Sha Tin New Town - Stage II

Trunk Road T3 (Tai Wai)

Environmental Impact Assessment (EIA) Study

Updated Final Report

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NT EAST DEVELOPMENT OFFICE

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1 INTRODUCTION

1.1 Background

Trunk Road T3 is part of the Sha Tin strategic road network which has yet to be completed for carrying through traffic away from the new town. Although various improvement schemes, such as Tai Po Road widening, Tate's Cairn Tunnel and increase of throughput of Lion Rock Tunnel had been implemented to ease the demands for external traffic, the need for implementation of additional external link, Route 16 including the connecting links - Trunk Road T3, in Sha Tin becomes imminent.

The proposed alignment for Trunk Road T3 runs north-south through Sha Tin along the existing transport corridor formed by Tai Po Road (Tai Wai), Tai Po Road (Sha Tin) and the Shing Mun Tunnel Road. The road will be on elevated structures above the existing roads. In order to minimise additional environmental disturbance, the alignment was selected to follow the existing transport corridor. This was considered favourable to opening up an otherwise unaffected corridor and introducing additional planning constraints.

A reassessment of the proposed Trunk Road T3 was undertaken in the "Sha Tin New Town Stage II Trunk Road T3 (Tai Wai), Traffic and Transport Review". As part of this review, a working paper on the noise impact of the proposed Trunk Road T3 based on the latest highway layout has been produced to evaluate the significance of the potential impacts and to identify any possible mitigation measures where necessary. An environmental impact assessment (EIA) report has been prepared in 1996 to further consider the key issues, noise impacts, air quality and visual impacts, and identify possible mitigation methods. The proposals will be refined during detailed design stage.

1.2 Updating the EIA Report

An additional traffic review has been conducted to examine the latest highway layout to include a new elevated road linking Tai Po Road (Sha Tin Heights) to Lower Shing Mun Road as suggested by the Provisional District Board, the revised slip road alignment from T3 southbound to Mei Tin Road via Chik Wan Street and the modified gyratory road system adjacent to Mei Lam Estate suggested in the Sha Tin and Ma On Shan District Traffic Review conducted by Transport Department as shown in Figure 1.1. The updated traffic projection for 2011 is based on the revised territory population of 8.1 million. Consequently, there is a need to update the EIA report and it is the objective of this report to review the potential impacts based on the prevailing traffic flows and the maximum traffic forecasts within 15 years. It is for this purpose that additional traffic flows forecasts have been carried out for year 2019. It also intends to re-examine the means to reduce the established potential impacts to acceptable levels, ie levels in compliance with established standard and guidelines.

1.3 Land Use

Adjacent to the alignment are variety of land uses, including high rise residential, village housing, modern low-rise housing and industrial uses. Land use zoning in Sha Tin is indicated in the Sha Tin Outline Zoning Plan (OZP), an extract of which is included for reference in Figure 1.2.

2 NOISE IMPACT

2.1 General

Noise will be one of the key environmental issues in this Project. It is anticipated that noise from the use of powered mechanical equipment on site and the haulage of construction material on- and off-site during the construction of the Project will cause a nuisance to the nearby existing noise sensitive receivers, including the many high-rise buildings along Tai Po Road (Tai Wai), Mei Lam Estate and the low-rise village houses in Tai Wai New Village and Tung Lo Wan. As the trunk road is open to traffic, vehicle noise from the new road will contribute to the already high noise levels from the existing road network. As a result, the noise impacts from the Project could be adverse if unmitigated. This Chapter presents a detailed assessment of the likely impacts on the existing and planned noise sensitive receivers during the construction and operation phases of the Project, together with an evaluation of noise mitigation measures aimed to alleviate the impacts.

2.2 Sensitive Receivers

Along the route alignment are a number of buildings that will be sensitive to noise impacts during both construction and operation of the road. The NSRs in Table 2.1 are considered to be representative of the likely noise impacts during the construction and operation phases of the Project. Locations of the NSRs are shown in Figure 2.1. There are no planned NSRs in the current OZP within the Study Area which will be affected by noise from traffic on Road T3.

Table 2.1 Representative Noise Sensitive Receivers

NSR ID	Name	Type	Representative Locations	
			Construction	Operation
WWC1 - WWC7	Wai Wah Centre	HR Res	WWC6	All
HP1 - HP3	Hilton Plaza	HR Res	HP1	All
SC1 - SC3	Scenery Court	HR Res	SC2	All
VLP1 - VLP4	Villa Le Parc	LR Res	VLP1	All
STGS	Sha Tin Government School	Ed	STGS	All
STC1 - STC3	Sha Tin Clinic, Man Lam Road	I	STC2	All
CS	Caritas School, Man Lam Road	Ed	CS	All
PRC1 - PRC2	Pine Ridge Church	I	PRC1	All
VM	Villa Maria	LR Res	VM	All
MLV	Man Lin Villa	LR Res	MLV	All
OLV	On Lok Villa	LR Res	OLV	All
MV	Mantex Villa	LR Res	MV	All
HL1 - HL2	Harmony Lodge	LR Res	HL2	All
OTT1 - OTT3	On Ting Terrace	LR Res	OTT1	All
KG	Kindergarten	Ed	KG	All
TLW1 - TLW8	Tung Lo Wan Village	LR Res	TLW3	All
TLWK	Kindergarten, Tung Lo Wan Village	Ed	TLWK	All
HA	Home for the Aged	HA	OLD	All
WWT	Wong Wan Tin College	Ed	WWT	All

Table 2.1 (Cont'd)

NSR ID	Name	Type	Representative Locations	
			Construction	Operation
MTH1 - MTH5	Mei Tao House, Mei Lam Estate	HR Res	MTH5	All
MFH1 - MFH6	Mei Fung House, Mei Lam Estate	HR Res	MFH2	All
CCS1 - CCS5	Buildings along Chik Chuen Street	LR Res	CCS2	All
SCWPS	Sin Chu Wan Primary School	Ed	SCWPS	All
KSB1 - KSB3	Kam Shan Building	MR Res	KSB1	All
STPS1 - STPS2	Sha Tin Public School	Ed	STPS1	All
GLG1 - GLG2	Glamour Garden	HR Res	GLG2	All
GRG	Grandeur Garden	HR Res	GRG	All
HG1 - HG6	Holford Garden	HR Res	HG4	All
LPL1 - LPL3	Lau Pak Lok Secondary School	Ed	LPL1	All
CWG	Cheng Wing Gee College	Ed	CWG	All
SCH1 - SCH2	School	Ed	SHL2	All
TWV1 - TWV8	Tai Wai New Village	LR Res	TWV4	All
VDV1 - VDV2	Vista do Vale	LR Res	VDV2	All
STH	Shatin Heights	LR Res	STH	All
KSH1 - KSH2	Kwai Shing House, Mei Shing Court	HR Res	KSH2	All
PG1 - PG3	Parkview Garden	HR Res	PG2	All
VH1 - VH2	Village House	LR Res	VH2	All

Notes: HR Res - High Rise Residential; MR Res - Medium Rise Residential; I - Institutional; LR Res - Low Rise Residential; Ed - Educational Institutions; HA - Home for the Aged

2.3 Existing Noise Levels

The existing noise environment in the vicinity to the Project site is dominated by road traffic on Tai Po Road, with contribution also from the KCR trains along the mainline. According to a noise survey conducted in 1994, the existing noise levels, L_{10}(30-mins.), are in the range of 68-86 dB(A) depending on the proximity of the receivers to the existing transport corridor. As the HKPSG maxima are 70 dB(A) for dwellings and 65 dB(A) for schools and churches, it is apparent that the existing NSRs in the Study Area are being suffered from significant traffic noise impacts.

2.4 Environmental Standards and Guidelines

Construction Noise

<u>*Non-restricted Hours*</u>

Under the existing provisions, there is no legal restriction on noise generated by construction activities (other than percussive piling) between the hours of 07:00 and 19:00 on normal weekdays. However, EPD's *Practice Note for Professional Persons ProPECC PN 2/93* sets a non-statutory daytime noise limit of 75 dB(A) L_{eq} (30 min) at the facades of dwellings, and 70 and 65 dB(A) at the facades of schools during normal school hours and examination period respectively. These criteria have been adopted for the assessment of construction noise during non-restricted hours.

Restricted Hours

It is expected that night works will not be required and therefore the criteria stipulated in the *Technical Memorandum on Noise from Construction Work other than Percussive Piling*, as well as in *Technical Memorandum on Noise from Construction Work in Designated Areas*, issued under the Noise Control Ordinance (NCO) are not applicable to this Project.

Further details of the statutory controls are provided in Appendix 1.

Operational Noise

The impact of road traffic noise has been assessed with reference to the Hong Kong Planning Standards and Guidelines (HKPSG) which stipulates maximum L_{10}(1 hour) road traffic noise levels of 70 dB(A) for domestic premises, 65 dB(A) for churches and educational institutions, and 55 dB(A) for clinics and homes for the aged (diagnostic rooms and wards).

In case where no practical direct technical remedies can be applied or the identified mitigation measures fail to bring down the noise to the relevant HKPSG standards, reference has been made to the ExCo directive *Equitable Redress for Persons Exposed to Increased Noise Resulting from the Use of New Roads.* The following three criteria have been adopted to test the eligibility of the affected receivers for consideration of indirect technical remedies.

- The predicted overall facade noise level from the new road, together with other traffic noise in the vicinity, must be above the HKPSG criteria of L_{10} (peak hour) 70 dB(A) for dwellings, 65 dB(A) for churches / schools, or 55 dB(A) for clinics / homes for the aged.

- The predicted overall noise level is at least 1.0 dB(A) more than the prevailing noise level, i.e. the total traffic noise level existing before the commencement of the construction works.

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

2.5 Construction Phase

2.5.1 Construction Activities

The Project will entail construction of both at-grade and elevated roads. In addition, drainage along the ground level roads will be installed. Details of construction activities and methods are not available at this preliminary stage of the Project. However, it will be the responsibility of the contractor to carry out the construction works in a noise acceptable manner. It is not anticipated that there will be extensive excavation works or earthworks, and there will be no percussive piling. No detailed construction schedule is available at this preliminary stage, although it is known that the contract period will be 36 months. Utility diversions and piling work will start soon after contract commencement, and are expected to last for about 12 months. Deck construction will follow column and pile cap construction. For the purpose of this assessment, the following working methods were assumed:

Elevated Sections

Elevated road will be built on reinforced concrete decking, supported by reinforced concrete columns founded on piles. The concrete decks of the main carriageway will be fabricated in segments in a casting yard, transported to the site by trucks, and then placed using a launching girder and a track-based crane powered by a truck-based generator. Concrete slabs and parapet walls along both sides of the deck will be cast in-situ following placement of the deck.

The locations of works and casting yards are not yet known and it has therefore not been possible to include them in the construction noise assessment at this stage. It is unlikely that a concrete batching plant and aggregate stockpiles will be permitted in Tai Wai, and it has therefore been assumed that ready mix concrete will be supplied from outside sources. Access to the site will be by road. It is not anticipated that significant amounts of fill material will have to be transported on or off the site.

Bored piling is expected along the elevated alignment at all column locations. Up to five piling rigs, located at adjacent column sites, can be expected to be operating at one time. Pile cap construction will proceed as soon as piling work is completed. The work will involve excavating for the caps, fixing reinforcements, concreting and backfilling. Columns will be built to support the road structure and the work will involve fixing the reinforcement, erecting formwork, and pouring concrete.

Slip roads, curved road segments, and segments over which the road width changes cannot be precast and placed using the launching girder. These segments will be cast in-situ. In addition, parapet walls on the precast segments will be cast in-situ on the completed deck. In-situ works require that formwork must first be built. Reinforcement will then be placed, and concrete will be delivered by mixer trucks and placed using a concrete pump. Elevated road structures will be finished with a bituminous surface.

At-Grade Sections

Drainage will be installed along new road sections. The establishment of drainage culverts will require excavation of the drainage trench alongside the road into which precast concrete pipes will be lowered.

Detailed lists of the construction tasks and PME required for both elevated and at-grade sections of the alignment are provided in Tables 2.2 - 2.9 below.

2.5.2 Assessment Methodology

The sound power levels for the equipment were obtained from the *Technical Memorandum on Noise from Construction Sites other than Percussive Piling*. The assessment methodology follows the TM.

