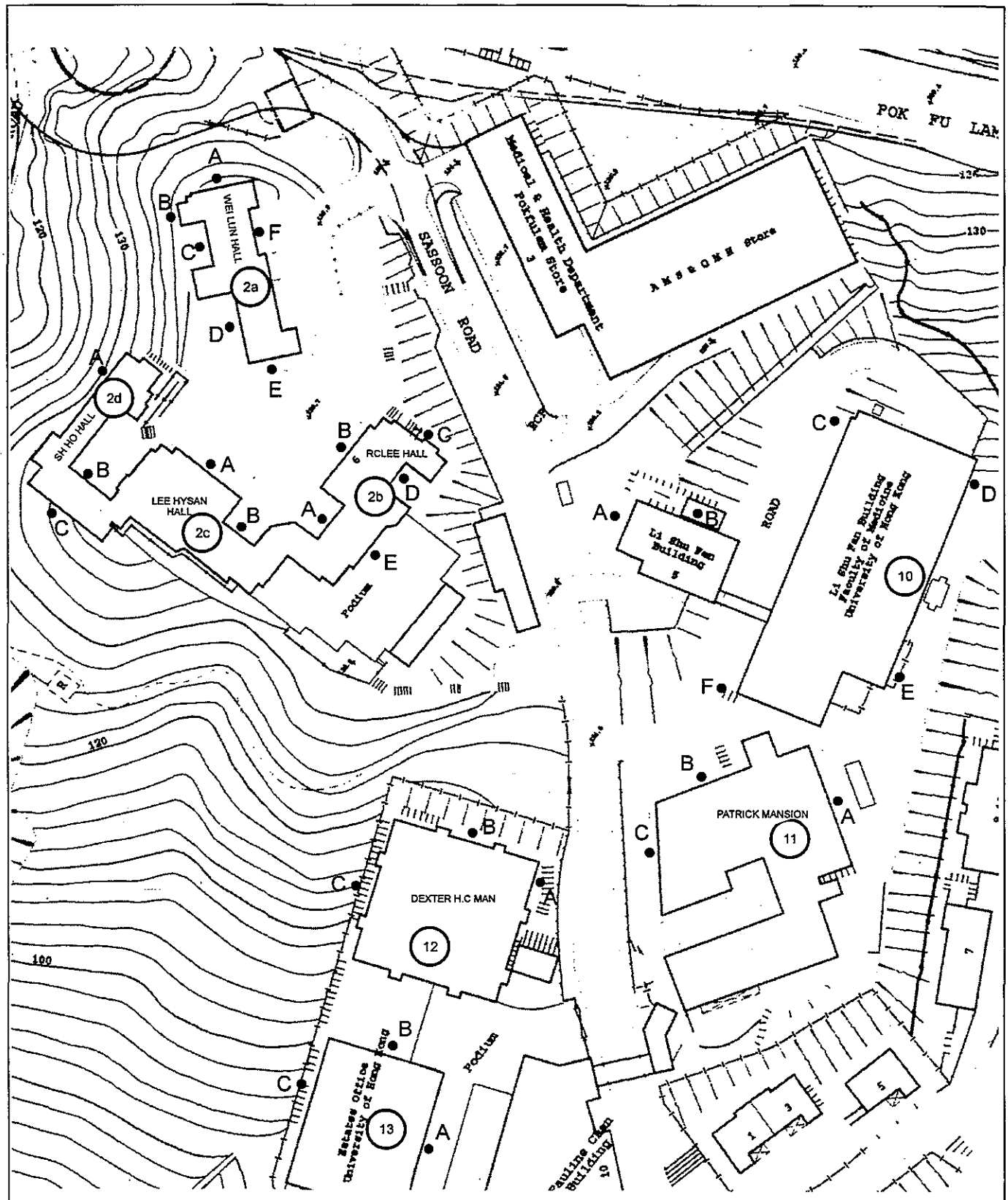

FIGURE 3.4b - LOCATION OF NSRs (HKU - STUDENT RESIDENCE HALL AT 6 SASSOON ROAD & HKU BUILDINGS)

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Source of Impact

In order to achieve the minimum interruption to the existing traffic during the construction work, the construction will be carried out in 3 stages:

Stage 1: Construction of link bridge for Pok Fu Lam and aligned Sassoon road and re-aligned the Bisney road.

Stage 2: Carry out At grade road widening at QMS store for the depressed 3-lane northbound carriageway. Construct the interchanging network bridges linking Sassoon Road and re-alignment Bisney Road.

Stage 3: Reconstruct the existing retaining wall and the remaining depressed 2-lane southbound carriageway.

Different construction stage will involve the use of different Power Mechanical Equipment (PME). A plant inventory has been assumed for each construction stage and is summarized in Annex A below together with SWLs obtained from TM1. No percussive piling will be adopted for the construction.

Evaluation of Impacts

The Area Sensitivity Rating (ASRs) for the identified NSRs has been assigned in accordance with TMs and are presented in *Table 3.5a* below.

As Northcote Close No. 13-15, Ebenezer School, Northcote College of Education, Dor Fook Mansion and Kai Ming Temple (NSR 3, 4, 5, 7 and 8) do not have a direct line of sight to the worksite areas, these NSRs have been omitted in the assessment. In addition, these NSRs are at least 200m from the worksite areas and hence, are not expected to be affected by the construction of the Roadworks.

Table 3.5a Area Sensitivity Ratings (ASRs) for identified NSRs

NSRs		Influencing Factors	ASRs
1d	Queen Mary Hospital - Professorial Block	Directly affected by Pok Fu Lam Road (AADT 1995 - 31,860)	C
1e	Queen Mary Hospital - Sister Quarters	Directly affected by Pok Fu Lam Road (AADT 1995 - 31,860)	C
2a	HKU - Wei Lun Hall	Directly affected by Pok Fu Lam Road (AADT 1995 - 31,860)	C
2b	HKU - R. C. Lee Hall	Directly affected by Pok Fu Lam Road (AADT 1995 - 31,860)	C
2c	HKU - Lee Hysan Hall	Directly affected by Pok Fu Lam Road (AADT 1995 - 31,860)	C
2d	HKU - S.H. Ho Hall	Directly affected by Pok Fu Lam Road (AADT 1995 - 31,860)	C
6a	Residential building - Bisney Road	Indirectly affected by Pok Fu Lam Road	B
6b	Consort Rise No. 18 - 24	Indirectly affected by Pok Fu Lam Road	B
10	HKU - Li Shu Fan Building	Indirectly affected by Pok Fu Lam Road	B

The unmitigated predicted noise levels (PNLs) and cumulative noise levels at NSRs for each construction stage have been predicted and are shown in Annex B (*Table B1*). Only the NSRs with direct line of sight to the appropriate construction activity are included in this assessment and no correction for screening is applied to the PNLs.

Results of predicted noise levels indicate that all NSRs will be impacted by construction activities during different construction stages. During the course of each different construction stages, the HKU - Student Residence Hall at 6 Sassoon Road (NSR2a to 2d) will be subjected to construction noise impacts of up to 78 - 89 dB(A). Also, the predicted construction noise impacts at the residential building along the Bisney Road (NSR6a & 6b) are 1 dB(A) exceeded the daytime construction criteria during the Stage 2 construction period. For the Queen Mary Hospital - Professorial Block, daytime construction noise levels of up to 78 dB(A) have also been predicted during the Stage 2 & 3 construction period. Mitigation measures are therefore required for all NSRs in order to alleviate the noise impacts during the construction phase.

Mitigation Measures

Recommended Mitigation Measures

Mitigation measures for each construction site are detailed below, and the following forms of mitigation are recommended and should be incorporated into the Contract Specifications:

- good site practice to limit noise emissions at source;
- selection of quieter plant and working methods; and
- reduction in the numbers of plant operating in critical areas close to NSRs.

General Mitigation Measures

The Contractor may develop a different package of mitigation measures to meet the required noise standards, but the following illustrates one such package to demonstrate an approach to mitigation that would be adequate.

Good Site Practice

Good site practice and noise management can considerably reduce the impact of the construction sites' activities on nearby NSRs. The following package of measures should be followed during each phase of construction:

- only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction works;
- machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;
- plant known to emit noise strongly in one direction, should, where possible, be orientated so that the noise is directed away from nearby NSRs;
- silencers or mufflers on construction equipment should be utilised and should be properly maintained during the construction works;
- mobile plant should be sited as far away from NSRs as possible; and
- material stockpiles and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.

The Good Site Practice can reduce the noise at a certain level, however, as

various of degree these techniques can be implemented, it should not be assumed as a guarantee of high level noise mitigation measure.

Selecting Quieter Plant and Working Methods

The Contractor may be able to obtain particular models of plant that are quieter than standard types given in TM1. The benefits achievable in this way will depend on the details of the Contractor chosen methods of working, and it is considered too restrictive to specify that a Contractor has to use specific items of plant for the construction operations. It is therefore both preferable and practical to specify an overall plant noise performance specification to apply to the total sound power level of all plant on the site so that the Contractor is allowed some flexibility to select plant to suit his needs.

Quiet plant is defined as PME whose actual sound power level is less than the value specified in TM1 for the same piece of equipment. Examples of SWLs for specific silenced PME, which are known to be used, are given below:

Bulldozer:	110 dB(A) max;
Breaker (Hand):	110 dB(A) max;
Bored Piling Rig:	10 dB(A) max;
Dump Truck:	110 dB(A) max;
Excavator:	105 dB(A) max;
Lorry:	105 dB(A) max;
Concrete Pumps:	105 dB(A) max;
Compressors:	100 dB(A) max;
Generators:	100 dB(A) max;
Water Pumps:	88 dB(A) max;
Poker Vibrator:	110 dB(A) max; and
Loader:	105 dB(A) max.

It should be noted that various types of silenced equipment can be found in Hong Kong. However, EPD, when processing a CNP application, will apply the noise levels contained in the relevant statutory TM unless the noise emission of a particular piece of equipment can be validated by certificate or demonstration.

With the above quiet plant substituted in the equipment inventories given in Annex A, the mitigated noise level at each NSR would be as shown in Annex B (*Table B2*).

Table B2 indicates that up to 5 dB(A) attenuation can be obtained by using quiet plant, however, noise exceedances still are predicted at NSRs 1d, 2a, 2b and 2d. Additional noise mitigation measure, such as the use of temporary noise barriers or movable barrier will be considered to further reduce the

construction noise levels at the affected NSRs.

Constructing Temporary Noise Barriers

In general, noise barriers without roof top between 3 and 5 m high located on the site boundaries between noisy construction activities and NSRs could give up to 5 dB(A) reduction from screening (estimated in accordance with TM1). The 5 dB(A) noise reduction could be achieve by either using temporary noise barrier in the form of site hoardings, located along the Stage 2 & 3 worksite boundary or by using movable barrier located close to individual noisy PME. Certain types of PME, such as generators and compressors, can be completely enclosed giving a total noise reduction of SWL of 10 dB(A) or more. Movable vertical barriers that can be located close to noisy plant can also be very effective at screening NSRs from particular plant. The predicted noise level with additional movable barrier is shown in *Annex B* (*Table B3*).

As indicated in *Table B3*, exceedances (3 to 5 dB(A)) are still predicted at Wei Lun Hall (NSR 2a) during all construction stages.

As discussed in *Section 3.6*, the HKU - Wei Lun Hall (NSR 2a) will be provided with indirect remedies in the form of window insulation and air conditioning for the protection of road traffic noise. In view of the construction noise exceedances at this NSRs, it is recommended that the provision of noise insulation to NSR 2a (approximately 30 dwellings facing Pok Fu Lam Road) should be provided prior to the construction of the Roadworks. The provision of noise insulation will provide the means of reducing the residual impacts to acceptable noise levels at the affected dwellings.

If there is any construction work during the restricted hours, it is the responsibility of the contractor(s) to comply with NCO and relevant TMs if there is any construction work during the restricted hours. The contractor(s) should submit CNPs application, if required, and will be assessed by Noise Control Authority. Conditions stipulated in CNPs should be strictly followed.

EM&A Requirements

It is recommended that noise monitoring be carried out during the construction period of the Roadworks at the HKU Student Residence Hall at 6 Sassoon Road (NSR 2b) and residential building on Bisney Road (NSR 6a). The monitoring is required to ensure compliance with the ProPECC guidelines in providing feedback to the Contractors for the management of their operations.

3.6 Traffic Noise Impacts

Assessment Methodology

The surrounding road scheme was divided up into 100 road segments, each of which was assigned one of 31 road layouts. A road layout defines the road width, surface type, traffic conditions and (if applicable) the height and location of roadside barriers. The segmentation process was carried out in accordance with Calculation of Road Traffic Noise (CRTN) procedures and the noise model was built using the HFANoise traffic noise model which fully implements CRTN procedures and methodologies. Hard ground as defined in CRTN was assumed throughout the Study Area except for vegetated areas. All other features that could add noise screening or reflection to the modelling process were included.