Table 2.2 Details of Construction Equipment Required for Bored Piling

Construction Equipment: Bored Piles			
Task and Equipment	Quantity	SWL, dB(A) per piece	CNP Code
Boring (Total SWL = 115 dB(A))			
Large diameter bored piling rig (oscillator or grab-and-chisel)	1	115	164
Concreting (Total SWL = 113 dB(A))			
Concrete mixer truck	1	109	044
Concrete pump	1	109	047
Water pump (petrol)	1	103	282

Table 2.3 Details of Construction Equipment Required for Pile Capping

Construction Equipment: Pile Caps			
Task and Equipment	Quantity	SWL, dB(A) per piece	CNP Code
Ground Excavation (Total SWL = 119 dB(A))			
Backhoe	1	112	081
Earth-moving trucks	1	117	067
Excavator	1	112	081
Reinforcement (Total SWL = 112 dB(A))			
Crane (mobile diesel)	1	112	048
Compressor (silenced)	1	100	002
Bar bender/cutter (electric)	1	90	021
Concreting (Total SWL = 117 dB(A))			
Concrete mixer truck	1	109	044
Vibratory poker	2	113	170
Backfilling (Total SWL = 108 dB(A))			
Roller	1	108	185

Table 2.4 Details of Construction Equipment Required for Column Construction

Construction Equipment: Column Construction			
Task and Equipment	Quantity	SWL, dB(A) per piece	CNP Code
Reinforcement (Total SWL = 112 dB(A))			
Crane (mobile diesel)	1	112	048
Compressor (silenced)	1	100	002
Bar bender/cutter (electric)	1	90	021
Concreting (Total SWL = 117 dB(A))			
Concrete mixer truck	1	109	044
Vibratory poker	2	113	170
Concrete pump truck	1	109	047

Table 2.5 Details of Construction Equipment Required for Precast Superstructure Construction

Construction Equipment: Precast Superstructure Construction			
Task and Equipment	Quantity	SWL, dB(A) per piece	CNP Code
Precast Superstructure Construction (Total SWL = 113 dB(A))			
Launching girder	1	100	Estimate
Truck-based generator (silenced)	1	100	102
Track-mounted crane	1	112	048
Compressor (silenced) for prestressing	1	100	002

Table 2.6 Details of Construction Equipment Required for In-Situ Superstructure Construction

Construction Equipment: In-Situ Superstructure Construction			
Task and Equipment	Quantity	SWL, dB(A) per piece	CNP Code
Formwork and Reinforcement (Total SWL = 117 dB(A))			
Crane (mobile diesel)	2	112	048
Compressor (silenced)	2	100	002
Winch (pneumatic)	2	110	261
Concreting (Total SWL = 118 dB(A))			
Concrete mixer truck	2	109	044
Vibratory poker	2	113	170
Concrete pump truck	1	109	047

Table 2.7 Details of Construction Equipment Required for Paving

Construction Equipment: Paving			
Task and Equipment	Quantity	SWL, dB(A) per piece	CNP Code
Paving (Total SWL = 112 dB(A))			
Asphalt paver	1	109	004
Road roller	1	108	185

Table 2.8 Details of Construction Equipment Required for Drainage

Construction Equipment: Drainage			
Task and Equipment	Quantity	SWL, dB(A) per piece	CNP Code
Excavation of trench (Total SWL = 118 dB(A))			
Excavator	1	112	081
Dumptruck	1	117	067
Placement of pipe (Total SWL = 112 dB(A))			
Mobile diesel crane	1	112	048

Table 2.9 Details of Construction Equipment Required for Road Construction

Construction Equipment: Road Construction			
Task and Equipment	Quantity	SWL, dB(A) per piece	CNP Code
Levelling of new road (Total SWL = 117 dB(A))			
Grader	1	113	104
Bulldozer	1	115	030
Laying base and sub-base (Total SWL = 119 dB(A))			
Dumptruck	1	117	067
Compactor	1	115	050
Roller	1	108	185
Kerbing (Total SWL = 114 dB(A))			
Concrete mixer truck	1	109	044
Vibratory poker	1	113	170
Laying new surface (Total SWL = 112 dB(A))			
Asphalt paver	1	109	004
Road roller	1	108	185

2.5.3 Impact Assessment

Since Trunk Road T3 comprises both at-grade and elevated alignments, two sets of construction noise results were obtained for each of the representative NSRs, as distances from a given NSR to each type of alignment are not necessarily the same. The predicted construction noise levels for the worst affected NSRs given in Table 2.1 are shown in Appendix 3, Table A3.1. It should be noted that these noise levels represent the maximum anticipated noise levels that may be experienced at some time during the construction works. However, these levels would not persist for the duration of the whole works.

With regard to construction of elevated sections, the activity producing the highest cumulative sound power level (SWL) would be excavation for pile cap construction. Predicted noise levels for this activity are 68-93 dB(A). Of the 38 representative NSRs, 30 (79%) would be exposed to noise levels higher than the daytime limit if no mitigation measures were implemented. High noise levels can be expected at some receivers, particularly those close to the construction corridor. In particular, receivers at Chik Chuen Street (i.e. NSR CCS1-5) may be subject to high noise levels for periods during construction.

With regard to the construction of at-grade sections, the predicted noise levels are in the range of 60-95 dB(A). Of the 38 representative NSRs, 30 NSRs (79%) may be exposed to noise levels in excess of the daytime limit, if no mitigation measures were implemented. These worst case noise levels would be a result of road base laying activities. The highest noise levels would be experienced at On Ting Terrace (i.e. NSR OTT1-3) for periods during construction.

2.5.4 Mitigation

As discussed in Section 2.5.3, most of the NSRs will be exposed to significant construction noise impacts. Suitable noise mitigation measures should be provided to protect the affected NSRs throughout the construction period.

In view of the number of NSRs potentially exposed to noise levels exceeding the daytime limit, it is strongly recommended that where at all possible construction activities should remain restricted to daytime hours (07:00 to 19:00).

The most effective measure is to control noise at source. In the case of powered mechanical equipment, this involves either using silenced equipment, or reducing the transmission of noise using mufflers, silencers, or acoustic enclosures. Potential noise control provisions to reduce noise levels from construction activities include, but are not limited to, the following:

- Noisy equipment and activities shall be sited as far from sensitive receivers as is practical.
- Noisy plant or processes shall be replaced by quieter alternatives where possible. For example, pneumatic concrete breakers can be silenced with mufflers and bit dampers. Silenced diesel and gasoline generators and power units, as well as silenced and super-silenced air compressors, can be readily obtained. Manual operations are generally quietest, but may require long periods of time.
- Idle equipment shall be turned off or throttled down. Noisy equipment should be properly maintained and used no more often than is necessary.
- The power units of non-electric stationary plant and earth-moving plant may be quietened by vibration isolation and partial or full acoustic enclosures for individual noise-generating components.
- Construction activities shall be planned so that parallel operation of several sets of equipment close to a given receiver is avoided.
- If possible, the numbers of operating items of powered mechanical equipment should be reduced.
- Construction plant should be properly maintained and operated. Construction equipment often has silencing measures built in or added on, e.g., bulldozer silencers, compressor panels, and mufflers. Silencing measures should be properly maintained and utilised.
- Temporary noise reducing measures other than noise barriers (e.g. earth embankment) may be used to screen specific receivers. Enclosures for noisy activities such as concrete breaking should be applied where the noise impact is potentially severe.

Use of Silenced PME

Tables 2.2M-2.9M give the likely reduction in overall Sound Power Levels of the activities by the use of silenced PME which may be available in the market at the time of construction of the Project or the use of acoustic enclosures. The sound reduction is estimated based on current noise control technologies and Table 15 in BS5228:Part I:1984. It should be noted that silenced PME may not be available for some items.

Table 2.2M Possible Sound Reduction for Bored Piling

Construction Equipment: Bored Piles				
Task and Equipment	Qty.	Possible Remedies(1)	Possible Sound Reduction, dB(A)	SWL, dB(A) (Silenced)
Boring (Total SWL = 115 dB(A))				
Large diameter bored piling rig (oscillator or grab-and-chisel)	1	N/A	0	115
Concreting (Total SWL = 105 dB(A))				
Concrete mixer truck	1	E	-5	104
Concrete pump	1	A	-10	99
Water pump (petrol)	1	A	-10	93

Note 1: A = Use of acoustic enclosure
E = Fit more efficient exhaust
M = Fit suitably designed muffler
N/A = Not applicable

Table 2.3M Possible Sound Reduction for Pile Capping

Construction Equipment: Pile Caps				
Task and Equipment	Qty	Possible Remedies(1)	Possible Sound Reduction, dB(A)	SWL, dB(A) (Silenced)
Ground Excavation (Total SWL = 114 dB(A))				
Backhoe	1	E	-5	107
Earth-moving trucks	1	E	-5	112
Excavator	1	E	-5	107
Reinforcement (Total SWL = 108 dB(A))				
Crane (mobile diesel)	1	E	-5	107
Compressor (silenced)	1	N/A	0	100
Bar bender/cutter (electric)	1	N/A	0	90
Concreting (Total SWL = 113 dB(A))				
Concrete mixer truck	1	E	-5	104
Vibratory poker	2	N/A	0	113
Backfilling (Total SWL = 103 dB(A))				
Roller	1	E	-5	103

Table 2.4M Possible Sound Reduction for Column Construction

Construction Equipment: Column Construction				
Task and Equipment	Qty	Possible Remedies(1)	Possible Sound Reduction, dB(A)	SWL, dB(A) (Silenced)
Reinforcement (Total SWL = 109 dB(A))				
Crane (mobile diesel)	1	E	-5	108
Compressor (silenced)	1	N/A	0	100
Bar bender/cutter (electric)	1	N/A	0	90
Concreting (Total SWL = 112 dB(A))				
Concrete mixer truck	1	E	-5	104
Vibratory poker	2	E	-5	108
Concrete pump truck	1	E	-5	104

Table 2.5M Possible Sound Reduction for Precast Superstructure Construction

Construction Equipment: Precast Superstructure Construction				
Task and Equipment	Qty	Possible Remedies(1)	Possible Sound Reduction, dB(A)	SWL, dB(A) (Silenced)
Precast Superstructure Construction (Total SWL = 109 dB(A))				
Launching girder	1	E	-5	95
Truck-based generator (silenced)	1	N/A	0	100
Track-mounted crane	1	E	-5	108
Compressor (silenced) for prestressing	1	N/A	0	100

Table 2.6M Possible Sound Reduction for In-Situ Superstructure Construction

Construction Equipment: In-Situ Superstructure Construction				
Task and Equipment	Qty	Possible Remedies(1)	Possible Sound Reduction, dB(A)	SWL, dB(A) (Silenced)
Formwork and Reinforcement (Total SWL = 110 dB(A))				
Crane (mobile diesel)	1	E	-5	108
Compressor (silenced)	1	N/A	0	100
Winch (pneumatic)	1	M	-5	105
Concreting (Total SWL = 112 dB(A))				
Concrete mixer truck	1	E	-5	104
Vibratory poker	2	E	-5	108
Concrete pump truck	1	E	-5	104

Table 2.7M Possible Sound Reduction for Paving

Construction Equipment: Paving				
Task and Equipment	Qty	Possible Remedies(1)	Possible Sound Reduction, dB(A)	SWL, dB(A) (Silenced)
Paving (Total SWL = 106 dB(A))				
Asphalt paver	1	E	-5	104
Road roller	1	E	-5	103

Table 2.8M Possible Sound Reduction for Drainage

Construction Equipment: Drainage				
Task and Equipment	Quantity	Possible Remedies(1)	Possible Sound Reduction, dB(A)	SWL, dB(A) (Silenced)
Excavation of trench (Total SWL = 113 dB(A))				
Excavator	1	E	-5	107
Dumptruck	1	E	-5	112
Placement of pipe (Total SWL = 107 dB(A))				
Mobile diesel crane	1	E	-5	107

Table 2.9M Possible Sound Reduction for Road Construction

Construction Equipment: Road Construction				
Task and Equipment	Quantity	Possible Remedies(1)	Possible Sound Reduction, dB(A)	SWL, dB(A) (Silenced)
Levelling of new road (Total SWL = 112 dB(A))				
Grader	1	E	-5	108
Bulldozer	1	E	-5	110
Laying base and sub-base (Total SWL = 114 dB(A))				
Dumptruck	1	E	-5	112
Compactor	1	E	-5	110
Roller	1	E	-5	103
Kerbing (Total SWL = 114 dB(A))				
Concrete mixer truck	1	E	-5	104
Vibratory poker	1	E	-5	108
Laying new surface (Total SWL = 107 dB(A))				
Asphalt paver	1	E	-5	104
Road roller	1	E	-5	103

Use of Effective Temporary Noise Screens

Temporary noise screens of 4m high can be used to shield the nearby and in particular the lower floor receivers from PME located at ground level. Also, mobile barriers of 3m high can be used to screen fixed plant on site. For the purpose of this assessment, it has been assumed that the correct use of temporary or mobile screens can reduce the noise levels at a given lower floor NSR by 10 dB(A).

The effectiveness of combined use of silenced PME and noise screens to reduce construction noise is illustrated in Appendix 3, Table A3.2. The results show that mitigated noise levels at nearly all of the domestic premises would comply with a daytime noise limit of 75 dB(A). However, a few domestic premises very close to alignment are expected to be exposed to higher noise levels, in the order of 78-80 dB(A). Also, a few schools, e.g. Shatin Public School (i.e. STPS1) and a kindergarten near Tung Lo Wan Village (i.e. KG) and Lau Pak Lok Secondary School (LPLS) would be exposed to noise levels close to or exceeding 70 dB(A) for educational institutions. The exceedance arises mainly from the construction of the elevated sections and the noise exceedance is expected to be in the range of 5-10 dB(A), taking into account cumulative noise effects from multiple activities near the NSRs. Each NSR is expected to be exposed to construction noise for a period of no more than about 3 months and the duration in which the maximum noise levels occur is expected to be no more than about one months, and about 4-6 hours per day within this duration. In view of the short duration in which the maximum noise levels occur, no sound insulation is recommended for the construction phase, though the Contractor is encouraged to keep noise down as much as practical.

Noise control requirements can be incorporated in the contract documents, specifying the noise standards to be met and requirements for noise monitoring on the site. A set of recommended pollution control clauses is provided in Appendix 2 for incorporation in the contract documents. Also, details of environmental monitoring and audit (EM&A) requirements are contained in the EM&A Manual.

2.6 Operational Phase

2.6.1 Assessment Methodology

The traffic noise levels at the sensitive facades of the representative NSRs have been modelled in accordance with the UK Department of Transport's Calculation of Road Traffic Noise (CRTN) procedures. The assessment was based on the prevailing traffic flows in the morning peak hour and the highest traffic projections within 15 years after the opening of the trunk road to traffic. As Trunk Road T3 is anticipated to be open to traffic in 2002 and hence the 2002 scenario has been taken to represent prevailing conditions. In order to establish the worst scenario within 15 years, traffic forecasts for 2011 and 2019 were selected in process of identification. The year 2019 has taken into account the possible delay in the construction of Trunk Road T3.

The traffic forecasts for years 2002 and 2011 were based on the current planning data adopted in the Enhanced Comprehensive Transport Study II model and the input from the Sha Tin and Ma On Shan development programme. Detailed territory planning data for traffic forecasts beyond 2011 have been extrapolated from 2011 data.

On the other hand, the traffic forecasts for 2019 were based on the assumptions for the long term planning horizon reported in the Territorial Development Strategy Review. The major assumption is the inclusion of a north-south highway linking Kwu Tung and Tseun Wan with a spur to yuen Long. With the provision of such a major trunk road system, the projected traffic loading on the trunk road system in Sha Tin and East New Territories would be reduced. The modelled traffic flows confirm that forecasts for 2011 represent the worst scenario. Traffic forecasts for 2002 and 2011 are tabulated in Tables 2.10 and 2.11 respectively. The corresponding traffic flows are also shown in Figures 2.2 and 2.3.

Table 2.10 2002 AM Peak Traffic Flows (Before completion of T3 & Rte. 16)

Road	Direction	Traffic Flows (veh/hr)	% of Heavy Vehicles	Speed (km/hr)
Tai Po Road - Sha Tin Heights, up to Sha tin Heights Road	NB	1370	64	70
Tai Po Road - Sha Tin Heights, after Sha Tin Heights Road	NB	1020	63	50
Tai Po Road - Sha Tin Heights	SB	3300	50	70
Lower Shing Mun Road	EB	150	21	50
	WB	80	40	50
Chik Wan Street	WB	370	41	50
Tai Po Road - Tai Wai				
Up to slip road connection to Mei Tin Road	EB	1650	60	50
After slip road connection to Mei Tin Road	EB	1150	62	50
After elevated slip road connection to Shing Mun Tunnel	EB	1580	45	50
Slip road down to junction with Shing Chuen Road	EB	340	41	50
After junction with Shing Chuen Road	EB	720	30	50
Up to junction with Shing Chuen Road	WB	2800	48	50
After junction with Shing Chuen Road	WB	2650	46	50
After junction with Shing Ho Road	WB	2840	45	50
After slip road connection to Tai Wai Road	WB	3080	48	50
Mei Tin Road				
Up to slip road connection to Tai Po Road - Tai Wai	SB	1930	35	50
Up to junction with Tai Wai Road	SB	960	37	50
Up to junction with Chik Fai Street	SB	1180	40	50
Up to junction with Chik Wan Street	SB	1740	36	50
Up to junction with Che Kung Miu Road	SB	1810	37	50

Table 2.10 (Cont'd)

Road	Direction	Traffic Flows (veh/hr)	% of Heavy Vehicles	Speed (km/hr)
Up to junction with Chik Wan Street	NB	2020	33	50
Up to junction with Chik Fai Street		1640	39	50
Up to junction with Tai Wai Road		1180	40	50
Up to Mei Lam gyratory system		1940	36	50
Mei Lam gyratory system		1840	38	50
Slip road from Mei Tin Road to Tai Po Road - Tai Wai/Shing Mun Tunnel Road	EB	1360	40	50
Slip road from Tai Po Road - Tai Wai joining with Mei Tin Road	WB	500	41	50
Shing Mun Tunnel Road elevated slip road (to tunnel)	NB	620	49	50
Shing Mun Tunnel Road elevated slip road (from tunnel)	SB	710	50	50
Slip road from Tai Po Raod - Tai Wai, up to Shing Mun Tunnel Road	EB	1550	44	50
Shing Mun Tunnel Road, up to slip road joining from Tai Po Road - Tai Wai	EB	1600	66	70
Shing Mun Tunnel Road/Tai Po Road - Sha Tin	EB	3150	57	70
Tai Po Road - Sha Tin, up to slip road to Lion Rock Tunnel	WB	4320	53	70
Tai Po Road - Sha Tin, leading to Shing Mun Tunnel Road	WB	2140	58	70
Shing Mun Tunnel Road, after slip road connection from Tai Wai	WB	2760	54	70
Sha Tin Centre Street	EB	780	31	50
	WB	980	44	50
Slip road from Tai Po Road - Sha Tin, to Lion Rock Tunnel	WB	2180	46	50
Lion Rock Tunnel Road	SB	1560	30	50
	NB	1480	40	50
Slip road from Tai Po Road - Tai Wai, to Tai Wai Road	WB	360	24	50
After slip road connection from Shing Mun Tunnel WB and up to Tai Wai Road junction	WB	930	40	50
Tai Wai Road, from junction with Mei Tin Road	EB	380	44	50
Tai Wai Road, up to junction with Mei Tin Road	WB	1260	46	50
Tai Wai Road, up to Chik Shun Street junction	NB	430	53	50
Tai Wai Road, between Chik Shun Street and Chik Chuen Road		510	51	50

Table 2.10 (Cont'd)

Road	Direction	Traffic Flows (veh/hr)	% of Heavy Vehicles	Speed (km/hr)
Tai Wai Road, north of Chik Chuen Street		320	49	50
Chik Fat Street	EB	390	32	50
	WB	420	30	50
Tai Wai Road, up to Chik Chuen Street	SB	360	46	50
Chik Chuen Street	EB	600	46	50
Shing Ho Road, up to junction with Chik Shun Street	SB	180	32	50
Shing Ho Road, after junction with Chik Shun Street	SB	280	30	50
Slip road from Tai Po Road - Tai Wai to Tung Lo Wan	NB	190	41	50
Tung Lo Wan Hill Road	NB	130	36	50
Road from Tung Lo Wan joining with Shing Chuen Road	SB	410	10	50
Shing Chuen Road, south of Tai Po Road	NB&SB	750	40	50
Shing Chuen Road, west of Shing Wan Road	NB&SB	810	30	50
Shing Chuen Road, bridge	NB&SB	720	37	50
Shing Wan Road	EB	200	51	50

Table 2.11 Predicted Year 2011 AM Peak Traffic Flows

Road	Direction	Traffic Flows (veh/hr)	% of Heavy Vehicles	Speed (km/hr)
Link Road from Tai Po Road (Sha Tin Heights) to Lower Shing Mun Road	SB	340	25	50
	NB	140	39	50
Chik Wan Street	EB	530	25	50
	WB	540	39	50
Tai Po Road - Tai Wai				
Up to slip road to Shing Mun Tunnel	EB	1540	42	50
Up to junction with road to Tung Lo Wan	EB	890	35	50
Up to junction with Shing Chuen Road	EB	500	35	50
Up to junction with Lion Rock Tunnel Road	EB	770	37	50
After junction with Lion Rock Tunnel Road	WB	1690	36	50
After junction with Shing Chuen Road	WB	1780	35	50
After junction with Shing Wan Road and before connection to T3 WB	WB	1390	37	50
Up to junction with Shing Ho Road	WB	890	40	50
After junction with Shing Ho Road	WB	870	40	50
After connection from Shing Mun Tunnel slip road	WB	1050		

Table 2.11 (Cont'd)

Road	Direction	Traffic Flows (veh/hr)	% of Heavy Vehicles	Speed (km/hr)
Mei Tin Road				
Up to slip road connection to T3	SB	1950	30	50
Up to junction with Tai Wai Road		1110	36	50
Up to junction with Chik Fai Street		1360	48	50
Up to junction with Chik Wan Street		1000	42	50
Up to junction with Che Kung Miu Road		1570	36	50
Up to junction with Chik Wan Street	NB	1310	38	50
Up to junction with Chik Fai Street		1480	40	50
Up to junction with Tai Wai Road		900	32	50
Up to turn-off to Mei Lam gyratory system		1030	34	50
Mei Lam gyratory system		1100	43	50
Slip road from Mei Tin Road to join T3 eastbound	EB	1050	28	50
Tai Wai Road, from Mei Tin Road junction	EB	840	40	50
Tai Wai Road, up to junction with Mei Tin Road	WB	1050	40	50
Chik Fai Street	EB	330	32	50
	WB	270	39	50
Tai Wai Road, up to Chik Shun Street	NB	480	41	50
Tai Wai Road, after junction with Chik Shun Street	NB	1010	43	50
Chik Chuen Street	EB	120	52	50
	WB	540	46	50
Shing Ho Road, up to junction with Chik Chuen Street EB	SB	275	40	50
Shign Ho Road, up to junction with Chik Chuen Street WB	SB	375	44	50
Shing Ho Road,. after junction with Chik Shun Street	SB	75	56	50
Shing Mun Tunnel Road (elevated slip road), to Shing Mun Tunnel	NB	1060	38	50
Shing Mun Tunnel Road (elevated slip road), from Shing Mun Tunnel	SB	507	58	50
Shing Chuen Raod, from junction with Tai Po Road - Tai Wai	SB	100	54	50
Shing Chuen Road, west of Shing Wan Road	NB&SB	500	29	50
Shing Chuen Road. bridge	NB&SB	500	29	50
Shing Wan Road, up to junction with Shing Wan Road	EB	100	54	50
Road from Tai Wai Road - Tai Wai, to Shing Wan Road	SB	580	25	50
Shing Wan Road	SB	670	36	50
Sha Tin Centre Street	EB	550	46	50
	WB	950	51	50

Table 2.11 (Cont'd)

Road	Direction	Traffic Flows (veh/hr)	% of Heavy Vehicles	Speed (km/hr)
Lion Rock Tunnel Road	SB	640	34	50
	NB	870)	28	50
Shing Mun Tunnel Road				
Up to slip road connection from T3	EB	1140	46	70
After slip road connection from T3		3200	78	70
Up to slip road connection to T3 WB	WB	3990	71	70
Up to slip road connection from Lion Rock Tunnel Road	WB	1270	72	70
Up to slip road connection from Shing Mun Tunnel Road elevated sliproad NB	WB	2160	68	70
T3 Trunk Road, NB/EB				
Tai Po Road - Sha Tin Heights, before elevated section over Chik Wan Street	NB	810	52	50
Elevated section over Chik Wan Street	NB	600	61	50
After slip road connection from Route 16	NB	2760	74	80
After slip road down to Mei Tin Road	NB	2280	75	80
After slip road connection from Mei Tin Road	EB	3330	61	80
Slip road to T4	EB	1640	66	50
Slip road from T3 down to Mei Tin Road	WB	480	67	50
Slip road from Mei Tin Road to T3	EB	1050	28	50
Slip road from Tai Po Road - Sha Tin, to T3 WB	WB	2720	53	50
T4, over Shing Mun River Channel	NB	1900	45	50
Slip road from T4 to join with Shing Mun Tunnel Road WB	WB	890	45	50
Slip road from T4 to join with T3 WB	WB	1270	32	50
T3 after slip road connections from T4 & Tai Po Road - Sha Tin	WB	3990	47	80
Slip road from Tai Po Road - Tai Wai, up to T3 WB	WB	390	45	80
T3, after slip road connection from Tai Po Road - Tai Wai	WB	4380	45	80
Slip road connection from T3 WB to Route 16 WB	WB	2210	52	50
Slip road from T3 down to Chik Wan Street	EB	50	54	50
slip road connection to Route 16, after slip road down to Chik Wan Streeet	SB	2210	52	50
Slip road from Mei Tin Road to join with Route 16 SB	SB	940	40	50
Route 16	SB	3010	45	70
Route 16 connection to T3 NB	NB	2160	76	50

2.6.2 Impact Assessment

The results of the noise analysis are presented in Appendix 4, Table A4.1 and show that under the prevailing conditions most of the NSRs along the proposed Trunk Road T3 alignment are currently exposed to high traffic noise levels exceeding 70 dB(A) from Tai Po Road - Tai Wai and Shing Mun Tunnel Road. The maximum noise level is 86 dB(A) at NSR WWC6 (i.e. Wai Wah Centre).