The Transport Department (TD) approved peak hour traffic flows for both the year 1996 and the 2011, including the percentage of heavy vehicles are shown in *Figure 2.3a* and *2.3b* respectively. The latter is the worst case year scenario within 15 years after the commissioning of the Roadworks. Traffic speeds of 50 kph at all locals roads were assumed in this assessment. Road surfaces were assumed to be standard wearing course.

The predicted road traffic noise levels at the identified NSRs have been compared with the HKPSG criteria of $L_{10,\ peak\ hour}$ of 70 dB(A) for residential use, 65 dB(A) for educational institutions and 55 dB(A) for hospitals (diagnostic rooms and wards).

Evaluation of Impacts

The unmitigated predicted noise impacts at the NSRs with the operation of proposed Roadworks are presented in *Annex C* (*Table C1*).

As indicated in *Table C1*, the noise levels at Queen Mary Hospital's Professorial Block & Sister Quarters, Northcote Close No. 13-15, Ebenezer School, residential buildings along Bisney Road and Consort Rise, Dor Fook Mansion, Kai Ming Temple, Royalton, Patrick Mansion Building, Dexter H C Man Building and HKU-Estate Building (NSRs 1d, 1e, 3, 4, 6a, 6b, 7, 8, 9, 11, 12 and 13) are dominated by road traffic noise from the existing road network (Pok Fu Lam Road, Bisney Road and Sassoon Road). The noise levels from the existing road will already exceed the $L_{10,\ peak\ hour}$ 70 dB(A) limit. *Table C1* indicates that the noise contribution from the new road section of Pok Fu Lam Road are in general 10 dB(A) below the existing road networks. These NSRs are excluded from the consideration of mitigation measures as it would not be effective to provide mitigation measures on the Roadworks.

As shown in *Table C1*, the unmitigated predicted noise levels are above the HKPSG criteria at all NSRs except Northcote College of Education (NSR 5) indicating that all dwellings facing Pok Fu Lam Road will be exposed to adverse traffic noise impacts. As shown in *Table C1*, the unmitigated noise levels at Northcote College of Education is in the region of 65 dB(A). Therefore, NSR 5 is excluded from the following assessment.

The assessment indicates that the area most affected by the Roadworks will be the HKU - Student Residence Hall at 6 Sassoon Road (NSR 2a to 2d) facing Pok Fu Lam Road and Li Shu Fan Building (NSR 10). The noise levels at these NSRs are dominated by traffic noise from the new Roadworks and the noise levels from the new roads alone will exceed the $L_{10,\ peak\ hour}$ 70 dB(A) limit. Therefore, mitigation measures will be necessary to alleviate the noise impacts from the Roadworks.

Queen Mary Hospital including Pathology Building, Block K and Radiology Block (NSR 1a, 1b and 1c) have already provided with existing central air conditioning and fixed windows. Based on the existing Queen Mary Hospital's window glazing, noise reduction of approximately 30 dB(A) are achieved. Taking into account of this correction, noise calculations present in *Annex D* indicates that the existing window glazing of the Pathology Building, Block K and Radiology Block are considered to be adequate in alleviating the future road traffic noise. Details of noise calculations are shown in *Annex D*.

Mitigation Measures

Direct Technical Remedies

The assessment in the above section indicates that the areas most affected by the Roadworks will be the HKU- Wei Lun Hall near Sassoon Road Bridge. Mitigation measures such as roadside noise barriers have been considered to reduce the noise impacts from the Roadworks. However, owing to the road junctions arrangements, it is considered that the extent and location of the noise barriers will be extremely limited by design and safety constraints as described below. These constraints are illustrated in *Figure 3.6a.*

Owing to sight line safety considerations, mitigation measures in the form of barriers or enclosures is not feasible at/near the Sassoon Road/Pok Fu Lam Road and the Bisney Road/Pok Fu Lam Road Junctions. As required by Transport Department and Highways Department, visibility splays and sight lines at road junctions must comply with the requirements in Chapters 3 & 4 of the Transport Planning & Design Manual (TPDM). It is stated that a minimum sight line of 70 m is required for a junction or a curved section with a speed limit of 50 kph, and a minimum sight line of 125 m for a speed limit of 70 kph. The use of barriers or enclosures would therefore have to stop short at these

junctions approximately 70m away. This discontinuity of barriers or enclosures are considered to be not effective in reducing the noise levels.

In addition, according to the Transport Department and Fire Services Department's requirement, the minimum height of a full enclosure should not be less than 7.6m to allow for the provision of overhead signage and emergency recovery of vehicles. In order to maintain safe road gradient on the depressed Pok Fu Lam Road and as the elevation of the Sassoon Road Bridge are fixed to allow for connection to the existing Pok Fu Lam Road, the maximum vertical height clearance between Sassoon Road Bridge and the depressed Pok Fu Lam Road carriageways are only 6m, hence, a semi or full enclosure on this part of the road is not feasible.

The extent of noise barriers is limited by the limited space for the road widening and the provision of new bus layby. Due to limited space for the road widening and the expected congested utilities on footpaths, it may not be possible to have space for the foundation of noise barriers along the footpaths, in particular immediately next to AMS store. As the proposed flyovers will be built on steep and hilly terrain, foundation works for flyovers is expected to be extremely difficult because of slope stability and accessibility problem. Increased lateral loads from noise barriers due to wind effects would further worsen the situation.

Considering all the design and safety constraints and limited space, the best practicable mitigation package was modelled, comprising 5 m high roadside noise barriers located at 1 m from the kerb of the northbound carriageway for section of Pok Fu Lam Road, and 2 m high noise barriers located on the Sassoon Road Bridge (see *Figure 3.6b*). With the use of the roadside noise barriers, the predicted noise levels for the worst affected NSRs, Wei Lun Hall and R C Lee Hall (NSR 2a & 2b) are shown in Annex C (*Table C2*). As the dominant noise contribution at the other NSRs (i.e. NSR 1d, 1e, 3, 4, 5, 6a, 6b, 7, 8, 9, 11, 12 and 13) are from the existing road networks, the benefit of the noise barriers have not been assessed for these receivers.

Predicted results in *Table C2* indicate that even with the use of the roadside noise barriers, the mitigated noise levels would still exceed the noise criteria. Owing to the proximity and high-rise nature of the HKU - Student Residence Hall at 6 Sassoon Road, the residents will look down onto the Roadworks at a steep angle, and consequently noise barriers have very limited effect, with a maximum noise reduction of 1 dB(A).

Therefore, the considered noise barriers are not considered to be effective in mitigating the road traffic noise.

The noise barriers will also greatly increase the visual impact of the proposed

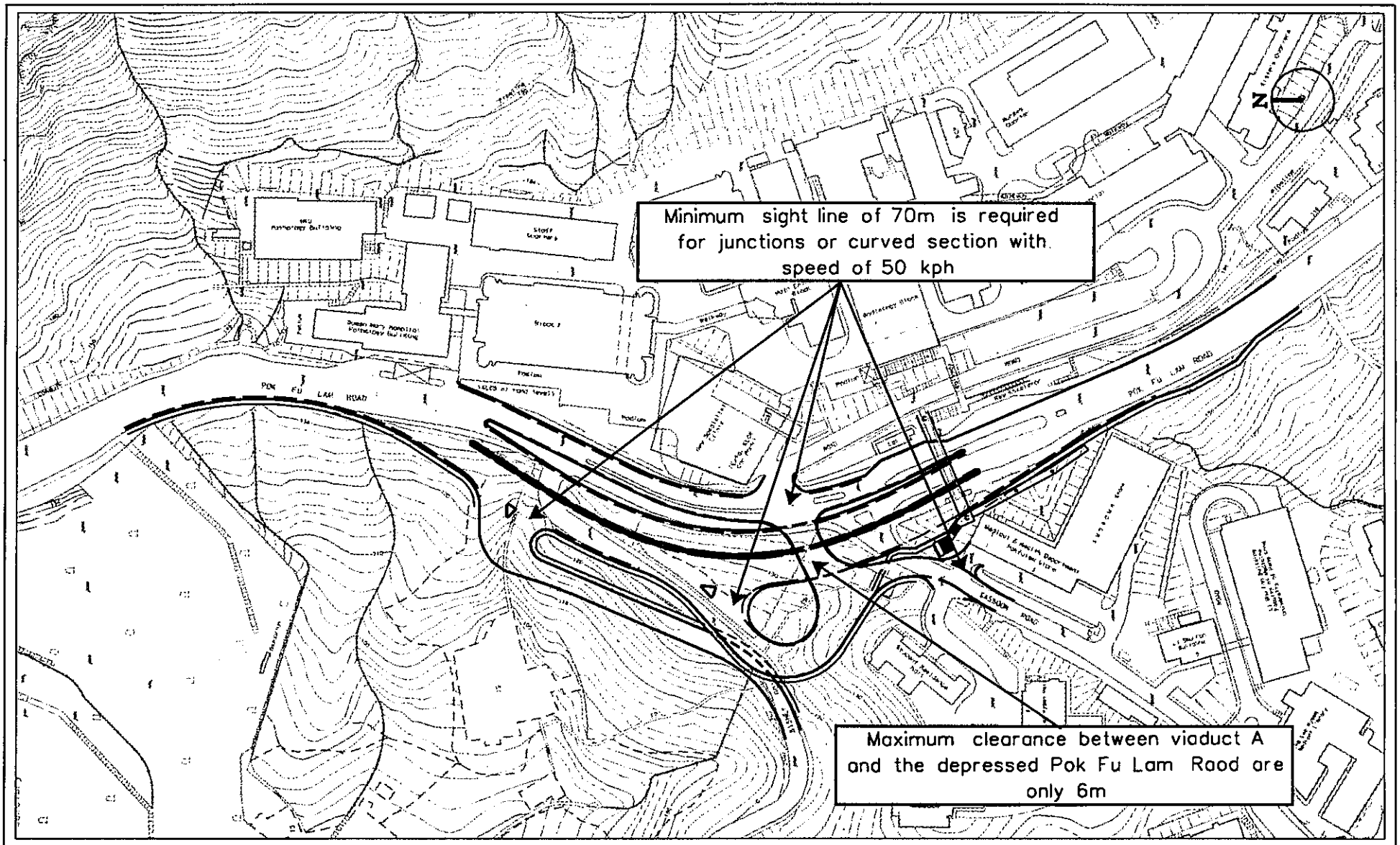

FIGURE 3.6a Design and Safety Constraints for Direct Technical Remedies

Date : 24 April 97	Drawing No. /Contract/C1563/C1563_5
Sources :	

Prepared by ERM's GIS & MAPPING Group

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9 Chatham Road
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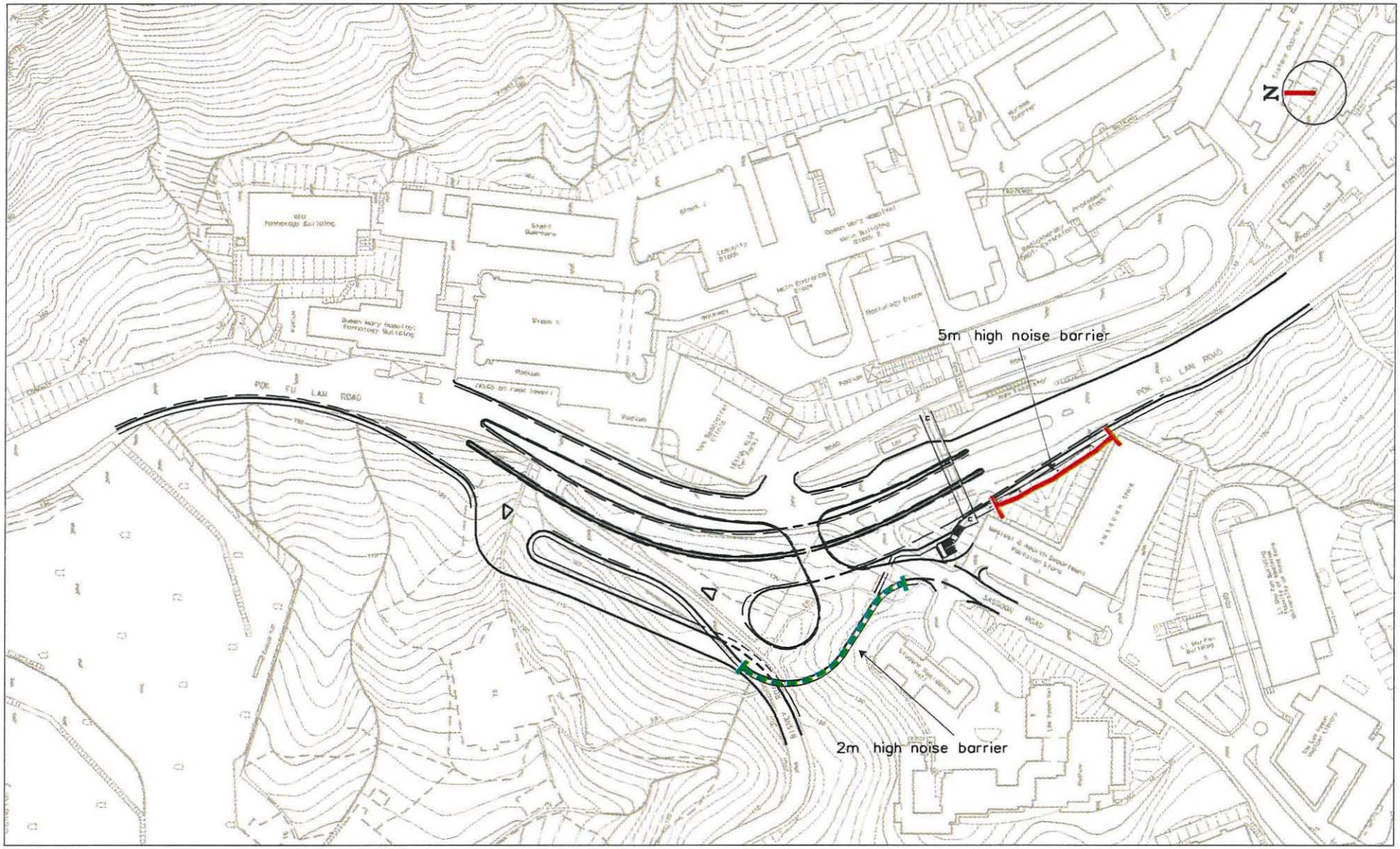