Following the operation of T3, almost all of the sensitive uses in the vicinity to the proposed alignment would be exposed to noise levels exceeding HKPSG standards. With no noise mitigation, the predicted L_{10} noise levels in the design year 2011 would be in the range of 69 to 87 dB(A). The maximum noise level of 87 dB(A) is also predicted at Wai Wah Centre.

Given that the predicted noise levels at the NSRs are well in excess of the HKPSG criteria, appropriate noise mitigation measures should be provided to remedy the adverse noise environment. It should be noted that current EPD policy requires full consideration of direct technical measures to reduce levels to HKPSG standards before consideration is given to provision of indirect technical remedies under the ExCo criteria.

2.6.3 Mitigation Scenarios

Scenario 1 : Pervious Friction Course

One of the options to control traffic noise at its source is to pave the road with low noise surface material. A pervious macadam paving surface (i.e. friction course surfacing) has high acoustic absorption characteristics that can reduce traffic noise levels by 2.5 dB(A) when compared with impervious or concrete road surface for speeds below 75 kph, according to CRTN.

Highways Department Guidance Note on Noise Reducing Highways Surfacing (RD/GN/001/A) states that friction course material should be limited to roads with free flowing traffic running at 70 kph or above. As Trunk Road T3 is designed for free flowing traffic running at 70 kph or above, the use of friction course on this Project should produce some noise improvement, though the overall reduction may not be adequate to alleviate the impacts.

The effectiveness of friction course for controlling noise has been examined in this scenario, though it is understood that the road will be paved anyway with this material for safety reasons. In this assessment, it has been assumed that friction course material will be applied to the main carriageway where the vehicle speeds are expected to be high and no friction course will be applied on the slip roads where vehicle speeds are low. Table A4.2 in Appendix 4 shows the noise exposure levels at the NSRs under Scenario 1.

As shown in Table A4.2, the use of friction course on this Project will produce a slight improvement in the overall noise levels because of the significant noise contributions from the existing roads. The predicted noise levels are in the range of 68 to 87 dB(A). For those NSRs (e.g. Wai Wah Centre, Hilton Plaza and Scenery Court) where the noise levels are dominated by the existing road traffic, the noise reductions are no more than 0.2 dB(A). On the other hand, the noise reduction at NSRs in Mei Lam Estate can expect to have 2 dB(A) on average.

Scenario 2 : Noise Screening Structures with Pervious Friction Course

In addition to the application of pervious friction course on the main carriageways of T3, purpose-built noise screening structures are considered and examined in this scenario.

As the noise sensitive developments along the alignment of Trunk Road T3 are comprised of high-rise and low-rise buildings, various forms (including plain barriers, inverted-L barriers, partial enclosures and full enclosures) and configurations (including the height and horizontal extent) of the noise screening structures have been considered at strategic locations to protect groups of NSRs where the predicted noise levels in the design year exceed the HKPSG noise criteria by 1 dB(A) or more. In general, vertical plain barriers of 3m or 4m high are considered for low-rise receivers or receivers which are low relative to the elevation of the road decks. On the other hand, inverted-L barriers , partial enclosures or even full enclosures are considered for medium and high rise receivers. In particular, full enclosures are considered where high-rise buildings are found on both sides of the road.

The headroom of the partial enclosure and full enclosure will be 5.5m or 10m high, depending on whether road sign gantries are included or not within the enclosures. Details of the arrangement will be subject to detailed engineering design. In addition, absorptive panels will be used for noise screening structures so as to minimise the reverberation of road traffic noise.

For a given form of barrier, the horizontal extent of the noise screening structures has been optimized by iterative calculations using the computer model developed for this Study in order to determine the most effective noise mitigation scheme. The need arises because the noise contributions from the existing roads play a dominant role at most of the NSRs while the current policy does not provide for noise mitigation for the existing roads. Furthermore, it is beyond the scope of the Project to provide direct mitigation measures for these existing roads.

The optimization process proceeds with examining the overall noise levels from the new and the existing roads for increasing lengths of the barrier with due consideration of the underlying engineering constraints and traffic sightline and stops where the barrier produces no further or significant improvements in the overall noise levels. The optimized noise screening structures are described in Table 2.12 together with the target NSRs to be protected and their locations are shown schematically in Figure 2.4. Typical configurations of the noise screening structures examined are illustrated in Figures 2.5 to 2.9 with the five sections of road, Section 1-1, 2-2, 3-3, 4-4 and 5-5, at locations shown in Figure 2.4.

The following paragraphs provide the rationale for the provision of the noise barriers. Please refer to Figure 2.4 for the designation of the barrier segments.

Barrier Segments a - b

A 170m of inverted-L barrier (a - b) is required to protect lower and middle floors in Scenery Court and Hilton Plaza from the traffic on the slip road between Tai Po Road - Shatin and T3. Although the slip road is close to these buildings, a partial enclosure for this road is not justified because for the upper floor receivers the dominant noise source is Tai Po Road – Shatin which carries over 5,000 veh/hr.

Barrier Segment e - f

As most of the NSRs in Tung Lo Wan are low-rise and below the levels of the new roads, and therefore would be partially screened by crush barriers on the new roads, a barrier of, say 3m high or even higher, on the nearside carriageway of Road T4 would not be effective. Furthermore, the noise contribution from the existing roads is comparable to that from the new roads and this makes the overall noise reduction from the barrier small and insignificant. On the other hand, OTT's, HL's, MV's, PRC's, and VLP's, would be effectively protected by a 3m high barrier of about 370m long on Road T4. However, it should be further reviewed and investigated by EIA study for Trunk Road T4. Both a 2m and a 4m high barriers have been examined and it has been concluded that 3m is the optimal height.

Barrier Segments g - h, h - i, h - j and l - m

These barrier segments are aimed to protect various floors of Mei Tao House and Mei Fung House. First, 200m of partial enclosure (g - h) and 105m of inverted-L barrier (h - j) are required to protect the middle and upper floors from the high traffic flows on E/B carriageway (about 3,000 veh/hr) of Road T3. It has been shown that an inverted-L barrier for g-h is insufficient to screen these high rise receivers. On the other hand, the shadow zone of the proposed inverted-L barrier along h-j is sufficient to cover all the receivers in MFH's which are 20 storeys high.

Furthermore, 128m of full enclosure (l - m) are required to protect the upper floors of the buildings. Besides, the NSRs at Kam Shan Building are also protected by the full enclosure. As the extension of the full enclosure already covers Mei Tao House which is closer to Road T3, a further extension of such enclosure is therefore not recommended.

For lower residential floors, it was considered adequate to have 125m of 4m high plain barrier (h - i) on the slip road between Mei Tin Road and Road T3. This barrier is necessary because the slip road is close to the buildings. However, no additional protection is recommended because the traffic flow is about 900 veh/hr. Further extension of the barrier towards Mei Tin Road is not feasible because of the presence of an existing footbridge and also because one wing of Mei Fung House is set back from the slip road.

Barrier Segment k - l

A 250m of partial enclosure with an overhang of 5m into the carriageway is required to protect the medium-rise residential buildings along Chik Chuen Street, e.g. CCS1-3. Although an inverted-L barrier is able to create a shadow zone to cover these buildings, it is insufficient to provide the required noise reduction for the heavy traffic (about 4,000 veh/hr) on W/B of T3.

Barrier Segments m - n and n - p

An inverted -L barrier has been found to be insufficient to protect the school STPS although the upper floors of the school are just within the shadow zone of the barrier in view of the heavy traffic (about 4,000 veh/hr) on the W/B of T3 and the close proximity of STPS's to the road. A 230m of partial enclosure along m-p is required to protect the school. The partial enclosure will also protect the medium-rise Kam Shan Building, and the high-rise Glamour Garden further to the south.

Barrier Segments n - p, p - r and n - x

Three segments of partial enclosure, n-p, p-r, and n-x, with a total length of 588m are required to protect the high-rise Glamour Garden (GLG's), Grandeur Garden (GRG's) and Holford Garden (HG's).

An inverted-L barrier along n-r is sufficient to screen HG's GRG's, GLG's from the medium traffic (about 1,200) on S/B of Road T3. However, the inverted-L barrier will not screen noise from traffic (about 3,000 veh/hr.) on the N/B carriageway. As a cost-effective alternative, the partial enclosure with a full deck over the carriageway of the S/B is recommended along n-x in order to protect adequately HG's GRG's, GLG's from both the heavy traffic on N/B and the medium traffic on S/B of road T3.

Barrier Segment q - r - s

In view of the close proximity of the slip road in front of HG's, a 320m of partial enclosure with an overhang of 5m along q-r-s is required to protect the high-rise receivers.

Barrier Segment v - w

As the village house at Tai Wai New Village are located on step platforms, 320m of inverted-L barrier are required to protect up to the rear rows of the 3-storeys village houses in the Village from the heavy traffic (about 3,200 veh/hr.) on the N/B of Road T3. A plain barrier of about 3m high would be insufficient to adequately protect these houses.

On the other hand, no barrier is proposed to protect VDV from traffic on Tai Po Road (Shatin Heights) for the following reasons:

(a) Because of space limitation and traffic safety, noise barriers can only be placed on the N/B edge of the loop road leading from Tai Po Road (Shatin Tin Heights) to Lower Shing Mun Road. However, the barrier can only be extended for about 100m. Further extension of this barrier will create sightline and stopping sight distance problem. A barrier of this length is insufficient to protect VDV's.

(b) A plain barrier of about 8-10m on the N/B edge of the loop road leading from Tai Po Road (Shatin Tin Heights) to Lower Shing Mun Road is required to create a shadow zone to cover VDV's.

Similarly, no barriers on Road T3 are proposed to screen VDV because the angle of view of T3 is less than about 20 degrees and the distance is over 200m away.

As summarized in Table A4.1, Appendix 4, the unmitigated overall noise levels in the design year 2011 at NSRs STGS, STC and CS (i.e. Sha Tin Government School, Sha Tin Clinic and Caritas School) are in the range of 74 to 80 dB(A). Since the major noise contribution is from the existing roads, all direct technical remedies on T3 were found to be ineffective and impractical to meet the stringent noise standards of 65 and 55 dB(A) for educational institutions and clinics respectively. As such, eligibility criteria should be applied to test whether these NSRs are eligible for consideration for indirect mitigation.

Although NSRs at Wai Wah Centre (i.e. WWC1 - WWC8) are expected to be significantly affected by the future traffic noise, the main noise contribution should be from the existing road such as Tai Po Road - Tai Wai and therefore it is beyond the scope of this Study to provide any mitigation measures on the existing roads. However, no direct technical remedies within the project limit are practical to reduce the impact and hence eligibility criteria should be applied to test whether these NSRs are eligible for consideration for indirect mitigation.

Table A4.3 in Appendix 4 presents the noise exposure levels at the NSRs under Scenario 2.

As shown in Table A4.3, mitigation scenario 2 will provide a considerable improvement to the predicted noise exposure from T3 at most of the NSRs. However, as the major traffic noise contribution is from the existing Tai Po Road and Shing Mun Tunnel Road, almost all of the representative NSRs along the alignment of T3 are still likely to be exposed to unacceptable traffic noise levels in the range of 65 to 87 dB(A).

Table 2.12 Schedule of Noise Screening Structures

Barrier Segment (1)	Target NSRs	Length of Noise Screening Structure (m)				
		3m High Plain Barrier	4m High Plain Barrier	Inverted-L Barrier (2)	5.5m High Partial Enclosure	5.5m High Full Enclosure
a - b	Scenery Court, Hilton Plaza	-	-	170	-	-
e - f	Villa Le Parc, Pine Ridge Church, Villa Maria, On Lok Villa, Mantex Villa, Harmony Lodge, Tung Lo Wan Village	370	-	-	-	-
g - h	Mei Tao House, Mei Fung House (higher residential floors) (Note 5)	-	-	-	200 (11 m overhang)	-
h - i	Mei Tao House, Mei Fung House (lower residential floors)	-	125	-	-	-
h - j	Mei Tao House, Mei Fung House (higher residential floors)	-	-	105	-	-
k - l	Buildings along Chik Chuen Street (Note 3)	-	-		250	-
l - m	Mei Tao House, Mei Fung House (higher residential floors) Kam Shan Building	-	-	-	-	128

Table 2.12 (Cont'd)

Barrier Segment (1)	Target NSRs	Length of Noise Screening Structure (m)				
		3m High Plain Barrier	4m High Plain Barrier	Inverted-L Barrier (2)	5.5m High Partial Enclosure	5.5m High Full Enclosure
m - n	Sha Tin Public School, Glamour Garden, Kam	-	-	-	175 (11 m overhang)	-
n - p	Shan Building, Grandeur Garden (Note 5)	-	-	-	55 (8 m overhang)	-
p - r	Glamour Garden (Note 5)	-	-	-	185 (7 m overhang)	-
n - x	Holford Garden (Note 4)	-	-	-	348	-
q - r - s	Holford Garden (lower residential floors), Lau Pak Lok Secondary School, Cheng Wing Gee College (Note 3)	-	-	-	320	-
v - w	Tai Wai New Village	-	-	320	-	-

Note:
(1) See Figure 2.4 for barrier segment.
(2) 4.7m high inverted-L barrier with an inclined panel of 1.5m in length
(3). Partial enclosure minimum 5.5m high with an overhang of 5m into the carriageway
(4) Partial enclosure minimum 5.5m high with a full deck covering the south bound carriageway
(5) Partial enclosure minimum 5.5m high with an overhang covering the near half of the carriageway

2.6.4 Recommended Mitigation Scheme

A summary of the unmitigated and mitigated traffic noise levels under the two mitigation scenarios at the representative NSRs is presented in Appendix 4, Table A4.4. Although most of the representative NSRs along the alignment of Road T3 are likely to be exposed to noise levels exceeding the HKPSG limit even with direct mitigation measures in place, direct technical remedies should be implemented to minimize the noise impacts as far as practicable.

Two noise mitigation scenarios using direct mitigation measures on the road have been examined for effectiveness. Further direct measures become impractical because of sightline or engineering constraints. In terms of the overall noise reduction, mitigation Scenario 2 (i.e. noise screening structures with pervious friction course) is far better than noise mitigation Scenario 1 (i.e. application of friction course only) because the maximum noise reduction from Scenario 2 is 18 dB(A) at the NSR on Chik Chuen Street while the noise reduction is no more than 3 dB(A) from Scenario 1. Scenario 2 is therefore recommended for implementation in this Project.

2.6.5 Residual Impacts and Indirect Mitigation

As discussed in Section 2.6.3, the majority of representative NSRs would still be exposed to traffic noise levels exceeding the HKPSG noise standards after the implementation of the recommended mitigation scheme. In order to redress the residual impacts, indirect technical remedies in the form of window insulation and provision of air-conditioning should be considered subject to the fulfillment of EPD's eligibility criteria for consideration by the Exco.

Results of the eligibility assessment are presented in Appendix 4, Table A4.5.

Due to the high prevailing noise and dominant noise contributions from other roads, all of the representative NSRs identified within the Study Area are not eligible for consideration for indirect technical remedies.

Before the operation of T3, the noise levels at about 2380 number of dwellings exceeded the HKPSG criteria. Table 2.13 summarizes the estimated number of dwellings exceeding the HKPSG criteria upon the operation of T3 with and without the recommended mitigation measures, as well as the estimated number of dwellings eligible for consideration for indirect technical remedies by ExCo even with the recommended mitigation measures in place. Also, with the recommended noise mitigation scheme in place, it has been estimated that about 1670 out of 2435 number of affected dwellings will be benefited by 1 dB(A) or more reduction in overall noise levels.

Table 2.13 Dwelling Units Exceeding the HKPSG Criteria and Eligible for Consideration for Indirect Technical Remedies

	Estimated Number of Dwellings	
	Exceeding the HKPSG criteria	**Eligible for Consideration for Indirect Technical Remedies**
Without Noise Mitigation Measures	2435	925
With Recommended Noise Mitigation Measures	2275	0

2.7 Summary

2.7.1 Conclusions

Construction of the Trunk Road T3 will cause excessive construction noise at the existing noise sensitive receivers along the proposed road alignment. The construction noise levels at the worst affected receivers are predicted to be in the range of Leq(30-min) 68 to 95 dB(A), if unmitigated, while the daytime construction noise guideline is 75 dB(A). The single most noisy activity is the pile cap excavation.

Mitigation measures have been proposed to reduce construction noise impacts, including the use of silenced PME, efficient exhaust system, mobile barriers and temporary noise screens. If properly implemented, it is anticipated that the construction noise levels at nearly all of the residential dwellings could be reduced to noise levels below 75 dB(A). On the other hand, a few schools (i.e. KG, STPS1 and LPL1) would still be exposed to noise levels close to or exceeding 70 dB(A) for a period of no more than about 1 month, and about 4-6 hours per day. Nevertheless, the Contractor is encouraged to keep noise down as much as practical.

According to the noise calculation based on the 2002 traffic flows along the existing roads, most of the noise sensitive receivers along the proposed road alignment are exposed to traffic noise levels exceeding the HKPSG noise standards. Operation of the trunk road is expected to further increase the traffic noise levels at these receivers.

All practical direct technical measures have been considered to mitigate the anticipated noise impact in 2011. The recommended noise mitigation scheme comprises plain barriers, inverted-L barriers, partial enclosures and full enclosure of various heights and horizontal extents at various locations to screen the exposed receivers. However, the overall noise improvement is limited by the dominant noise contribution from the existing roads, in spite of the provision of extensive noise barriers.

Also, no practical direct technical measures can be provided to meet the HKPSG standards for Shatin Government School, Shatin Clinic and Caritas School because of the large exceedance above the standards.

In order to redress the residual impacts at the affected receivers, the EPD's eligibility criteria have been applied to test whether these receivers are eligible for consideration of indirect measures, such as the provision of window insulation and air conditioners. The results show that all of the representative NSRs within the Study Area are not eligible due to the high prevailing noise and dominant noise contributions from other roads.

2.7.2 Recommendations

The following are recommended for the road project:

- Incorporate the Pollution Control Clauses in Appendix 2 and the EM&A requirements in the Tender Document.
- Incorporate the barrier scheme shown in Figure 2.4 as part of the road design.

3 AIR QUALITY IMPACT

3.1 General

This Section presents an assessment of the air quality during the construction and operation phases of the Project. The construction impact arises from the air pollutants, mainly dust, which will be generated from various construction activities and this is short-term. As no specific information on concurrent infrastructure projects is available, the assessment presented here has been confined to the net impact from the road works. During the operation phase of the Project, air emissions from vehicles on Trunk Road T3 and all adjacent roadways will impact on the air quality at the nearby air sensitive receivers (ASRs) and this is long-term. In order to assess the viability of the Project, the cumulative air quality impacts from vehicle emissions from Road T3 and all adjacent roadways have been assessed. Besides, the side-effect of the proposed noise screening structures along T3 on the air quality has also been taken into account. The assessment has been based on the projected traffic flows in the design year 2011.

3.2 Sensitive Receivers

Representative ASRs along the proposed road alignment are identified for the purpose of air quality impact assessments for the construction and operational phases of the Project. The representative ASRs are described in Table 3.1 and depicted in Figure 3.1. For construction dust assessment, all receiver heights are 1.5m above the local ground. For operation phase assessment, receiver heights are the lowest sensitive floors for the receivers.

Table 3.1 Representative Air Sensitive Receivers

ASR ID	Name	Type
WWC1 - WWC4	Wai Wah Centre	Residential
HP1 - HP2	Hilton Plaza	Residential
SC1 - SC3	Scenery Court	Residential
VLP1 - VLP3	Villa Le Parc	Residential
PRC	Pine Ridge Church	Church
VM	Villa Maria	Residential
MLV	Man Lin Villa	Residential
OLV	On Lok Villa	Residential
MV	Mantex Villa	Residential
HL1 - HL2	Harmony Lodge	Residential
OTT1 - OTT3	On Ting Terrace	Residential
STC1 - STC2	Sha Tin Clinic, Man Lam Road	Clinic
STGS	Sha Tin Government School	Educational Institution

Table 3.1 (Cont'd)

ASR ID	Name	Type
CS	Caritas School, Man Lam Road	Educational Institution
KG	Kindergarten	Educational Institution
TLW1 - TLW5	Tung Lo Wan Village	Residential
TLWK	Kindergarten, Tung Lo Wan Village	Educational Institution
HA	Home for the Aged	Home for the Aged
WWT	Wong Wan Tin College	Educational Institution
MTH1 - MTH3	Mei Tao House, Mei Lam Estate	Residential
MFH1 - MFH2	Mei Fung House, Mei Lam Estate	Residential
CCS1 - CCS4	Buildings along Chik Chuen Street	Residential
KSB	Kam Shan Building	Residential
SCWPS	Sin Chu Wan Primary School	Educational Institution
STPS1 - STPS2	Sha Tin Public School	Educational Institution
GLG	Glamour Garden	Residential
GRG	Grandeur Garden	Residential
SCH	School	Educational Institution
TWV1 - TWV7	Tai Wai New Village	Residential
HG1 - HG3	Holford Garden	Residential
LPL	Lau Pak Lok Secondary School	Educational Institution
CWG	Cheng Wing Gee College	Educational Institution
RH	Residential House	Residential
STH	Shatin Heights	Residential
VDV1 - VDV2	Vista do Vale	Residential
FY1 - FY4	Factory buildings adjacent to Shing Wan Road and Shing Chuen Road	Industrial
RC1	Chik Wan Street Rest Garden	Recreational
RC2	Tung Lo Wan Playground	Recreational
RC3	Heritage Museum	Museum
KSH	Kwai Shing House, Mei Shing Court	Residential
VH	Village House	Residential
PG1 - PG2	Parkview Garden	Residential

3.3 Existing Environment

An indication of the existing conditions is available from the air quality monitoring programme undertaken by EPD which operates a station in the Sha Tin district. Monitoring results for the years 1991 to 1993 indicate high maximum daily and annual average total suspended particulate (TSP) levels in the area, particularly in 1992 and 1993. Two exceedances of the 24-hour average Air Quality Objective (AQO) in respect of TSP were recorded in 1992.

For the purpose of estimating the prevailing air quality, a short-term monitoring exercise was undertaken over a 20 day period in January 1995 for TSP, Respirable suspended particulate (RSP), carbon monoxide (CO) and nitrogen oxides (NO_2). The monitoring station was located on the roof of the TDD Office which is approximately 100 metres from the road corridor. The results are provided in Table 3.2 and Appendix 8. The measured TSP concentrations were in the range of 16-112 $\mu g/m^3$, RSP concentrations 13-84 $\mu g/m^3$, CO 229-802 $\mu g/m^3$, and NO_2 49-197 $\mu g/m^3$. The arithmetic averages of the air quality parameters over the monitoring period have been determined. No exceedance of the AQO's was recorded during the monitoring period.