FIGURE 3.6b Location of Proposed Barriers

Date : 24 April 97	Drawing No. /Contract/C1563/C1563_1
Sources :	

Prepared by ERM's GIS & MAPPING Group

KEY

- 5m high noise barrier
- 2m high noise barrier

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scheme on the key visually sensitive views. By raising the level of the built form of the structures the barriers will become visually far more dominant than just the road in close range views from the Student Residence Hall and would result in greater visual obstruction. In long range views from the larger number of sensitive receptors from the north and west, the barriers will increase the apparent depth of the road which would be more difficult to screen with planting in the long term. There would also be a greater impact on pedestrians and motorist in particular feelings of entrapment caused by having pedestrians on the road side of such large solid barriers.

The noise barriers would also increase the balance of road structure over natural slope and result in a higher adverse impact on the landscape character of the area around the former junction with Sassoon Road.

Therefore, the use of barriers is not recommended.

Residual Impacts

As discussed above, the use of direct mitigation measures is evaluated to be ineffective or impracticable and is not recommended. The residual impacts should be assessed against the noise insulation criteria as stated in above Section 3.2. In order to assess the number of dwellings that could be qualified for noise insulation, the unmitigated noise levels will be compared with the three noise insulation criteria as presented in *Annex C* (*Table C3*).

From the assessment results presented in *Table C3*, it is found that NSRs 2a to 2d with facade facing Pok Fu Lam Road will meet the criteria in Section 3.2 for noise insulation (see *Figure 3.6c*). Predicted results indicated that approximately 150 dwellings of Wei Lun Hall (NSR 2a), 140 dwellings of R C Lee Hall (NSR 2b), 85 dwellings of Lee Hysan Hall (NSR 2c) and 80 dwellings of S H Ho Hall (NSR 2d) will be eligible for indirect remedies in the form of window insulation and air conditioning subject to Government approval. It is recommended that a detailed Noise Insulation Works Study be carried out to identify the exact requirement of noise insulations.

Although *Table C3* indicate that Li Shu Fan Building (NSR 10) will be eligible for indirect technical remedies, it is understand that Li Shu Fan Building are scheduled to be reprovisioned to the new faculty complex at Northcote college in the year 2001, ie similar period as when Roadworks commence operation. Hence, Li Shu Fan Building is considered unnecessary to provide noise insulation.

Development Constraints

The HKU Li Shu Fan Building and Patrick Mansion Building is scheduled to be handed back to the Government for redevelopment. It is recommended that the new development should take account of the noise constraints of the Roadworks in their design in accordance with HKPSG to mitigate the road traffic impact if the future use is noise sensitive.

3.7 Summary

Construction phase

The noise levels of representative NSRs have been predicted during the three different construction stages. Owing to the close proximity of some NSRs to the worksites, NSRs will potentially be adversely impacted by construction noise. Mitigation measures, including use of quiet plant and on-site movable barriers are required. With good time scheduling and site practices, the predicted construction noise levels at most NSRs are well within the noise criteria except for the north-eastern facade of Wei Lun Hall (NSR 2a) facing Pok Fu Lam Road. The provision of noise insulation for the protection of road traffic noise is recommended to the north-eastern facade of Wei Lun Hall (approximately 30 dwellings facing Pok Fu Lam Road) prior to the construction of the Roadworks. This will provide the means of reducing the residual impacts at NSR 2a. It is recommended that noise monitoring be undertaken during the construction period of the Roadworks at the HKU Student Residence Hall at 6 Sassoon Road and residential buildings on Bisney Road (NSR 6a) to ensure compliance with the ProPECC guidelines.

Operational phase

The existing noise levels at the NSRs facing Pok Fu Lam Road is generally high with levels in the region of 71 to 81 dB(A), exceeding the HKPSG 70 dB(A) traffic noise criteria. Future predicted noise levels by the year 2011 indicate that these NSRs will continue to be exposed to high traffic noise impacts (74 to 85 dB(A)). The assessment result indicates predicted noise levels at most of the NSRs will still be dominated by traffic noise from existing road in 2011.

A combination of 2 m and 5 m high roadside barriers were tested for sections of Pok Fu Lam Road and Sassoon Road Bridge to reduce noise impacts. However, owing to the design and safety constraints, the extent and height of the barriers are limited and the modelling results show that such noise barriers will have limited effect in reducing the traffic noise impacts at the affected NSRs. Residents at HKU - Student Residence Hall at 6 Sassoon Road (NSR 2a to 2d) will still be exposed to high traffic noise levels (74 to 79 dB(A)) even

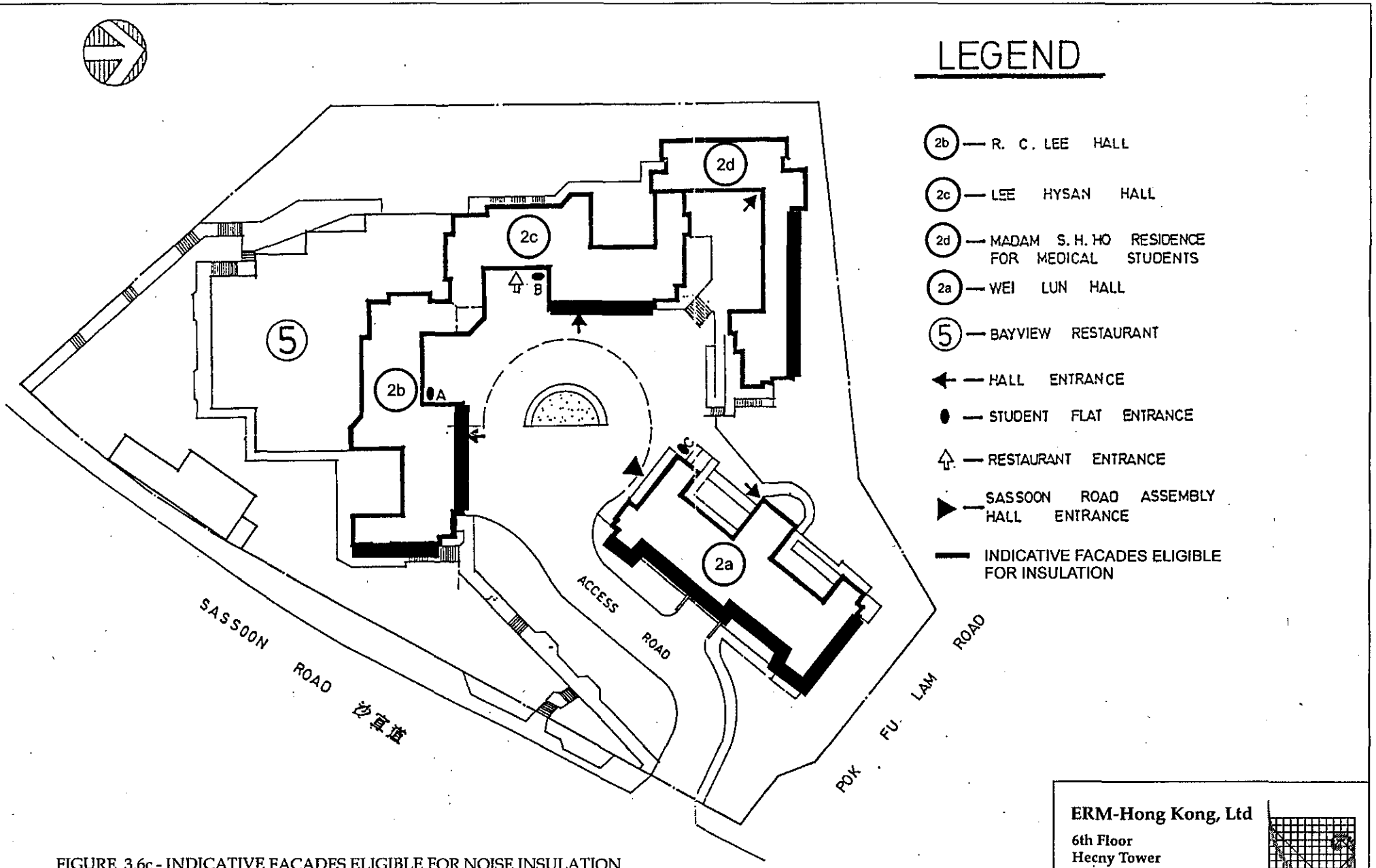

FIGURE 3.6c - INDICATIVE FACADES ELIGIBLE FOR NOISE INSULATION

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with the incorporation of the considered barrier. Therefore, the use of barriers are not recommended in this Study.

In order to mitigate the noise impact, indirect technical remedies are recommended as a last resort. From the assessment results presented in *Table C3*, it is found that NSRs 2a to 2d with facade facing Pok Fu Lam Road will meet the three criteria for noise insulation. Predicted results indicated that approximately 455 dwellings of the HKU Student Residence Hall at 6 Sassoon Road (NSRs 2a, 2b, 2c, and 2d) will be eligible for indirect remedies in the form of window insulation and air conditioning system subject to Government approval. It is recommended that a detailed Noise Insulation Works Study be carried out to identify the exact requirement of noise insulations.

4 CONSTRUCTION WASTE MANAGEMENT

4.1 Introduction

This section identifies the potential waste arisings from the construction of the Roadworks and assesses the potential environmental impacts resulting from these wastes.

The options for waste minimisation, reuse, storage, collection, transport and disposal of waste arisings from the construction of Roadworks have been examined. Procedures for waste reduction and management are considered and mitigation measures for minimising the impacts of the wastes are recommended.

4.2 Statutory Requirements, Assessment Criteria and Methodology

Statutory Requirements and Assessment Criteria

The following legislation covers or has some bearing upon the handling and disposal of wastes in Hong Kong, and will be used as the assessment criteria:

- *Waste Disposal Ordinance (Cap 354);*
- *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354);*
- *Crown Land Ordinance (Cap 28); and*
- *Public Health and Municipal Services Ordinance (Cap 132) - Public*
- *Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council)* By-laws.

Additional Guidelines

Other 'guideline' documents which detail how the Contractor should comply with the regulations are as follows:

- *Waste Disposal Plan for Hong Kong (December 1989), Planning, Environment and Lands Branch Government Secretariat.*
- *Environmental Guidelines for Planning In Hong Kong (1990), Hong Kong Planning and Standards Guidelines, Hong Kong Government.*
- *New Disposal Arrangements for Construction Waste (1992), Environmental Protection Department & Civil Engineering Department.*
- *Code of Practice on the Packaging , Labelling and Storage of Chemical Wastes (1992), Environmental Protection Department.*
- *Works Branch Technical Circular No. 2/93, Public Dump.*

4.3 Construction Waste Impact

Potential Sources of Impact

The proposed Roadworks includes the following construction works:

- demolition of existing footbridge and Bisney Road Flyover;
- bridge work;
- earthworks;
- retaining wall construction;
- construction of bridge structures; and
- road pavement.

These construction activities will result in the generation of a variety of wastes which can be divided into distinct categories based on their constitutes, as follows:

- construction and demolition waste;
- chemical waste; and
- general refuse.

The nature of each of these wastes is discussed below.