Table 3.2 Baseline 24-hour Average Air Pollutant Concentrations ($\mu g/m^3$)

Date	Air Pollutant			
	TSP	RSP	CO	NO_2
08.01.95	112	84	687	197
09.01.95	89	66	802	164
10.01.95	81	62	573	66
11.01.95	77	57	458	64
12.01.95	87	56	687	79
13.01.95	76	56	687	66
14.01.95	81	59	344	49
15.01.95	88	66	458	55
16.01.95	94	67	573	96
17.01.95	64	49	458	62
18.01.95	66	47	344	55
19.01.95	68	52	344	83
20.01.95	57	45	344	81
21.01.95	42	34	229	64
22.01.95	74	52	573	90

Table 3.2 (Cont'd)

Date	Air Pollutant			
	TSP	RSP	CO	NO_2
23.01.95	58	41	573	70
24.01.95	71	57	573	49
25.01.95	55	38	802	60
26.01.95	40	30	344	53
27.01.95	16	13	687	53
20-day Average	70	52	527	78

3.4 Environmental Standards and Guidelines

The Hong Kong Air Quality Objectives stipulate maximum acceptable concentrations for seven criteria pollutants in air. The concentrations for CO, NO_2, TSP and RSP are shown in Table 3.3.

Table 3.3 Hong Kong Air Quality Objectives (AQOs)

Pollutant	Pollutant Concentrations ($\mu g/m^3$) [a]			
	1 Hour [b]	8 Hours [c]	24 Hours [c]	1 Year [d]
CO	30000	10000	-	-
NO_2	300	-	150	80
RSP	-	-	180	55
TSP	500 [e]	-	260	80

Notes: a Measured at 298°K (25°C) and 101.325 kPa (one atmosphere).

b Not to be exceeded more than three times per year.

c Not to be exceeded more than once per year.

d Arithmetic means.

e In addition to the above established legislative control, it is generally accepted that an hourly average TSP concentration of 500 $\mu g/m^3$ should not be exceeded. Such a control limit is particularly relevant to construction work.

Besides, the maximum concentration of NO_2 inside the vehicle tunnel should be kept within 1,800 $\mu g/m^3$ or 1 ppm, according to the EPD Practice on Control of Air Pollution in Vehicle Tunnels.

3.5 Construction Phase

3.5.1 General

Construction of the Trunk Road will generate considerable amount of dust during most of the construction activities, e.g. excavation, backfilling, haulage and handling of construction materials. Trace amounts of sulphur dioxide will also be generated from road paving using bituminous asphalt. In general, TSP is the main air pollutant of concern to the public. Apart from the likely health effect, construction dust has the potential to cause public nuisance because it may soil the floors, table tops, windows, clothing of the nearby dwellings. In this assessment, focus has been placed on the TSP likely to be generated from the construction activities of the road and the effect it may have on the ASRs in the close vicinity to the work site. No cumulative effect will arise from other road construction, e.g. Road T4, in the vicinity since these roads will not be constructed within this construction period.

3.5.2 Assessment Methodology

The dispersion of TSP arising from the above construction activities was modelled using the Fugitive Dust Model (FDM). Hourly meteorological data as recorded at the Tai Po Weather Station in year 1993 was obtained from of the Hong Kong Observatory for modelling the 1-hour and 24-hour average TSP concentrations at the identified ASRs close to the construction corridor. In addition, contours of the maximum 1-hr TSP concentrations were produced to show the extent of the dust impact. The receiver height used for the analysis was 1.5 metres above local ground level. As most of the dust will be generated at ground level and the study area is flat, this should represent the worst-case situation.

The quantity of dust generated from road construction is a function of the size of the construction area and the intensity of activity. For the present dust calculations, the emission factor as suggested by the USEPA for general heavy construction operations, i.e. 1.2 ton/acre/month was adopted (ref: *Compilation of Air Pollutant Emission Factors,* AP-42). This emission factor includes emissions associated with land clearing, blasting, ground excavation, cut and fill operations and the construction of the facilities. As the dust arising activities for the road construction will be mainly excavation, piling and pile cap and column construction. the above emission factor should be conservative.

The annual average TSP concentration as measured at EPD's Sha Tin monitoring station was 69 $\mu g/m^3$. For the purpose of this assessment, this value has been used as an indication of the future TSP background concentration.

3.5.3 Impact Assessment

Ground excavation and foundation works would be the major potential dust sources during the construction phase. Subsequent construction activities, i.e. construction of the superstructure which involves concreting, road paving and other minor activities are not considered to be dusty.

In order to minimise dust emissions at any one time, ground excavation and foundation works would be staggered in eight phases or sections, as depicted in Figure 3.2. Construction of the superstructure which is much less dusty would proceed following the completion of the foundation works in each section. Furthermore, dust suppression measures as detailed in Section 3.5.4 would be implemented. It is anticipated with these measures, dust emissions from each works section can be reduced by 70 per cent, i.e. 20 per cent more effective than using twice watering daily which can reduce dust by 50 per cent according to the AP-42 publication.

Assuming an overall dust suppression efficiency of 70 per cent, maximum 1-hour and 24-hour average TSP concentrations at 1.5 metres above ground level at the representative sensitive receivers were predicted and the results are shown in Tables 3.4 for Phases I to IV construction and 3.5 for Phases V to VIII construction. A background TSP concentration of 69 $\mu g/m^3$ has been included in the results. As RC1 (i.e. Chik Wan Street Rest Garden) is located underneath and RC2 (i.e. Tung Lo Wan Playground) is located within 20m of the proposed alignment of the elevated road, it is likely that these two recreational grounds will be temporarily closed for Road T3 construction. Sample computer output is given in Appendix 5.

As shown by the modelling results, dust impacts are mainly confined to the areas close to the construction corridor. Predicted 1-hr and 24-hr average concentrations for each construction phase are summarised below:

Phase	Range of TSP Concentrations ($\mu g/m^3$)		Worst Affected ASR	
	1-Hour	24-Hour	1-Hour	24-Hour
I	80 - 315	70 - 189	TLW5	TLW3
II	80 - 321	70 - 178	TLW3	CCS1
III	77 - 409	70 - 242	CCS1	CCS2
IV	75 - 365	70 - 180	STPS1	KSB
V	75 - 410	70 - 175	STPS1	STPS1
VI	73 - 318	70 - 197	STPS1	TWV3
VII	79 - 491	70 - 199	LPL	TWV7
VIII	71 - 293	69 - 161	RH	RH

The highest maximum 1-hour average TSP level of 491 $\mu g/m^3$ is predicted at ASR LPL (i.e. Lau Pak Lok Secondary School) during PhaseVII and the highest maximum 24-hour average TSP level of 242 $\mu g/m^3$ is predicted at ASR CCS2 (i.e. building along Chik Chuen Street). With the proper implementation of the recommended dust suppression measures, the predicted maximum 1-hour and 24-hour average TSP concentrations at all representative ASRs identified within the Study Area would comply with the corresponding air quality standard and guideline. Contours of the predicted highest hourly average dust concentrations at 1.5 metres above ground level arising from each of the works sections are shown in Figures 3.3 to 3.10.

3.5.4 Control and Mitigation Measures

In order to suppress dust generation from the construction activities, the following site management and general dust control provisions will be implemented as good site practice:

- Effective water sprays will be employed during the delivery and handling of all raw and aggregate and other similar material when dust is likely to be created and to dampen all stored materials during periods of persistent dry and windy weather.

- The site will be frequently cleaned and watered to minimise the fugitive dust emissions.
- Any material which has the potential to create dust during the process of material handling will be treated with water or other suitable wetting agent sprays.
- All motorised vehicles will be restricted to a maximum speed of 8 kph.
- Areas within the site where there is regular movement of vehicles will have an hard surface and be kept clear of loose surface material.
- Wheel washing facilities will be installed and used by all vehicles leaving the site.
- Any vehicle with an open load carrying area used for moving potentially dust producing material will have properly fitting side and tail boards and a tarpaulin cover.
- Any air pollution control system installed (e.g. wheel washing facility) will be operated whenever the site is in operation.
- A control programme will be instigated to monitor the construction process in order to enforce controls and modify methods of work if dusty conditions arise.

Table 3.4 Predicted TSP Concentrations (μg/m^3) at ASRS at 1.5 metres Above Local Ground Level - Phases I - IV

ASR ID	Phase I		Phase II		Phase III		Phase IV	
	1 HOUR	24 HOUR	1 HOUR	24 HOUR	1 HOUR	24 HOUR	1 HOUR	24 HOUR
	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3
WWC1	111	76	90	72	79	71	76	70
WWC2	122	78	92	72	78	71	75	70
WWC3	135	80	93	72	77	71	75	70
WWC4	170	86	93	72	79	71	76	70
HP1	178	101	94	73	87	72	81	71
HP2	182	96	90	75	83	72	76	71
SC1	185	103	103	74	85	72	81	71
SC2	211	105	99	75	80	72	79	71
SC3	201	104	92	75	82	72	78	71
VLP1	125	85	108	74	84	72	79	71
VLP2	130	82	111	75	87	72	80	71
VLP3	139	83	110	76	96	73	84	71
PRC	216	98	150	82	106	75	91	72
VM	247	109	171	85	106	76	92	73
MLV	141	78	130	79	111	74	90	72
OLV	150	80	136	81	106	74	88	72
MV	164	86	148	83	104	75	87	72
HL1	170	87	155	84	108	75	88	72
HL2	208	104	180	89	126	77	95	73
OTT1	251	127	208	92	113	78	96	74
OTT2	240	138	209	99	127	80	99	74
OTT3	228	137	220	99	138	80	100	74
STC1	195	103	137	88	98	77	87	73
STC2	218	129	135	90	91	76	89	73
STGS	162	93	116	84	100	77	81	73
CS	192	99	142	92	110	80	87	75
KG	181	107	175	94	117	78	91	73
TLW1	230	146	242	115	158	82	103	74
TLW2	184	125	191	99	131	81	96	74

Table 3.4 (Cont'd)

ASR ID	Phase I		Phase II		Phase III		Phase IV	
	1 HOUR	24 HOUR	1 HOUR	24 HOUR	1 HOUR	24 HOUR	1 HOUR	24 HOUR
	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3
TLW3	314	189	321	140	146	88	107	76
TLW4	293	169	301	138	171	89	109	76
TLW5	315	141	316	144	195	93	114	77
TLWK	174	114	179	99	192	84	114	76
HA	260	120	291	140	241	96	114	77
WWT	126	81	197	112	175	101	176	84
MTH1	118	83	182	98	178	122	224	84
MTH2	120	82	182	102	211	138	283	93
MTH3	106	78	182	100	249	154	301	106
MFH1	100	77	159	92	224	117	223	140
MFH2	95	75	133	85	204	111	225	141
CCS1	173	84	400	178	409	232	164	93
CCS2	159	81	376	140	401	242	184	101
CCS3	129	78	251	97	322	160	239	137
CCS4	121	75	156	81	252	109	256	164
KSB	109	74	150	78	295	102	331	180
SCWPS	139	79	133	86	133	78	128	84
STPS1	108	73	125	76	188	83	365	132
STPS2	100	72	119	75	170	82	281	112
GLG	101	72	110	74	126	76	159	82
GRG	94	71	111	74	117	76	141	77
SCH	91	72	102	74	162	80	180	94
TWV1	99	72	98	73	143	77	201	86
TWV2	94	71	110	73	149	76	205	87
TWV3	88	71	99	72	116	75	170	79
TWV4	85	71	102	73	129	74	156	80
TWV5	92	71	101	73	116	73	179	79
TWV6	91	71	94	71	108	74	136	76
TWV7	90	71	97	71	111	74	135	72
HG1	92	71	104	73	111	74	129	77
HG2	86	71	97	73	113	73	136	77
HG3	88	71	96	72	107	72	119	75
LPL	87	71	93	72	103	71	119	75
CWG	87	71	91	71	89	71	102	72
RH	82	70	85	71	87	70	94	72
STH	80	70	80	70	78	70	86	70
VDV1	81	70	81	70	88	71	97	70
VDV2	81	70	80	70	87	71	96	70
FY1	283	166	181	118	111	83	98	75
FY2	235	122	257	121	140	89	101	78
FY3	230	111	228	103	135	89	103	82
FY4	271	97	218	111	176	97	114	87
RC3	165	101	106	81	83	74	84	72
KSH	86	73	107	75	114	79	124	87
VH	94	72	110	73	140	77	140	99
PG1	83	73	97	73	97	75	115	79
PG2	86	73	85	74	103	74	113	77

Table 3.5 Predicted TSP Concentrations (μg/m^3) at ASRS at 1.5 metres Above Local Ground Level - Phases V - VIII

ASR ID	Phase V		Phase VI		Phase VII		Phase VIII	
	1 HOUR	24 HOUR	1 HOUR	24 HOUR	1 HOUR	24 HOUR	1 HOUR	24 HOUR
	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3
WWC1	77	70	73	70	79	70	73	69
WWC2	77	70	74	70	79	70	73	69
WWC3	77	70	74	70	79	71	73	69
WWC4	77	70	75	70	79	71	74	69
HP1	75	70	76	70	80	71	74	69
HP2	78	70	73	70	85	71	71	69
SC1	75	70	75	70	83	71	73	69
SC2	77	70	74	70	85	71	73	69
SC3	78	70	73	70	85	71	73	69
VLP1	80	70	76	70	85	71	74	69
VLP2	80	70	76	70	86	71	74	69
VLP3	80	71	77	70	86	71	74	70
PRC	81	71	80	70	89	72	75	70
VM	82	71	81	70	91	72	75	70
MLV	81	71	78	70	90	71	74	70
OLV	83	71	77	70	92	72	73	70
MV	85	71	76	70	94	72	73	70
HL1	86	71	76	70	95	72	73	70
HL2	86	71	79	71	97	72	73	70
OTT1	84	71	82	71	96	72	74	70
OTT2	87	72	81	71	99	72	73	70
OTT3	88	72	80	71	99	72	74	70
STC1	79	72	79	70	89	72	73	70
STC2	81	71	78	70	91	72	74	70
STGS	80	72	79	71	85	72	74	70
CS	80	72	81	71	93	73	75	70
KG	88	72	80	70	95	72	75	70
TLW1	91	72	79	71	100	73	76	70
TLW2	89	72	85	71	93	73	77	70
TLW3	92	72	81	71	102	73	76	70
TLW4	95	72	81	71	101	73	77	70
TLW5	97	73	85	71	99	73	78	70
TLWK	89	72	88	71	97	73	77	70
HA	98	73	90	71	96	74	79	70
WWT	113	74	99	71	126	73	79	70
MTH1	152	75	110	72	115	73	79	70
MTH2	184	78	107	72	139	75	84	70
MTH3	201	80	113	73	157	76	86	70
MFH1	209	82	114	73	144	75	85	70
MFH2	238	88	141	74	189	77	82	70
CCS1	118	77	106	73	122	76	77	70
CCS2	121	78	106	73	123	76	80	70
CCS3	141	83	109	75	127	76	87	70
CCS4	192	97	150	79	174	78	89	70
KSB1	250	110	169	77	179	78	85	70
SCWPS	102	82	101	75	123	78	82	71
STPS1	410	175	318	91	249	88	101	71
STPS2	299	171	296	102	240	91	101	71
GLG	175	96	182	125	249	104	111	72
GRG	147	88	153	112	290	122	104	73
SCH	154	106	162	95	168	89	86	71
TWV1	197	127	205	131	216	108	106	71
TWV2	278	143	292	162	311	127	107	72

Table 3.5 (Cont'd)

ASR ID	Phase V		Phase VI		Phase VII		Phase VIII	
	1 HOUR	24 HOUR	1 HOUR	24 HOUR	1 HOUR	24 HOUR	1 HOUR	24 HOUR
	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3	μg/m3
TWV3	395	139	285	197	392	157	106	72
TWV4	213	109	203	135	228	133	114	72
TWV5	185	109	177	121	201	120	99	72
TWV6	252	102	234	128	282	169	138	73
TWV7	220	90	252	104	297	199	155	74
HG1	168	85	172	105	256	138	107	73
HG2	193	87	222	103	352	166	139	74
HG3	182	85	287	100	365	173	159	76
LPL	196	84	268	90	491	183	191	79
CWG	137	76	169	78	253	145	201	89
RH	121	73	127	73	332	119	293	161
STH	96	70	91	70	170	81	162	81
VDV1	120	71	104	72	225	105	181	121
VDV2	116	71	101	72	221	98	176	121
FY1	87	72	79	71	93	73	78	70
FY2	90	73	80	71	96	74	79	70
FY3	91	74	82	72	98	74	79	70
FY4	98	75	93	72	113	75	76	70
RC3	77	71	77	70	84	72	73	70
KSH	108	78	97	73	119	76	84	71
VH	128	90	129	88	137	85	93	71
PG1	100	78	100	76	109	76	83	71
PG2	99	77	97	75	103	79	81	71

3.6 Operation Phase

3.6.1 General

Vehicles emissions are the main air pollutants during the operation of the new road. Vehicles generate carbon monoxide, nitrogen oxides, particulates, and trace amounts of volatile organic compounds. This section examines the air quality impacts arising from traffic-related air pollutants on the nearby air sensitive receivers which include all existing and planned receivers in the close vicinity of the road corridor.

3.6.2 Assessment Methodology

Traffic Flow Predictions

The traffic flows used for the air quality prediction are shown in Table 2.11. These traffic flows represent the projected morning peak hour for the year 2011. As discussed below, the combination of lower emission factors and higher traffic flows in 2011 makes this the worst year in terms of air pollution from traffic-related sources.

Vehicle Emissions

Emission factors for CO and NO_x were taken from the *Fleet Average Emission Factors - EURO2 Model* provided by EPD for the year 2011. Based on these figures, the composite emission factors for the road links were calculated as the weighted average of the emission factors of different types of vehicles. No speed correction or other adjustments were made. Besides, NO_2 was assumed to be an inert gas and the NO_2 concentrations have been taken as 20 percent of the total NO_x concentrations.

Preliminary calculations show that the combination of higher traffic flows while lower emission factors in 2011 represent the worst and long-term scenario in terms of air pollution from the road.

Petrol vehicles contribute more carbon monoxide, while diesel-powered vehicles emit more nitrogen oxides and particulate. Under the current emission controls, emissions from petrol vehicles will be reduced as a result of more vehicles being fitted with catalytic converters. In view of the lower emission rates of these pollutants together with the high statutory limit for carbon monoxide, the key air quality parameter will be nitrogen dioxide. For this reason, maximum one hour concentrations of NO_2 arising from the proposed road network have been predicted.

Meteorological Conditions

The worst-case meteorological conditions were adopted in the modelling. This involves a wind speed of 1m/s blowing at a worst wind angle to each sensitive receiver. The standard deviation of the wind direction varies from localities to localities. A suitable value for use in Shatin area, after consulted EPD, is 18 degrees. The stability is assumed to be Class D.

The following summarises the meteorological conditions adopted in the model calculations :

Wind Speed	1 m/s
Wind Direction	worst-case
Wind Direction Variation	18 degrees
Stability Class	D
Mixing Height	500 m
Temperature	25°C

Modelling Method

The USEPA *California Line Source Dispersion Model* - CALINE4 was used to model the air quality at the representative air sensitive receivers. As the road system to be modelled involves a long and winding stretch of new and existing road segments of varying elevations, it was considered necessary to simplify the model algorithm in order that the model can handle the complicated sources.

As the model can handle up to a maximum of 20 road links, the road network has been divided into batches of 20 links and the pollutant concentration at each receiver location is the summation of contribution from all relevant batches of road links. As a result, the model has been used to calculate the pollutant concentrations over 360 degrees at 10 degree intervals in order that the worst-case concentration at each and every receiver can be determined.

As the road elevations vary between 5mPD to over 60mPD over the entire alignment, while CALINE4 permits the road elevation to vary up to a maximum of 10m above ground, it was considered necessary to modify the model in order to truly predict the concentrations at those receivers very close to the alignment. Also, the air quality effect of barriers on the elevated roads can be modelled if the elevation of the road links can be relaxed. The modification includes relaxing the height restriction in the model, others remaining unchanged. With the modified model, all emission sources were modelled at the design elevations. Endorsement of the modification is being sought from USEPA.

The side-effects of the proposed noise screening structures along Road T3 in Chapter 2 were taken into account in the modelling. For plain barriers or cantilevered barriers, the source lines were shifted vertically by the height of the barriers. For partial enclosure, the source lines were shifted horizontally by the width of the extended panel and vertically by the height of the enclosures.

The model has been used to calculate the pollutant concentrations at the lowest sensitive floors of the representative ASRs.

As discussed in Chapter 2, a 120m full enclosure is proposed for Road T3. The net effect is a confinement of the air pollutants in the full enclosure with longitudinal transport of pollutants promoted by the statistical fluctuation of the traffic density, the meteorological condition, and the turbulence generated by the passing vehicles. As the worst case scenario, the air quality inside the full enclosure was assessed using the theory developed by Ohashi and Koso in their paper entitled "Longitudinal Distribution of Exhaust Pollutants in Two-way Automobile Tunnels" presented to International Symposium on the Aerodynamics and Ventilation of Vehicle Tunnels, 1985.

According to Ohashi & Koso's theory, the maximum concentration in a tunnel of a given length is given by :

$$C_{MAX} = wL_e^2 / 8DA_T$$

where C_{MAX} = maximum volumetric concentration of pollutant, ppm
w = emission of the pollutant per unit length, g/s-m
L_e = effective length of tunnel = $L + L_a$, m
D = longitudinal diffusion coefficient, m^2/s
A_T = cross-sectional area of tunnel, m^2
L = the physical length of tunnel, m
L_a = additional tunnel length, m

The additional length is a measure of the diffusive transport of pollutants at the portal and is given by:

$$L_a = 3 \times d_T$$

where d_T = equivalent diameter of the tunnel, m^2

The calculations have assumed an average vehicle speed of 25 kph and an average head-to-head distance of 11m in order to determine the air pollutant concentrations. Further details of the calculation method can be found in Appendix 6.

Ambient Pollutant Concentrations

The 1996 annual average concentration for NO_2 as monitored at Sha Tin was approximately 45 $\mu g/m^3$. After consulted with EPD, it was considered appropriate to adopt this figure to represent the future background concentration.

3.6.3 Impact Assessment

Under the above modelled conditions, the NO_2 concentrations at all of the identified ASRs would comply with the 1-hour average AQO of 300 $\mu g/m^3$ following the operation of the Trunk Road T3. The predicted highest (1-hour) NO_2 concentrations at the lowest sensitive floor of ASRs, as shown in Table 3.7, are in the range of 101 to 236 $\mu g/m^3$. The wind angle leading to the maximum hourly concentrations at each receptor is also indicated in Table 3.6. In addition, the maximum hourly average NO_2 concentrations at 1.5m, 10m and 20m above ground level are depicted in Figures 3.11 to 3.13. A background concentration of 45 $\mu g/m^3$ for NO_2 has been included in order to obtain the cumulative concentrations. Sample computer output is given in Appendix 7.

Table 3.6 Predicted NO_2 Concentrations ($\mu g/m^3$) at Representative ASRs

ASR ID	Wind Angle	Concentration ($\mu g/m^3$)	ASR ID	Wind Angle	Concentration ($\mu g/m^3$)
WWC1	230	188	STGS	20	127
WWC2	230	197	CS	40	166
WWC3	230	195	KG	240	144
WWC4	230	190	TLW1	250	170
HP1	230	181	TLW2	240	155
HP2	250	200	TLW3	250	192
SC1	240	212	TLW4	250	191
SC2	250	229	TLW5	250	197
SC3	250	228	TLWK	240	159
VLP1	240	101	HA	240	190
VLP2	240	101	WWT	100	156
VLP3	240	107	MTH1	210	155
PRC	240	156	MTH2	90	171
VM	240	175	MTH3	90	191
MLV	230	112	MFH1	190	182
OLV	240	119	MFH2	90	174
MV	240	126	CCS1	70	190
HL1	240	128	CCS2	70	184
HL2	240	136	CCS3	70	170
OTT1	240	168	CCS4	60	146
OTT2	250	164	KSB	60	159
OTT3	240	158	SCWPS	50	129

Table 3.6 (Cont'd)

ASR ID	Wind Angle	Concentration ($\mu g/m^3$)	ASR ID	Wind Angle	Concentration ($\mu g/m^3$)
STC1	270	175	STPS1	320	157
STC2	270	214	STPS2	330	148
GLG	320	121	RH	10	153
GRG	320	110	STH	40	125
SCH	70	147	VDV1	40	118
TWV1	60	123	VDV2	40	116
TWV2	50	150	FY1	270	236
TWV3	30	190	FY2	60	211
TWV4	50	148	FY3	50	198
TWV5	60	131	FY4	60	216
TWV6	40	147	RC1	20	135
TWV7	40	143	RC2	90	197
HG1	340	131	RC3	270	176
HG2	360	139	KSH	150	116
HG3	360	128	VH	80	153
LPL	10	130	PG1	100	102
CWG	10	114	PG2	100	104

As indicated in Table 3.6, following the operation of Road T3, the highest maximum 1-hour average NO_2 concentration of 236 $\mu g/m^3$ is predicted at ASR FY1 (i.e. factory building adjacent to Shing Chuen Road). Nevertheless, the predicted concentrations would still be within the AQO for NO_2 of 300 $\mu g/m^3$.