Construction and Demolition Waste

Construction waste comprises unwanted materials generated during construction, including rejected structures and materials, materials which have been over ordered or are surplus to requirements and materials which have been used and discarded. Construction waste will arise from a number of different activities carried out by the Contractor and may include:

- waste from clearance of site prior to construction;
- wood from formwork and falsework;
- waste from civil engineering works;
- equipment and vehicle maintenance parts;
- materials and equipment wrappings;
- unusable/surplus concrete/grouting mixes;
- waste from diversion of utilities; and
- damaged/contaminated/surplus construction materials.

Demolition waste will be generated from the demolition of existing footbridge and Bisney Road Flyover. At the completion of the works, any temporary noise screening structures erected to reduce noise emanating from construction activities will be dismantled, producing a small amount of demolition waste.

Chemical Waste

Chemical Waste, as defined under the Waste Disposal (Chemical Waste)(General) Regulation, includes any substance being scrap material, or unwanted substances specified under Schedule 1 of the Regulation. A complete list of such substances is provided under the Regulation, however substances likely to be generated by construction of the Roadworks will, for the most part, arise from the maintenance of equipment. These may include, but are not limited to the following:

- used batteries;
- used engine oils, hydraulic fluids and waste fuel;
- spent mineral oils/cleaning fluids from mechanical machinery; and
- spent solvents/solutions, some of which may be halogenated, from equipment cleaning activities.

Chemical waste may pose serious environmental and health and safety hazards if it is not stored and disposed of in an appropriate manner as outlined in the Waste Disposal (Chemical Waste) (General) Regulation and the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. These hazards include:

- toxic effects to workers;
- adverse effects on air, water and land from spills;
- fire hazards; and
- disruption to sewage treatment works, where waste enters the sewage system, through damage to the biological sewage treatment systems.

General Refuse

The presence of a construction site with numbers of workers and site office will result in the generation of a variety of general refuse requiring disposal. General refuse may include food waste, waste paper and packaging from construction materials.

The storage of general refuse will have the potential to give rise to adverse environmental impacts. These include odour if waste is not collected frequently (eg. daily), windblown litter, water quality impacts if waste enters water bodies, and visual impact. The sites may also attract pests, vermin, and other disease vectors if the waste storage area is not well maintained and cleaned regularly. In addition, disposal of wastes, at sites other than approved landfills, can also lead to similar adverse impacts at those sites.

Evaluation of Impacts

The nature and amount of the waste arising from the construction of the Roadworks and the potential environmental impacts which may arise from their handling, storage, transport and disposal are discussed in detail below, under the headings of each waste type.

Construction and Demolition Waste

The depressed carriageway scheme has optimised the overall cut and fill balance of the works. It is not anticipated that a considerable amount of surplus excavated material will require off-site disposal. The existing Bisney Road Flyover and footbridge across Pok Fu Lam Road will need to be demolished. It is estimated that the quantity of demolition waste to be generated from the works will be in the order of 800 m^3.

With respect to the nature of the demolition works, the demolition waste will consist mainly of concrete which could be delivered to public dumps or public dumping barging points. It is considered that the disposal of inert demolition waste at public dumps will not cause any long term environmental impact. The small amount of demolition waste to be disposed of at public dump will not have a significant impact on the demand of public dumping capacity.

General construction waste will be a mixture of inert and putrescible materials. It is expected that the amount of general construction waste to be generated from the works will be small. To conserve the limited void space at landfill sites, general construction waste should not be disposed of at landfill site if it contains more than 20% inert material by volume. It is therefore a good practice to segregate wastes at the construction site before disposing of the inert materials at public dumps for reclamation works and the putrescible fraction at a controlled landfill site. With respect to the limited working area for this project, on-site segregation of construction waste may not be practical.

The Contractor could deliver mixed construction waste with more than 20% inert (by volume) to the Construction Waste Recycling Facility at SENT Landfill or other intermediate sorting facilities available at that time.

If good practice is adhered to and all feasible avoidance, reuse opportunities are taken, including minimising over ordering, there should be minimal environmental impacts due to the handling, storage, transport and disposal of construction and demolition wastes.

Chemical Waste

Lubricating oil will be the principal waste to be generated from the vehicle and plant maintenance activities. It is difficult to quantify the amount of lubricating oil and other chemical wastes to be generated from the construction activities since it will be highly dependent on the Contractor's on-site maintenance intentions and the numbers of plant and vehicles utilised on site. However, it is anticipated that the quantity of chemical waste to be generated from the construction of the Roadworks will be small. Provided that correct handling and disposal procedures are adopted, the potential environmental impacts due to storage, transport and disposal of chemical waste will be minimal.

General Refuse

In general, the volume of general refuse to be generated from the construction of the Roadworks will be dependent on the number of workers working on-site at one time; operating procedures and site practices. It is expected that about 30 workers will be working on-site at one time and the quantity of general refuse to be produced will be in the order of 18 kg per day. With respect to the small quantity of general refuse to be disposed of at landfills, it is anticipate that the storage, handling, transport and disposal of general refuse will not cause a significant environmental impact.

4.4 Mitigation Measures

Introduction

This section sets out reuse, storage, transportation and disposal measures which are recommended to avoid or minimise potential adverse impacts associated with waste arising from the construction of the Roadworks under the headings of each waste type. These recommendations should, where applicable, be incorporated into the Contract Specification.

It is recommended that:

- wastes should be handled and stored in a manner which ensures that they are held securely without loss or leakage thereby minimising the potential for pollution;
- only reputable waste collectors authorised to collect the specific category of waste concerned should be employed;
- removal of demolition wastes should coincide as closely as practicable with the demolition work;

- appropriate measures should be employed to minimise windblown litter and dust during transportation by either covering trucks or transporting wastes in enclosed containers;

- the necessary waste disposal permits and licences should be obtained from the appropriate authorities, if they are required, in accordance with the *Waste Disposal Ordinance* (*Cap 354*), *Waste Disposal* (*Chemical Waste*) (*General*) *Regulation* (*Cap 354*) and the *Crown Land Ordinance* (*Cap 28*);collection of general refuse should be carried out frequently, preferably daily;

- waste should only be disposed of at licensed sites and site staff and the Contractor should develop procedures to ensure that illegal disposal of wastes does not occur;

- waste storage areas should be well maintained and cleaned regularly; and

Training and instruction of construction staff should be given at the site to increase awareness and draw attention to waste management issues and the need to minimise waste generation.

Construction and Demolition Waste

Careful design, planning and good site management can minimise over ordering and wastage of materials such as concrete, mortars and cement grouts. Reusable material should be used for the construction of temporary noise screening structures so that the screening structures can be dismantled and reused at other construction sites. Proper storage and site practice will minimise the damage or contamination of construction materials. The design of formwork should maximise the use of standard wooden panels so that high reuse levels can be achieved. Alternatives such as steel formwork or plastic facing should be considered to increase the potential for reuse.

The Contractor should reuse as much as possible of the construction waste on-site. Proper segregation of wastes on site will increase the feasibility of reusing certain components of the waste stream. Where appropriate, different areas should be designated for such segregation and storage of waste. For example having separate skips for inert (rubble, sand, stone, etc) and non-inert (wood, organics, etc) wastes would help to ensure that the former are taken to public dumps, while the latter are properly disposed of at controlled landfills. Scrap metals may be sold for recycling.

In order to maximise landfill life, Government policy restricts the disposal of construction and demolition waste with more than 20 % (by volume) inert material at landfills. Public dumps will only accept inert construction and

demolition waste (ie earth, building debris, and broken rock and concrete) which is free from marine mud, household refuse, plastic, metal, industrial and chemical waste, animal and vegetable matter. Public dumping licences do not clearly define the proportion of non-inert materials in the public dumping material. Government plans to establish a number of intermediate sorting facilities at strategic locations to process this material, however it is unlikely that these facilities will be available during the proposed roadworks. It is therefore desirable for Contractor of the Roadworks to adopt on-site segregation of waste so that the segregated waste can either be recycled and reused or disposed of at landfills or public dumps.

Government has established a charging policy for the disposal of waste at landfill. Construction waste delivered to landfill will be charged at a rate of $43 per tonne. However, the disposal of inert construction waste at public dumps will not be charged. Segregation of inert and non-inert construction waste will therefore reduce waste disposal costs. The implementation of the landfill charging scheme will provide an additional incentive to the Contractor to minimise waste generation and segregate waste materials.

Chemical Waste

Chemical waste which is produced, as defined by Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation, should be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes.

General Refuse

General refuse generated on-site should be stored in enclosed bins separate from construction and chemical wastes. A reputable waste collector should be employed by the Contractor to remove all the general refuse from the site, separately from construction and chemical wastes, on a daily or every second day basis to minimise odour, pest and litter impacts. Burning of refuse on site should be strictly prohibited.

4.5 Summary

This section discusses the waste management requirements and recommends mitigation measures to minimise the impacts due to storage, handling, transport and disposal of wastes.

Waste reduction is best achieved at the planning and design stage, as well as by ensuring that processes are run in the most efficient way. Good site management and control can minimise the generation of waste. Inert and non-inert materials should be segregated on site as far as practical in order to

minimise the amount of waste to be disposed of at landfills and reuse and recycling of materials should be encouraged.

Provided that wastes are stored, handled and transported in accordance with the relevant codes of practices and are disposed of at the licensed facilities and the mitigation measures recommended are properly implemented, it is considered that the environmental impacts due to storage, handling, transport and disposal of construction waste will be minimal.

5 TERRESTRIAL ECOLOGY

5.1 Introduction

This section assesses the potential ecological impacts associated with the Project and recommend mitigation measures where appropriate to minimize adverse impacts.

5.2 Government Legislation and Guidelines

There are a number of international and local regulations, legislations and guidelines which provide the framework for the protection of species and habitats of ecological importance, those related to the current project are:

- Forests and Countryside Ordinance (Cap 96) of the Revised Edition 1994;
- Wild Animals Protection Ordinance (Cap 170) of the Revised Edition 1994;
- Animals and Plants (Protection of Endangered Species) Ordinance (Cap 187) of the Revised Edition 1993;
- Town Planning Ordinance (Cap 131);
- Hong Kong Planning Standards and Guidelines (Chapter 10);
- Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures; and
- United Nations Convention on Biodiversity

The *Forests and Countryside Ordinance (Cap 96)* prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on government land. Its subsidiary Regulations prohibit the picking, felling or possession of listed rare and protected plant species. The list of protected species in Hong Kong which comes under the Forestry Regulations was last amended on 11th June 1993 under the Forestry (Amendment) Regulation 1993 made under section 3 of the *Forests and Countryside Ordinance (Cap 96).*

Under the *Wild Animals Protection Ordinance (Cap 170)*, designated wild animals are protected from hunting, whilst their nests and eggs are protected from injury, destruction and removal. All birds and most mammals are protected under this Ordinance. The Second Schedule of the Ordinance which

lists all the animals protected was last revised in June 1992. As there will be potential loss of woodland habitat, as well as indirect impact to the associated species, the above Ordinances are relevant.

The *Animals and Plants (Protection of Endangered Species) Ordinance* controls the local possession of any endangered species of animals and plants listed in its schedules. It is designed to control trade in endangered species and restricting the local possession of them. In addition, there are measures which cover the retention, removal and replacement of trees on development sites, and is therefore relevant to this development.

The recently amended *Town Planning Ordinance* provides for the designation of coastal protection areas, Sites of Special Scientific Interest (SSSIs), Green Belt or other specified uses that promote conservation or protection of the environment, eg conservation areas. The authority responsible for administering the Town Planning Ordinance is the Town Planning Board (Planning Department). The woodland habitat found in the study area is zoned as Green Belt under the OZP (Plan No. S/H10/5).

The new revised chapter 10 of the *Hong Kong Planning Standards and Guidelines (HKPSG)* covers "landscape and conservation". This chapter details the principles of conservation, the conservation of natural landscape and habitats, historic buildings, archaeological sites and other antiquities. It also addresses the issue of enforcement. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong and government departments involved in conservation.

The Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures (PELB TC No. 1/97 - WBTC No. 4/97) sets out the government's policy in implementation of off-site ecological mitigation measures which, in brief, requires that where such a measure is required, it would be provided to the extent that it is practicable, on a "like for like" basis and within the boundaries of Hong Kong. The evaluation criteria recommended in the Technical Circular Annex A was adopted in the current study.

Both UK and PRC are Contracting Parties to the *United Nations Convention on Biological Diversity* of 1992. The Convention requires signatories to make active efforts to protect and manage their biodiversity resources. Hong Kong Government has stated that it will "committed to meeting the environmental objectives" of the Convention in 1996.

5.3 Methodology

A general habitat survey was conducted during the site visit, primarily aim at identifying the presence of suitable habitats for wildlife of known importance based on the floral characteristics and some general habitat attributes, such as vegetation type, size, naturalness to evaluate the importance of the habitat for different wildlife groups.

Since habitat is molded mainly by vegetation type, a comprehensive vegetation survey was undertaken to establish the baseline condition of the Study Area. A stratified sampling and transect approach were employed in the study. Within each representative habitat type, all plant species observed along a transect were identified and recorded to species level. The relative abundance of the recorded species was noted using a five point nominal scale, namely: very abundant, abundant, common, uncommon and rare. Wildlife groups with recognised ecological importance were also noted in the field.

After the necessary ecological information were collected from the field survey, the ecological value and severity of potential impact were evaluated against the criteria recommended in the Annex A of the *Planning, Environment & Lands Branch Technical Circular No. 1/97* (TC) as far as possible, such as area, diversity, rarity and naturalness of the habitats being affected, addressing both on-site and off-site impacts at each stage of the project.

5.4 Baseline Condition

According to the site visit undertaken on 12 June 1997, most of the southern part of the area affected by the Roadwork falls within developed areas including the Queen Mary Hospital and other residential/institutional development, where no natural habitats were identified and vegetation found are only road-side weeds, and other vegetation associated with landscape planting.

The majority of the northern part of the affected area, include the hill-slopes on western side of Pok Fu Lam Road, however, are well-vegetated and composed of mainly disturbed grassland, scrubland and woodland.

According to the Outline Zoning Plan (Plan No. S/H10/5), except the developed area as well as the woodland and grassland patches in the junction of the Pokfulam Road and Bisney Road, most of the study area is zoned as "Green Belt" area (See *Figure 1.3a*).

Owing to the highly fragmented environment, and the localized scale of the proposed project, the ecological impact arising form the project is believed to

be localized. Hence, the study area is confined to the immediate vicinity of the work area. A brief description of each habitat type *(see Figure 5.4a)* is given below.

Vegetation/Habitat

Woodland

There are two patches of woodland within the study area, both of them have trees range from 4 to 20 meters high, with *Ficus microcapra* and *Celtis sinensis* that are common and widespread in Hong Kong as the dominant species in the canopy layer. It is believed that the woodlands has been suffering from human disturbance for a long time, as there are lots of litter and signs of vegetation clearance in the understorey which is sparsely vegetated and limited in floral diversity, and dominated by mainly *Alocasia macrorrhiza,* as well as weedy climber *Mikania micrantha* and *Ipomoea carica.* Nonetheless, other pioneer tree species including *Litsea glutinosa, Bredelia monoica, Macaranga tanarius* and *Mallotus paniculata* can be found easily inside the woodland

Provided that the physical condition of the woodland can be improved through alleviate the human disturbance, there is a potential for the woodland to evolve into a more ecological important habitat and support a higher diversity of widelife.

Grassland

The disturbed grassland is located on the left-hand side of the top of Sassoon Road. Similar to other highly disturbed area in Hong Kong, the soil condition, habitat heterogeneity and structural complexity of the disturbed grassland are very poor, and hence the species supported. The community structure is typical to such habitat type, and dominated by only a few common, widely distributed weedy species, such as tall grass *Pennisetum purpureum,* and climbers *Mikania micrantha* and *Ipomoea carica.* Dwarf individuals (3-4 m tall) of the common pioneer trees *Ficus hispida, Leucocaena leucocephala* and *Macaranga tanarius* are also found scatter around the habitat.

Champion Tree

The pavement within the study area (on both sides of the current Pok Fu Lam Road and Sassoon Road) are planted with mainly ornamental species of about 5 to 8 meters tall, but several large individuals (higher than 15 meter) of tree species *Ficus microcarpa, Celtis sinensis* and *Aleurites moluccana* were observed along both sides of Sassoon Road. Even though the ecological value of such road-side trees is limited, but two *Ficus microcarpa* on the top of

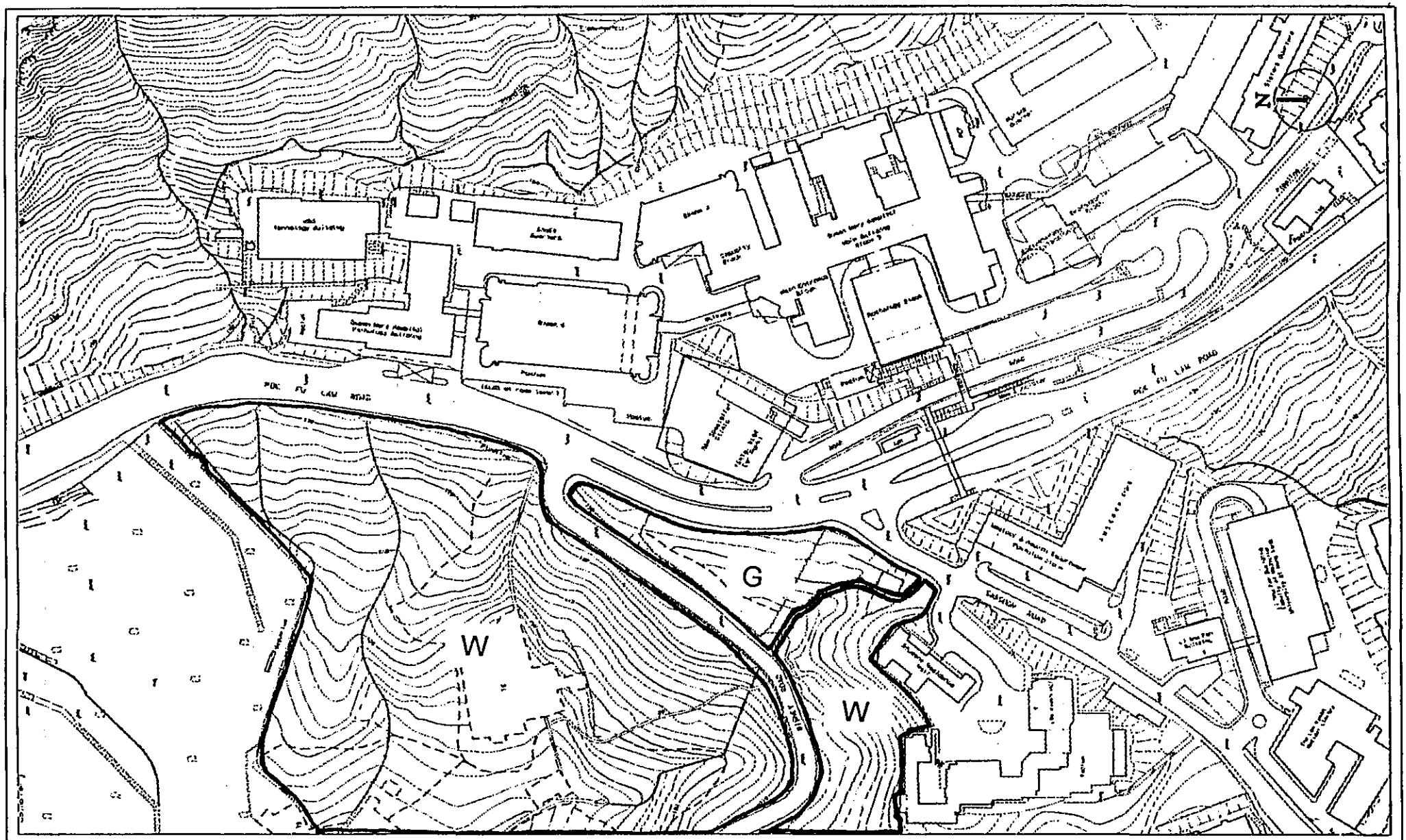

FIGURE 5.4a Habitat Map

Date: 17 June 97

Drawing No. /Contract/C1563/C1563_1

Sources :

Prepared by ERM's GIS & MAPPING Group

KEY

W - Woodland

G - Grassland

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Sassoon Road are recognized as "Champion Trees" in Urban Council's book "Champion Trees in Urban Hong Kong", and the fruits from *Ficus microcarpa* and *Bridelia monoica* can provide abundant food items during the fruiting season (summer) for different bird species, particular the bulbuls.

Table 5.4a Plant Species Recorded in the Study Area (12th June 1997)

Species	Relative Abundance *
Disturbed Grassland	
Bridelia tomentosa	+
Bidens pilosa	++
Celtis sinensis	++
Chloris barbata	++
Eleusine indica	++
Erigeron floribundus	+++
Ficus hispida	+++
Ficus microcarpa	+
Ipomoea carica	+++++
Lantana camara	++++
Leucanea leucocephala	++
Macaranga tanarius	++
Mallotus paniculatus	+
Mikania micrantha	+++++
Miscanthus floridulus	++
Paederia scandens	++
Paspalum spp.	++
Pennisetum purpureum	+++++
Psidium guajava	+
Triumfetta bartramia	+

Species	Relative Abundance *
Woodland	
Aleuriteus moluccana	++
Alocasia macrorrhiza	+++++
Bidens pilosa	+
Bridelia tomentosa	++
Celtis sinensis	+++
Cratoxylum cochinchinense	+++
Dalbergia balansae	++
Desmos cochinchinensis	++
Euphoria longan	+
Ficus hirta	++
Ficus hispida	++
Ficus microcarpa	++
Ficus variegata	+
Ficus viren	++
Leucanea leucocephala	++
Ligustrum sinensis	++
Litsea glutinosa	++
Macaranga tanarius	++++
Mallotus paniculata	++++
Microcos paniculata	+++++
Phyllanthus cochinchinensis	+
Psychotria rubra	++
Sageretia theezans	+
Sterculia lanceolata	+
Szgyium jambos	+

* *Note:* +++++ ***Very abundant***

++++ ***Abundant***

+++ ***Common***

++ ***Uncommon***

\+ ***Very Uncommon***

Animal Wildlife

Very few wildlife were observed during the general habitat survey, and there was little evidence that any wildlife species of recognized ecological importance were presence within the woodland area, except birds and possibly squirrel, which are both protected under the Wild Animals Protection Ordinance.

Bird

Birds observed are mostly common or wide-spread species either well-adapted to disturbed conditions (eg. Sparrow, Spotted Dove) or confined to semi-natural or natural areas (eg. Chinese Bulbul, Magpie Robin) *(Table 5.4b)*. No signs of breeding activities were recorded in the study area. Given the presence of a more natural and mature woodland habitat on the upper-slope of the Pok Fu Lam Road, the bird use of the study site for breeding or roosting should be limited.

Table 5.4b Bird Species Recorded at the Study Area (12th June, 1997)

Species	Status #
Crested Bulbul *(Pycnonotus jocosus)*	R
Chinese Bulbul (*Pycnonotus sinensis)*	R
Spotted Dove (*Streptopelia chinensis*)	R
Hwamei (*Garrulax canorus*)	R
Magpie (*Pica pica*)	R
Crested mynah (*Acridotheres cristatellus*)	R
Magpie-Robin (*Copsychus saularis*)	R
White-eye (*Zosterops japonica*)	R
Great-Tit (*Parus major*)	R
Tree Sparrow (*Passer montanus*)	R

Key: R = Resident

Butterfly

Only a few common butterfly species were observed during the site visit *(Table 5.4c)*, and they were mainly found in the disturbed grassland area where several weedy plant species such as *Lantana camara* and *Mikania micrantha* were flowering. It is considered that the ecological value of the study area for butterfly fauna should be limited as none of the plant species identified are important food plant for butterfly species of recognized importance, and the

poor floral diversity also provide less resources for butterfly species.

Table 5.4c Butterfly Species Recorded at the Study Area (12th June 1997)

Species	Habitat
Grass Blue Butterfly (*Famegane alsulus)*	Grassland
Small Yellow Butterfly *(Eurema brigitta)*	Grassland
Common Sergeant *(Athyma perius)*	Grassland
Blue Grassy Tiger (Danaus similis)	Grassland
Common Faun *(Faunis eumeus)*	Woodland

Mammal

No signs or tracks of mammals (except domestic animal) of any sizes were observed during the study, and the presence of any important mammal fauna within the study area is not expected owing to the small size, highly disturbed and fragmented nature of the habitats in the study area. Nonetheless, sightings of squirrels in other similar woodlands elsewhere on the down-slope of the Pok Fu Lam Road had been made by the Consultants in several occasions during the past few years. Therefore it is possible that squirrels may also utilize the woodland habitat within the study area.

Reptile and Amphibian

No reptiles or amphibians were observed during the visit, but certain common reptile species (gecko and snake) may inhabit the woodland habitat. Amphibian is unlikely to be present within the study area as there is little suitable moist habitat.

Overall speaking, the ecological value of the area to wildlife of recognized ecological importance is considered to be limited because of the following reasons:

- the highly fragmented nature of the existing habitats limit the potential and capacity of the study area as important wildlife habitat; and
- the poor habitat quality from frequent human activities surrounding/within the study area give rise to simple community structure and hence little micro-habitats for wildlife.

5.5 Ecological Importance

The field visit reveals that all habitat types (grassland and woodland) found within the study area are either established on heavily disturbed area, suffered from severe and frequent disturbance or fragmented in nature, with only simple structural complexity and species diversity. None of the plant species observed are rare or protected under the current legislation in Hong Kong, and the general habitat survey identify that the wildlife use of the woodland should be limited due to the location, physical condition, as well as the poor floral diversity and conditions of the micro-habitat provided by the existing habitat.

With reference to the evaluation criteria recommended in the TC, namely naturalness, size, species diversity, rarity, representativeness, potential value and degree of fragmentation, the ecological value of the study area is considered to be poor.

Nonetheless, those Champion Trees on the top of Sassoon Road is considered to be ecologically important in providing a stable food sources to different wildlife, especially birds.

5.6 Potential Impact

The major source of ecological impact associated with the Roadworks will be landtaking for the construction of the new carriageways, elevated bridge structures, excavation works and slope stabilisation. It should be noted that the affected woodland on the left-hand side of Bisney Road is established on a slope identified as "Very High Degree of Risk"[(1)], and the slope stabilisation work required for safety reason will be undertaken as part of the Roadworks. The Roadworks will result in direct habitat loss of approximately 1 ha of woodland and 0.2 ha of grassland. There will also be indirect impact to the wildlife associated with the habitat. However, as discussed previously in *Section 5.5*, the ecological value of the study area is considered to be poor, and the severity of the impact is therefore not considered to be high.

The increased human activities of the study area during construction may increase the risk of hill-fire and threaten the surrounding habitats, as most of the hill-fire in Hong Kong is anthropogenic in origin. However the impacts can be controlled by good practice as recommended in *Section 5.7*.

Of the two Champion Trees within the works limit, it is understood from the Tree Survey Report that one of the them has been avoided by the Roadworks, but the canopy spread of the other one will need to be substantially reduced

(1) Geotechnical Engineering Office, Civil Engineering Department under the GEO's Systematic Inspection of Features in the Territory Study

during construction. Since *Ficus microcarpa* is a common and wide-spread species, and such large sized individuals can be found along other sections of Pok Fu Lam Road and Sassoon Road, the impact is considered to be minimal.

5.7 Environmental Mitigation Measures

As reported in the Tree Survey Report, an extensive on-site compensatory tree replanting scheme have been proposed to reinstate the woodland after the completion of the Project, during which extensive planting of understorey tree and large woodland shrub species will be undertaken to promote the long term development of a mature woodland structure. The Tree Survey Report also recommends transplantation or preservation of some of the big-sized road-side trees into the nearby unaffected area, as well as minimizing the cutting/thinning of any trees in the immediate vicinity of the work area; such measures are considered to be appropriate and adequate to mitigate the impact arising from the Project.

However, it is recommended that native species compatible to the surrounding environment should be selected in the replanting scheme so as to promote the wildlife use of the woodland and enhance its ecological value. In addition, the reinstated woodland should be fenced off for the first five years after reinstatement to prevent unnecessary human activities within the woodland.

Whilst no adverse impacts have been identified, the following good construction practices are also recommended to avoid any adverse ecological impact to the surrounding environment due to uncontrolled construction activities:

- erect fences along the boundary of construction sites before the commencement of works to prevent tipping, vehicle movements, and encroachment of personnel into adjacent wooded areas;
- damages that may occur to major tree individuals such as the Champion Tree to be retained, should be treated with surgery;
- check regularly to ensure that the work site boundaries are not exceeded and that no damage is being caused to the surrounding areas;

- where the areas around the junction and Roadworks remain the responsibility of the proponent, maintain planted areas and ensure the survival of trees for at least the first two years after the completion of the construction works;

- the use of fire during construction should be avoided or such use if unavoidable should be carried out under close supervision; and

- wild and uncontrolled open fire should be strictly prohibited within the work site boundary, and fire fighting equipments should also be installed in the work area.

5.8 Conclusion

The key ecological issues for the proposed Project have been identified and examined, which are related to the potential loss of some of the woodland habitat on the down-slope side of Pok Fu Lam Road due to the road and slop stabilisation works. The ecological value of the woodland is established as low with reference to the evaluation criteria in the Technical Circular. Direct habitat loss resulted from landtaking is regarded as the major source of impact, but the severity is not considered to be high due to the poor ecological value of the woodland. The on-site compensation tree replanting scheme recommended in the Tree Survey Report and good construction practice recommended in this report are considered to be adequate to mitigate the impact and adverse residual impacts are not expected.

6 LANDSCAPE AND VISUAL IMPACT

The potential landscape and visual impact is assessed in detail in the *Landscaping and Visual Impact Assessment Report*. A summary of the key findings are presented below.

Landscape Impact

The new road would constitute a relatively small element in a large scale diverse landscape setting, and would result in localised impact on the character of the surrounding landscape impact through loss of trees, particularly on the slope below Bisney Road, and modification of the topography. The new road structures would be of the same nature as the existing road, and in the context of the surrounding high rise residential developments, Cemetery and the Queen Mary Hospital.

Only at the top of Sassoon Road, would the new flyover permanently alter the landscape setting by altering the balance of the surrounding area from natural slope to road corridor. There is likely to be a high impact during construction, and a low level landscape impact in the long term, that is the direct consequence of the works. To a degree this will be compensated for by additional planting proposed along both sides of the road.

Due considerations have been given to keep the impact to landscape and loss of trees to a minimum during the road works construction. The landscape impact of the scheme is considered to be acceptable with the proposed mitigation measures such as tree transplant and extensive replanting.

Visual Impact

The visual envelope of the new road was quite extensive on the north and east sides, due to the nature of the existing landscape, but the limited number of sensitive receivers close to the site would result the scheme having mainly localised visual impacts.

There would be a high visual impact during construction on the residents of HKU Wei Lun Hall, through loss of existing screen vegetation, a medium impact on the low rise houses on Consort Rise and Bisney Road, and a low impact on Victoria Gardens, the residential buildings on Mt. Davis Road and high rise towers further south on Pok Fu Lam Road, and on residents of Tai Hau Wan Village. There would also be a medium visual impact on occupants of the Queen Mary Hospital Buildings, and users of the Queen Mary Hospital Car Park and External Areas, the Chinese Christian Cemetery, and on Pedestrians and Motorists around the junction.

Architectural detailing of the retaining walls and elevated road structures and planting of disturbed slopes and roadside areas would reduce the level of these impacts upon completion of the works. However, the planting would grow to form an effective screen, ameliorating the visual impact on all views, except from the Wei Lun Hall, where the proximity of the structures to the building would result in a low visual impact in the long term. This would also be compensated for by additional planting proposed along both sides of the road.

The Visual Impact of the scheme is, therefore, also considered to be acceptable with the proposed mitigation measures.

7 ENVIRONMENTAL MONITORING & AUDIT

7.1 Introduction

As discussed in *Section 3*, construction noise would lead to exceedance of environmental criteria and therefore Environmental Monitoring and Audit (EM&A) at the potentially affected sensitive receivers are recommended. This Section summaries the EM&A requirements during construction of the Roadworks from the separate EM&A Manual Report

7.2 Objectives of Construction Noise Monitoring and Audit

The objectives of carrying out EM&A for the Roadworks include the following:

- to provide a database against which construction noise impacts of the Roadworks can be determined;
- to provide an early indication should any of the noise control measures or practices fail to achieve the acceptable standards;
- to verify the construction noise impacts predicted in the EIA Study;
- to determine the construction noise compliance with regulatory requirements, standards and government policies;
- to take remedial action if unexpected problems or unacceptable impacts arise; and
- to provide data to enable an environmental audit.

7.3 Affected Noise Sensitive Receivers

Noise produced during the construction phase will impact upon nearby noise sensitive receivers (NSRs) as assessed in *Section 3*. The primary noise source include excavators, loaders, rollers, graders and lorries. The construction noise criteria of 75 dB(A) will be exceeded at some of the representative NSRs if construction noise is unmitigated. These NSRs are HKU - Student Residence Hall at 6 Sassoon Road; and some residential buildings along Bisney Road and Consort Rise including Glamour Court and Bisney Garden.

7.4 Mitigation Measures

Noise mitigation measures have been recommended in the EIA report to reduce the noise impact to within the daytime construction noise criteria and are presented in *Section 3.5*.

It is anticipated that if the mitigation measures described in *Section 3.5* can be applied, the noise levels experienced by the affected receivers will be reduced to within the noise criteria.

7.5 Monitoring Locations

Noise monitoring should be carried out at the representative monitoring locations recommended in *Table 7.5a* and any additional locations considered necessary, in agreement with the EPD, to ensure compliance with the noise criteria.

Table 7.5a Noise Monitoring Stations

Monitoring Station Ref. No.	Monitoring Station Description
NSR 2b	R C Lee Hall
NSR 6a	Bisney Garden

8 CONCLUSION

The EIA has assessed the potential environmental impacts associated with the construction and operation of the proposed Roadworks. The findings demonstrate that whilst varying levels of construction noise impacts have been predicted, provided that the recommended mitigation measures are undertaken, unacceptable impacts are not expected to arise. Implementation Schedule of the recommendations are shown in Annex E.

Adverse operational noise impacts are predicted at the student residence halls facing Pok Fu Lam Road. Due to the civil and traffic engineering and safety constraints, practicable mitigation measures are limited. The only practicable direct mitigation measures are roadside noise barriers which extent and height are also restricted. As a result, they are evaluated to be ineffective in respect of noise reduction and not recommended. In order to mitigate the noise impact, indirect technical remedies are recommended as a last resort to mitigate the traffic noise impact. Construction waste impacts are expected to be minimal with the adoption of good site practice. The extensive replanting programme should adequately mitigate the loss of the woodland habitat with low ecological value. The landscape and visual impact is considered acceptable with the implementation of the proposed mitigation measures.

Annex A

Plant Inventory

Table A1 *Plant Inventory*

Activities		Noise Sources	TMRef.	No. Unit	SWL, dB(A)
Stage 1					
a	Bridge foundation	Concrete lorry mixer	CNP044	1	109
		Concrete pump	CNP047	1	109
		Compressor	CNP002	1	102
		Generator	CNP101	1	108
		Vibrator	CNP170	1	113
		Mobile crane	CNP048	1	112
		Bored piling, oscillator	CNP165	1	115
		Lorry	CNP141	1	112
					Total: 120
b	Road pavement	Road roller	CNP185	1	108
		Asphalt paver	CNP004	1	109
		Lorry	CNP141	1	112
					Total: 115
Stage 2					
c	At-grade road widening	Excavator	CNP081	1	112
		Loader	CNP081	1	112
		Lorry	CNP141	1	112
		Roller	CNP186	1	108
		Grader	CNP104	1	113
					Total: 119
d	Bridge foundation	Concrete lorry mixer	CNP044	1	109
		Concrete pump	CNP047	1	109
		Compressor	CNP002	1	102
		Generator	CNP101	1	108
		Vibrator	CNP170	1	113
		Mobile crane	CNP048	1	112
		Bored piling, oscillator	CNP165	1	115
		Lorry	CNP141	1	112
					Total: 120
e	Road pavement	Road roller	CNP185	1	108
		Asphalt paver	CNP004	1	109
		Lorry	CNP141	1	112
					Total: 115
Stage 3					
f	Construction of retaining wall	Mini backhoe	CNP081	1	112
		Lorry	CNP141	1	112
					Total: 115
g	At-grade road widening	Excavator	CNP081	1	112
		Loader	CNP081	1	112
		Lorry	CNP141	1	112

Activities		Noise Sources	TMRef.	No. Unit	SWL, dB(A)
		Roller	CNP186	1	108
		Grader	CNP104	1	113
					Total: 119
h	Bridge foundation	Concrete lorry mixer	CNP044	1	109
		Concrete pump	CNP047	1	109
		Compressor	CNP002	1	102
		Generator	CNP101	1	108
		Vibrator	CNP170	1	113
		Mobile crane	CNP048	1	112
		Bored piling, oscillator	CNP165	1	115
		Lorry	CNP141	1	112
					Total: 120
i	Road pavement	Road roller	CNP185	1	108
		Asphalt paver	CNP004	1	109
		Lorry	CNP141	1	112
					Total: 115

Annex B

Detailed Calculations of Construction Noise

Table B1 *Worst Case Predicted Noise Levels at NSRs Without Mitigation (dB(A))*

Activity	NSR 1d[1]	NSR1e	NSR 2a	NSR 2b	NSR 2c	NSR 2d	NSR 6a	NSR 6b	NSR10[1]
Stage 1									
Bridge Foundation	70	68	**89**	**78**	**79**	**80**	73	72	63
Road Pavement	64	63	**84**	72	74	74	67	67	58
Stage 2									
At grade road widening +	**78**	75	**88**	**81**	**78**	**81**	**76**	**76**	70
Road Pavement	70	68	**80**	73	70	73	68	68	62
Stage 3									
Retaining wall + At-grade road	**78**	75	**86**	**80**	**78**	**80**	74	73	69
Road Pavement	70	67	**78**	72	70	73	65	65	61

The unmitigated results given in *Table B1* are based on plan distances, rather than slant distances, and therefore worst-case distance corrections have been used.
Accumulation of noise level is considered for each stage, as the construction activities are carried out concurrently in Stages 2 and 3.
Predicted noise levels exceeded the criteria, 75 dB(A) and 70 dB(A) for residential premises and school[1] respectively, are shown in bold and underlined.
A 10 dB(A) noise reduction has been considered for NSR 10 owing to existing insulation with air-conditioning system.

Table B2 *Predicted Noise Levels at NSRs With The Use of Quiet PME (dB(A))*

Activity	NSR1d[1]	NSR1e	NSR 2a	NSR 2b	NSR 2c	NSR 2d	NSR 6a	NSR 6b	NSR10[1]
Stage 1									
Bridge foundation	66	64	**85**	73	75	75	68	68	59
Road pavement	62	60	**81**	70	71	72	65	64	55
Stage 2									
At grade road widening + Bridge foundation	**74**	71	**84**	**77**	74	**77**	72	72	66
Road pavement	68	65	**78**	71	68	71	66	65	59
Stage 3									
Retaining wall + At-grade road widening + Bridge foundation	**75**	72	**83**	**77**	74	**77**	70	70	66
Road pavement	67	64	75	69	67	69	63	62	58

Accumulation of noise level is considered for each stage, as the construction activities are carried out concurrently in Stages 2 and 3.
Predicted noise levels exceeded the criteria, 75 dB(A) and 70 dB(A) for residential premises and school[1] respectively, are shown in bold and underlined.
A 10 dB(A) noise reduction has been considered for NSR 10 owing to existing insulation with air-conditioning system.

Table B3 ***Predicted Noise Levels at NSRs With The Use of both Quiet PME and Barrier (dB(A))***

Acitivity	NSR1d[1]	NSR1e	NSR 2a	NSR 2b	NSR 2c	NSR 2d	NSR 6a	NSR 6b	NSR10[1]
Stage 1									
Bridge foundation	60	58	**80**	68	69	70	63	62	53
Road pavement	59	57	**78**	66	68	68	61	61	52
Stage 2									
At-grade road widening + Bridge foundation	69	67	**79**	72	69	72	67	67	61
Road pavement	64	62	74	67	64	67	62	62	56
Stage 3									
Retaining wall + At-grade road widening + Bridge foundation	70	67	**78**	72	70	72	66	65	61
Road pavement	64	61	72	66	63	66	59	59	55

Accumulation of noise level is considered for each stage, as the construction activities are carried out concurrently in Stages 2 and 3.
Predicted noise levels exceeded the criteria, 75 dB(A) and 70 dB(A) for residential premises and school[1] respectively, are shown in bold and underlined.
A 10 dB(A) noise reduction has been considered for NSR 10 owing to existing insulation with air-conditioning system.

Annex C

Road Traffic Modelling Results

Table C1 *Predicted Traffic Noise Impact - No Mitigation ($L_{10,\ peak\ hour}$ dB(A))*

NSR	1996 Prevailing Traffic Noise Levels	HKPSG criteria	2011 Predicted Noise Levels TOTAL	2011 Predicted Noise Levels Existing Road	2011 Predicted Noise Levels New Road
NSR 1a	**Queen Mary Hospital - Pathology Building**				
1/F	80.0	70	84.2	73.2	83.9
5/F	78.4	70	85.1	71.9	84.9
9/F	77.0	70	83.7	71.0	83.5
NSR 1b	**Queen Mary Hospital - Block K**				
1/F	72.4	55	78.0	70.3	77.2
12/F	75.4	55	78.5	69.8	77.9
22/F	73.9	55	77.5	68.9	76.9
NSR 1c	**Queen Mary Hospital - Radiology Block**				
1/F	76.7	55	78.8	73.1	77.4
2/F	76.5	55	79.0	72.9	77.8
NSR 1d	**Queen Mary Hospital - Professorial Block**				
1/F	70.6	65	74.3	73.9	64.2
3/F	71.5	65	75.7	74.9	67.8
6/F	72.9	65	77.0	76.2	69.3
NSR 1e	**Queen Mary Hospital - Sister Quarters**				
1/F	70.2	70	73.9	73.9	40.7
7/F	70.0	70	73.7	73.7	40.5
14/F	69.3	70	73.0	73.0	46.8
NSR 2a	**Wei Lun Hall**				
1/F					
A	75.9	70	80.5	69.7	80.1
B	73.1	70	75.6	70.0	74.2
C	67.8	70	69.2	68.0	63.2
D	64.4	70	64.2	63.6	55.1
E	68.3	70	70.0	69.4	60.8
F	74.8	70	77.8	72.3	76.3
8/F					
A	75.4	70	79.7	70.3	79.2
B	72.5	70	75.2	70.7	73.3
C	68.1	70	70.1	69.1	63.4

NSR	1996 Prevailing Traffic Noise Levels	HKPSG criteria	2011 Predicted Noise Levels TOTAL	2011 Predicted Noise Levels Existing Road	2011 Predicted Noise Levels New Road
D	65.2	70	65.8	65.5	54.6
E	67.6	70	69.7	68.8	62.1
F	73.9	70	77.3	71.3	76.0
16/F					
A	74.4	70	78.5	70.1	77.8
B	71.6	70	74.4	70.5	72.1
C	67.5	70	69.7	68.9	62.2
D	64.6	70	65.7	65.4	53.8
E	66.6	70	68.8	67.8	61.7
F	72.8	70	76.2	70.1	75.0
NSR 2b	**R.C. Lee Hall**				
1/F					
A	61.4	70	65.3	63.6	60.5
B	71.1	70	72.0	66.7	70.4
C	76.4	70	78.0	74.7	75.2
D	73.0	70	74.2	73.5	65.9
E	66.1	70	68.0	67.3	60.0
8/F					
A	63.0	70	66.4	64.8	61.3
B	70.6	70	72.2	66.5	70.9
C	74.6	70	77.4	73.1	75.4
D	71.4	70	73.7	72.8	66.0
E	68.4	70	70.9	70.5	60.4
16/F					
A	63.2	70	66.7	65.5	60.7
B	69.8	70	71.6	65.8	70.3
C	73.3	70	76.5	71.7	74.8
D	70.2	70	72.9	72.0	65.6
E	69.0	70	71.1	70.7	60.2
NSR 2c	**Lee Hysan Hall**				
1/F					
A	69.2	70	72.0	64.5	71.1

NSR	1996 Prevailing Traffic Noise Levels	HKPSG criteria	2011 Predicted Noise Levels TOTAL	2011 Predicted Noise Levels Existing Road	2011 Predicted Noise Levels New Road
B	66.1	70	68.9	63.5	67.4
8/F					
A	69.0	70	72.2	64.5	71.4
B	65.9	70	69.1	63.2	67.8
16/F					
A	69.4	70	72.9	68.0	71.2
B	65.5	70	68.7	62.7	67.5
NSR 2d	**Madam S.H. Ho Residence for Medical Students**				
1/F					
A	72.7	70	74.9	71.1	72.5
B	53.9	70	50.8	45.3	49.4
C	65.5	70	68.8	68.7	44.1
5/F					
A	72.8	70	75.0	71.5	72.4
B	53.8	70	50.7	45.2	49.3
C	66.5	70	69.7	69.7	43.9
8/F					
A	72.6	70	74.8	71.5	72.1
B	54.0	70	52.0	46.9	50.4
C	66.4	70	69.6	69.6	43.9
NSR 3	**Residential - Northcote Close No. 13 - 15**				
1/F	65.8	70	69.7	69.3	59.3
3/F	67.0	70	70.9	70.4	60.8
5/F	68.0	70	71.8	71.3	62.5
NSR 4	**Ebenezer Home for the Blind**				
1/F	81.0	65	84.7	84.7	52.8
3/F	81.4	65	85.1	85.0	62.2
4/F	80.9	65	84.6	84.6	63.8
NSR 5	**Northcote College of Education**				
1/F	61.2	65	64.9	64.3	56.2
3/F	61.8	65	65.4	64.8	56.9
4/F	62.2	65	65.7	65.0	57.2

NSR	1996 Prevailing Traffic Noise Levels	HKPSG criteria	2011 Predicted Noise Levels TOTAL	2011 Predicted Noise Levels Existing Road	2011 Predicted Noise Levels New Road
NSR 6a	**Residential - Bisney Road**				
1/F	72.9	70	76.4	75.9	66.7
2/F	72.8	70	76.3	75.8	67.2
3/F	72.6	70	76.2	75.6	67.6
NSR 6b	**Residential - Consort Rise No. 18 - 24**				
1/F	80.0	70	83.4	83.2	69.0
2/F	79.6	70	83.0	82.8	69.4
3/F	79.2	70	82.5	82.3	69.7
NSR 7	**Dor Fook Mansion**				
1/F	80.3	70	84.0	84.0	36.0
6/F	77.9	70	81.6	81.6	35.8
11/F	76.3	70	80.0	80.0	40.6
NSR 8	**Kai Ming Temple**				
G/F	81.2	65	85.2	85.2	62.8
NSR 9	**Royalton**				
1/F	77.9	70	81.6	81.5	67.8
12/F	74.7	70	78.4	78.0	67.1
22/F	73.0	70	76.6	76.2	66.2
NSR 10	**Li Shu Fan Building**				
1/F					
A	77.8	65	76.4	76.2	64.2
B	70.9	65	71.6	69.8	66.9
C	67.8	65	69.7	66.1	67.3
D	68.3	65	72.3	72.0	60.5
E	65.7	65	69.8	69.8	49.0
F	72.3	65	72.0	71.5	61.8
2/F					
A	77.6	65	76.6	76.1	67.4
B	71.6	65	72.8	70.3	69.3
3/F					
C	70.6	65	73.1	67.4	71.7
D	68.4	65	72.4	72.1	61.0

NSR	1996 Prevailing Traffic Noise Levels	HKPSG criteria	2011 Predicted Noise Levels TOTAL	2011 Predicted Noise Levels Existing Road	2011 Predicted Noise Levels New Road
E	65.9	65	70.0	69.9	50.3
F	72.9	65	73.2	71.5	68.3
5/F					
C	72.1	65	75.3	68.9	74.2
D	68.6	65	72.6	72.1	62.6
E	66.3	65	70.2	70.0	56.5
F	73.5	65	74.6	71.8	71.2
NSR 11	**Patrick Mansion Building**				
1/F					
A	64.4	65	68.2	68.2	46.4
B	74.3	65	73.4	72.5	65.9
C	78.3	65	76.8	76.7	58.5
2/F					
A	64.6	65	68.4	68.4	48.5
B	74.1	65	73.5	72.4	67.1
C	77.2	65	76.1	76.0	59.5
NSR 12	**Dexter H C Man Building**				
1/F					
A	76.5	65	75.5	75.4	56.7
B	72.5	65	71.9	71.8	56.9
C	58.1	65	61.6	61.5	46.8
3/F					
A	75.4	65	74.9	74.7	61.1
B	72.3	65	72.1	71.7	62.0
C	60.3	65	64.0	63.8	48.4
5/F					
A	74.5	65	74.4	74.0	63.8
B	72.0	65	72.2	71.4	64.3
C	61.7	65	65.3	64.9	54.3
NSR 13	**Estates Office**				
1/F					
A	64.5	70	63.5	63.4	45.6

NSR	1996 Prevailing Traffic Noise Levels	HKPSG criteria	2011 Predicted Noise Levels TOTAL	2011 Predicted Noise Levels Existing Road	2011 Predicted Noise Levels New Road
B	65.4	70	66.5	66.5	42.7
C	61.1	70	64.9	64.9	43.5
3/F					
A	64.3	70	63.4	63.2	49.0
B	65.5	70	66.9	66.9	47.1
C	61.7	70	65.5	65.4	45.7
5/F					
A	64.5	70	64.5	64.0	54.6
B	65.8	70	67.5	67.2	54.3
C	62.4	70	66.1	65.9	52.4

Table C2 *Predicted Noise Levels with Mitigation Package ($L_{10,\ peak\ hour}$ dB(A))*

NSRs	2011 Noise Levels TOTAL (No mitigation)	HKPSG criteria	2011 Noise Levels TOTAL (Mitigated)	2011 Noise Levels Existing Road (Mitigated)	2011 Noise Levels New Road (Mitigated)
NSR 2a - A HKU - Wei Lun Hall					
1/F	80.5	70	80.0	70.3	79.5
8/F	79.7	70	79.5	71.4	78.8
17/F	78.5	70	78.4	71.1	77.5
NSR 2b - C HKU - R.C. Lee Hall					
1/F	78.0	70	77.2	75.2	72.8
8/F	77.4	70	76.6	73.9	73.3
17/F	76.5	70	76.0	72.8	73.1

Table C3 Predicted Noise Levels Eligible for Insulation									
NSR	Prevailing	2011 'TOTAL'	2011 "Existing"	2011 "New"	Meet HKPSG	> Noise Criterion	Total ≥ prevailing+1.0	Total ≥ existing+1.0	Eligible for insulation
NSR 1d Queen Mary Hospital - Professorial Block									
1/F	70.6	74.3	73.9	64.2	no	yes	yes	no	no
3/F	71.5	75.7	74.9	67.8	no	yes	yes	no	no
6/F	72.9	77	76.2	69.3	no	yes	yes	no	no
NSR 1e Queen Mary Hospital - Sister Quarters									
1/F	70.2	73.9	73.9	40.7	no	yes	yes	no	no
7/F	70	73.7	73.7	40.5	no	yes	yes	no	no
14/F	69.3	73	73	46.8	no	yes	yes	no	no
NSR 2a Wei Lun Hall									
1/F									
A	75.9	80.5	69.7	80.1	no	yes	yes	yes	yes
B	73.1	75.6	70	74.2	no	yes	yes	yes	yes
C	67.8	69.2	68	63.2	yes	no	yes	yes	no
D	64.4	64.2	63.6	55.1	yes	no	no	no	no
E	68.3	70	69.4	60.8	yes	no	yes	no	no
F	74.8	77.8	72.3	76.3	no	yes	yes	yes	yes
8/F									
A	75.4	79.7	70.3	79.2	no	yes	yes	yes	yes
B	72.5	75.2	70.7	73.3	no	yes	yes	yes	yes
C	68.1	70.1	69.1	63.4	yes	no	yes	yes	no
D	65.2	65.8	65.5	54.6	yes	no	no	no	no
E	67.6	69.7	68.8	62.1	yes	no	yes	no	no
F	73.9	77.3	71.3	76	no	yes	yes	yes	yes
16/F									
A	74.4	78.5	70.1	77.8	no	yes	yes	yes	yes
B	71.6	74.4	70.5	72.1	no	yes	yes	yes	yes
C	67.5	69.7	68.9	62.2	yes	no	yes	no	no
D	64.6	65.7	65.4	53.8	yes	no	yes	no	no
E	66.6	68.8	67.8	61.7	yes	no	yes	yes	no
F	72.8	76.2	70.1	75	no	yes	yes	yes	yes

NSR	Prevailing	2011 'TOTAL'	2011 "Existing"	2011 "New"	Meet HKPSG	> Noise Criterion	Total ≥ prevailing+1.0	Total ≥ existing+1.0	Eligible for insulation
NSR 2b R C Lee Hall									
1/F									
A	61.4	65.3	63.6	60.5	yes	no	yes	yes	no
B	71.1	72	66.7	70.4	no	yes	no	yes	no
C	76.4	78	74.7	75.2	no	yes	yes	yes	yes
D	73	74.2	73.5	65.9	no	yes	yes	no	no
E	66.1	68	67.3	60	yes	no	yes	no	no
8/F									
A	63	66.4	64.8	61.3	yes	no	yes	yes	no
B	70.6	72.2	66.5	70.9	no	yes	yes	yes	yes
C	74.6	77.4	73.1	75.4	no	yes	yes	yes	yes
D	71.4	73.7	72.8	66	no	yes	yes	no	no
E	68.4	70.9	70.5	60.4	no	yes	yes	no	no
16/F									
A	63.2	66.7	65.5	60.7	yes	no	yes	yes	no
B	69.8	71.6	65.8	70.3	no	yes	yes	yes	yes
C	73.3	76.5	71.7	74.8	no	yes	yes	yes	yes
D	70.2	72.9	72	65.6	no	yes	yes	no	no
E	69	71.1	70.7	60.2	no	yes	yes	no	no
NSR 2c Lee Hysan Hall									
1/F									
A	69.2	72	64.5	71.1	no	yes	yes	yes	yes
B	66.1	68.9	63.5	67.4	yes	no	yes	yes	no
8/F									
A	69	72.2	64.5	71.4	no	yes	yes	yes	yes
B	65.9	69.1	63.2	67.8	yes	no	yes	yes	no
16/F									
A	69.4	72.9	68	71.2	no	yes	yes	yes	yes
B	65.5	68.7	62.7	67.5	yes	no	yes	yes	no
NSR 2d Madam S H Ho Residence for Medical Students									
1/F									
A	72.7	74.9	71.1	72.5	no	yes	yes	yes	yes
B	53.9	50.8	45.3	49.4	yes	no	no	yes	no
C	65.5	68.8	68.7	44.1	yes	no	yes	no	no
5/F									
A	72.8	75	71.5	72.4	no	yes	yes	yes	yes
B	53.8	50.7	45.2	49.3	yes	no	no	yes	no
C	66.5	69.7	69.7	43.9	yes	no	yes	no	no
8/F									
A	72.6	74.8	71.5	72.1	no	yes	yes	yes	yes
B	54	52	46.9	50.4	yes	no	no	yes	no
C	66.4	69.6	69.6	43.9	yes	no	yes	no	no

NSR	Prevailing	2011 'TOTAL'	2011 "Existing"	2011 "New"	Meet HKPSG	> Noise Criterion	Total ≥ prevailing+1.0	Total ≥ existing+1.0	Eligible for insulation
NSR 3 Residential - Northcote Close No. 13-15									
1/F	65.8	69.7	69.3	59.3	yes	no	yes	no	no
3/F	67	70.9	70.4	60.8	no	yes	yes	no	no
6/F	68	71.8	71.3	62.5	no	yes	yes	no	no
NSR 4 Ebenezer Home for the Blind									
1/F	81	84.7	84.7	52.8	no	yes	yes	no	no
3/F	81.4	85.1	85	62.2	no	yes	yes	no	no
4/F	80.9	84.6	84.6	63.8	no	yes	yes	no	no
NSR 5 Northcote College of Education									
1/F	61.2	64.9	64.3	56.2	yes	no	yes	no	no
3/F	61.8	65.4	64.8	56.9	yes	no	yes	no	no
4/F	62.2	65.7	65	57.2	no	no	yes	no	no
NSR 6a Residential - Bisney Road									
1/F	72.9	76.4	75.9	66.7	no	yes	yes	no	no
2/F	72.8	76.3	75.8	67.2	no	yes	yes	no	no
3/F	72.6	76.2	75.6	67.6	no	yes	yes	no	no
NSR 6b Residential - Consort Rise No. 18-24									
1/F	80	83.4	83.2	69	no	yes	yes	no	no
2/F	79.6	83	82.8	69.4	no	yes	yes	no	no
3/F	79.2	82.5	82.3	69.7	no	yes	yes	no	no
NSR 7 Dor Fook Mansion									
1/F	80.3	84	84	36	no	yes	yes	no	no
6/F	77.9	81.6	81.6	35.8	no	yes	yes	no	no
11/F	76.3	80	80	40.6	no	yes	yes	no	no
NSR 8 Kai Ming Temple									
G/F	81.2	85.2	85.2	62.8	no	yes	yes	no	no
NSR 9 Royalton									
1/F	77.9	81.6	81.5	67.8	no	yes	yes	no	no
12/F	74.7	78.4	78	67.1	no	yes	yes	no	no
22/F	73	76.6	76.2	66.2	no	yes	yes	no	no

NSR	Prevailing	2011 'TOTAL'	2011 "Existing"	2011 "New"	Meet HKPSG	> Noise Criterion	Total ≥ prevailing+1.0	Total ≥ existing+1.0	Eligible for insulation
NSR 10 Li Shu Fan Building									
1/F									
A	77.8	76.4	76.2	64.2	no	yes	no	no	no
B	70.9	71.6	69.8	66.9	no	yes	no	yes	no
C	67.8	69.7	66.1	67.3	no	no	yes	yes	no
D	68.3	72.3	72	60.5	no	yes	yes	no	no
E	65.7	69.8	69.8	49	no	no	yes	no	no
F	72.3	72	71.5	61.8	no	yes	no	no	no
2/F									
A	77.6	76.6	76.1	67.4	no	yes	no	no	no
B	71.6	72.8	70.3	69.3	no	yes	yes	yes	yes
3/F									
C	70.6	73.1	67.4	71.7	no	yes	yes	yes	yes
D	68.4	72.4	72.1	61	no	yes	yes	no	no
E	65.9	70	69.9	50.3	no	no	yes	no	no
F	72.9	73.2	71.5	68.3	no	yes	no	yes	no
5/F									
C	72.1	75.3	68.9	74.2	no	yes	yes	yes	yes
D	68.6	72.6	72.1	62.6	no	yes	yes	no	no
E	66.3	70.2	70	56.5	no	no	yes	no	no
F	73.5	74.6	71.8	71.2	no	yes	yes	yes	yes
NSR 11 Patrick Mansion Building									
1/F									
A	64.4	68.2	68.2	46.4	no	no	yes	no	no
B	74.3	73.4	72.5	65.9	no	yes	no	no	no
C	78.3	76.8	76.7	58.5	no	yes	no	no	no
2/F									
A	64.6	68.4	68.4	48.5	no	no	yes	no	no
B	74.1	73.5	72.4	67.1	no	yes	no	yes	no
C	77.2	76.1	76	59.5	no	yes	no	no	no
NSR 12 Laboratory Animal Unit									
1/F									
A	76.5	75.5	75.4	56.7	no	yes	no	no	no
B	72.5	71.9	71.8	56.9	no	yes	no	no	no
C	58.1	61.6	61.5	46.8	yes	no	yes	no	no
3/F									
A	75.4	74.9	74.7	61.1	no	yes	no	no	no
B	72.3	72.1	71.7	62	no	yes	no	no	no
C	60.3	64	63.8	48.4	yes	no	yes	no	no
5/F									
A	74.5	74.4	74	63.8	no	yes	no	no	no
B	72	72.2	71.4	64.3	no	yes	no	no	no
C	61.7	65.3	64.9	54.3	yes	no	yes	no	no

NSR	Prevailing	2011 'TOTAL'	2011 "Existing"	2011 "New"	Meet HKPSG	> Noise Criterion	Total ≥ prevailing+1.0	Total ≥ existing+1.0	Eligible for insulation
NSR 13 Estates Office									
1/F									
A	64.5	63.5	63.4	45.6	yes	no	no	no	no
B	65.4	66.5	66.5	42.7	yes	no	yes	no	no
C	61.1	64.9	64.9	43.5	yes	no	yes	no	no
3/F									
A	64.3	63.4	63.2	49	yes	no	no	no	no
B	65.5	66.9	66.9	47.1	yes	no	yes	no	no
C	61.7	65.5	65.4	45.7	yes	no	yes	no	no
5/F									
A	64.5	64.5	64	54.6	yes	no	no	no	no
B	65.8	67.5	67.2	54.3	yes	no	yes	no	no
C	62.4	66.1	65.9	52.4	yes	no	yes	no	no

Annex D

Window Insulation

Window Insulation

Based on the *Engineering Noise Control by D A Bies & C H Hansen, Table 8.1*, the averaged A-weighted transmission loss of a typical window with 6mm single glass pane are 30.1 dB(A).

The sound pressure levels immediately inside the window at the worst affected window facade of each sensitive block at Queen Mary Hospital are calculated using the following formulae. The calculated noise levels for each NSRs are shown in *Table D1*.

$$Lp_2 = Lp_1 - TL$$

where Lp_2 = *Sound pressure level immediately inside the window*

Lp_1 = *Average sound pressure level outside the window*

TL = *Transmission loss for 6mm glass pane*

Table D1 ***Transmission Loss of A Typical Window***

NSR	SPL outside window (dB(A))	TL of Window (dB(A))	SPL inside window (dB(A))
NSR 1a - Pathology Building	85.1	30.1	55.0
NSR 1b - Block K	78.5	30.1	48.4
NSR 1c - Radiology Block	79.0	30.1	48.9

Annex E

Implementation Schedule

IMPLEMENTATION SCHEDULE

Location	Recommendation	Responsibilities	Timing
HKU Student Residence Hall at 6 Sassoon Road	Detailed Noise Insulation Works Study	HyD	Before the construction of the Roadworks
Within the Works Boundary	Environmental pollution control measures for minimizing construction impacts	HyD/Contractor	Within the construction period
Dwellings at Wei Lun Hall affected by construction work	Window insulation with air-conditioning	HyD	Before the construction of the Roadworks
HKU Student Residence Hall at 6 Sassoon Road Affected Facades	Window insulation with air-conditioning	HyD	Part of the Roadworks
Within the Works Boundary	Erect fences along boundary of construction site to minimize disturbance into adjacent wooded areas	HyD	Before the construction of the Roadworks
Within the Works Boundary	Compensatory tree replanting	HyD	After the completion of the Roadworks