For the proposed Heritage Museum (i.e. ASR RC3) in Area 25 near Man Lam Road, NO_2 concentration of 180 $\mu g/m^3$ is predicted based on a 20m setback from the proposed new roads.

With regard to the air quality inside the full enclosure, the maximum concentration of NO_2 under the worst case scenario is estimated to be 342 $\mu g/m^3$. The concentration has taken into account the contributions from vehicles inside the full enclosure as well as the boundary concentrations. Against the EPD's guideline of maximum NO_2 concentration (i.e. 1,800 $\mu g/m^3$) inside the vehicle tunnel, the impact on the drivers inside the proposed full enclosure on Road T3 is considered minimal. Detailed calculations are shown in Appendix 6.

As the predicted NO_2 concentrations at all receivers, including the drivers inside the full enclosure, would comply with the AQO and guideline, no air quality mitigation measures are considered necessary for this Project.

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As shown by the pollution contours in Figures 3.11 to 3.13, hourly average NO_2 concentrations at 10m above ground level are predicted to be the highest. Nevertheless, the predicted NO_2 concentrations at all sensitive land uses are well within the AQO.

3.7 Summary

The assessment has considered the impacts of construction dust and vehicle emissions arising from the proposed road project. The results indicate that the maximum TSP concentrations at all representative air sensitive receivers during the road construction are well within the Dust Suppression Guideline of 500 $\mu g/m^3$ and the AQO, and thus no specific mitigation measures are considered necessary apart from the normal dust control practices, e.g. twice daily watering, watering the haul roads, wheel-washing of haul vehicles, covering the materials on trucks with tarpaulin sheeting, good housekeeping and the use of wind barriers. Notwithstanding this, site management and general dust control measures have been recommended for implementation as good site practice.

The results for the operation phase also indicate that the predicted 1-hour NO_2 concentrations from vehicular emissions are within the Hong Kong AQO, taking into account the side-effects of the proposed noise screening structures on Road T3. Besides, assessed against the EPD's guideline on the maximum NO_2 concentrations inside the vehicle tunnel, the air quality impact on drivers inside the proposed full enclosure is considered minimal. As such, no specific mitigation for air quality in the operation phase is considered necessary.

4. WATER

4.1 Existing Water Quality

Within the vicinity of Trunk Road T3 the main water quality sensitive receiver is the Upper Shing Mun River Channel.

The channel is of concrete construction, approximately 40 metres wide and 8 metres deep. It is generally dry during the winter and provides a flood protection measure in the wet season. A central deeper storm flow gully, which is only 2 metres wide, flows all year round. East of the Shing Chuen Road bridge, the channel joins the main Shing Mun River Channel, the upper tidal reach. The main channel is permanently flooded and flows into Tolo Harbour.

Upstream of the Tai Po Road bridge the water quality was graded as "good" in 1992 by EPD. Just downstream of the bridge before joining the main channel the water quality was graded as "fair" in 1992. This was an improvement on the previous year's grading of "bad", probably as a result of measures implemented in 1991 in this catchment. These measures included interceptor sewers that diverted polluting flows to the Sha Tin wastewater treatment works.

The proposed Trunk Road T3 is not expected to cause water quality impacts on any other sensitive receivers during construction and operation.

4.2 Legislation and Guidelines

Details are provided in Appendix 1.

4.3 Construction Phase Impacts

During the construction phase, three flyovers will be constructed to span the channel. Possible impacts would arise from site runoff, which could contain suspended solids, as well as dust and construction waste. Sewage effluent arising from the on-site construction workforce also have the potential to cause water pollution.

4.4 Operational Phase Impacts

When Trunk Road T3 becomes operational, the main source of impact will be from runoff. The quantity of pollutants present in the runoff of Trunk Road T3 are not be expected to be different from those found in any other urban runoff. The discharge of this runoff would be unlikely to produce any quantifiable adverse effects. The dangerous material generated from spillage from the road traffic accidents would be anticipated to be infrequent, but it is difficult to predict and assess. Its impact would depend on the quality and composition of any spillage.

A significant impact of the water quality of the Shing Mun River could arise if it is proposed that Trunk Road T3 be drained into the Upper Shing Mun Channel.

4.5 Mitigation

4.5.1 Construction Phase

The need for mitigation measures during the construction phase would be greatly reduced by carrying out works to span the channel in the dry season, when only the smaller central channel would be vulnerable. The stretch of channel under the works area and a margin up to 50 metres either side could be covered over to prevent any material entering the water course. Waste could then be easily cleared from the channel bed below the construction.

The following mitigation measures have been recommended by EPD to minimise water quality impacts during construction :

- all stormwater runoff from the study area during construction should be routed through oil/grit separators and/or sediment basins/traps before being allowed to discharge into the nearby receiving waters, and the water quality of all discharges must not be allowed to cause exceedances of the WQO's in the receiving Tolo Harbour waters ;

- all stockpiled areas should be covered (eg with tarpaulin) and intercepting drains provided to prevent stormwater runoff from washing across exposed soil surfaces or stockpiled areas ;

- all proposed sediment removal facilities should be maintained and the deposited sediment/grit removed regularly and after each rainstorm, to ensure that these facilities are functioning properly at all times ; and

- all storm catchbasins/inlets, if any, receiving stormwater runoff from construction areas, should be covered with wire mesh filters with crushed stone on top in order to prevent sediment from entering the inlet structure, and to reduce potential sediment loading to the receiving waters.

Any effluent generated by the on-site workforce would require appropriate treatment and disposal. All sewage discharges from the study area would have to meet the TM standards, and approval from EPD through the licensing process would be required.

4.5.2 Operational Phase

Since the Trunk Road T3 will consist almost entirely of elevated sections, all the road runoff will flow down the slope gradient. At present there are no plans to provide a special drainage system for Trunk Road T3. It is envisaged that the proposed drainage for the trunk road will be of no difference from the overall system for Sha Tin New Town. Sumps and soakaways would be required at each end of the overpass and at the bottom of each slip road to receive the runoff, thus containing dangerous material in case of spillage and avoiding flooding during heavy rain.

EPD has indicated that the implementation of stormwater Best Management Practices (BMP's) (eg oil/grit separators, sediment traps, vegetation channels) should be investigated for treating stormwater runoff from the paved areas. The water quality of all stormwater runoff from the study area must not lead to exceedances of the WQO's of the receiving Tolo waters.

4.6 Summary

The existing water quality along the proposed Trunk Road T3 has improved in recent years. Avoidance of water deterioration can be achieved through carrying out construction during the dry season and implementing adequate mitigation measures, which will prevent construction waste from entering the water course. These measures are listed in detail in Section 4.5.1. Sewage effluent arising from the construction workforce would also require appropriate treatment and disposal to the satisfaction of EPD.

The incorporation into the road design of sumps and soakaways will also mitigate potential impacts from road runoff and accidental spillage during the operational phase. Best Management Practices should also be implemented to treat stormwater runoff during operation.

It is considered that through implementation of the mitigation measures considered in Section 4.5, potential water quality can be avoided during both construction and operation of Trunk Road T3.

5 WASTE DISPOSAL

5.1 General

This section reviews the potential tunnel spoil and general construction waste issues for the proposed Trunk Road T3.

Legislation and Planning Standards are provided in Appendix 1.

Construction activities may result in the generation of wastes. The types of waste include:

- excavated material;
- construction waste;
- chemical waste; and
- general refuse.

5.2 Excavated Material from Pile Foundations

Quantities of spoil will be produced from the excavation pile foundations for the elevated structures. Excavated material from construction activities will comprise rock, gavel, sands, clay, soil and hard surface where the alignment passes over existing paved areas. Given the inert nature of this material, it should be reused on-site where practical, such as for landscaping.

5.3 Construction Waste

Waste will arise from a number of different activities carried out by the contractor during construction and maintenance activities. It may include wood from formwork, equipment and vehicle maintenance parts, materials and equipment wrappings, and substandard or unused concrete.

Construction waste should be separated as far as is practicable into two main categories: 'inert' materials (eg soil, rock, concrete, brick, cement, plaster/mortar, inert building debris, aggregates and asphalt), and 'non-inert' materials (e.g. timber, paper, glass, general garbage and other organic).

The volume of construction waste cannot be quantified at this stage. This will depend on the operational practices of contractors. Due to the inert nature of most construction waste, disposal is not likely to raise long term environmental concerns.

Disposal of construction waste can either be at a specified landfill, or at a public dumping ground. Depending on the nature of the construction waste generated, surplus construction waste not suitable for reuse on-site should be collected by a waste collector under arrangement with the Contractor and deposited at a suitable public dump or designated landfill. The Contractor should ensure that the necessary waste disposal permits are obtained prior to the collection of the waste.

Due to the limited space at landfills disposal at reclamation sites or an approved public dump would be the preferred method. Contractors should contact the Civil Engineering Department for details of available public dump sites.

It would be advantageous for the contractor to recycle as much of the construction waste on-site as possible, in order to reduce the requirement to import additional materials. In addition, recycling would reduce the collection, transportation and disposal of the construction waste and any associated charges by the transport contractor. At the present time, Government has not implemented a charging policy for the disposal of construction wastes, although it is understood that this may be introduced in future. Only when recycling is not feasible on technical and/or economic grounds should the contractor dispose of the wastes at an approved landfill site.

5.4 Chemical Waste

Chemical Waste is defined under the *Waste Disposal (Chemical Waste)(General) Regulations* and includes any substance being scrap material, or unwanted substances specified under *Schedule 1* of the *Waste Disposal Ordinance (Cap. 354).* A complete list of such substances is provided under the Ordinance, however substances likely to be generated by construction activities will for the most part arise from the maintenance of equipment. These may include, but need not be limited to the following:

- scrap batteries or spent acid/alkali from their maintenance
- waste oil
- mechanical machining producing spent mineral oils
- equipment cleaning producing spent solvents and solutions

Chemical wastes may pose serious environmental and health and safety hazards if not stored and disposed of in an appropriate manner as outlined in the *Chemical Waste Regulations.* These hazards include:

- toxic effects to workers
- adverse effects on water quality from spills
- fire hazards
- disruption of sewage treatment works where waste enters the sewage system.

Chemical waste will arise principally as a result of maintenance activities. It is difficult to quantify the amount of chemical waste which will arise from the construction activities since it will be highly dependant on the contractor's on-site maintenance requirements and the amount of plant utilised.

The Chemical Waste Treatment Centre (CWTC) located at Tsing Yi was commissioned in June 1993 and is the point of disposal for chemical wastes in the Territory. Disposal of chemical wastes in this manner will ensure that environmental and health and safety risks are reduced to a minimum provided that correct storage procedures are instigated on-site.

5.5 General Refuse

General refuse may include any waste that does not fit into any of the categories previously described. The presence of a construction site will result in the generation of a variety of general refuse requiring disposal. General refuse may include food wastes and packaging, waste paper, etc and will ultimately be disposed of to landfill.

The storage of general refuse has the potential to give rise to adverse environmental impacts including:

- odour if the waste is not collected regularly;
- presence of pests and vermin if the waste storage area is not well maintained and cleaned regularly
- litter with consequent visual impact

General refuse generated on-site should be stored and collected separately from other construction and chemical wastes. The Contractor will be responsible for the removal of waste generated on the work sites. A private waste contractor may be commissioned by the Contractor to remove any general refuse generated.

5.6 Waste Minimisation

In order to ensure that all waste is disposed of in an appropriate manner, if practical, waste should be separated by category on-site by the contractor.

It is recommended that waste is segregated into the following categories:

- excavated material or construction waste suitable for reuse on-site
- construction waste for disposal at public dump or landfill
- chemical waste
- general refuse

Good site practice will ensure that the on-site impacts mentioned previously are minimised. These should include:

- daily collection of general refuse or as often as required
- regular maintenance and cleaning of waste storage areas
- storage of waste in suitable containers/receptacles

It is the contractor's responsibility to ensure that only approved licensed waste collectors are used and that appropriate measures to minimise adverse impacts, including windblown litter and dust from the transportation of these wastes are employed. In addition, the contractor must ensure that all the necessary waste disposal permits are obtained.

6 LANDSCAPE ASSEMENT AND VISUAL IMPACT ASSESSMENT

6.1 General

6.1.1 The following Landscape and Visual Impact Assessment has utilized a methodology based on the "Design Manual for Decks and Bridges, Volume 11 - Environmental Assessment", published by the Department of Transport, United Kingdom, June 1993. The Design Manual provides the guiding principles for the assessment of the road scheme.

6.1.2 A Landscape Assessment in relation to road proposals consists initially of the collection of baseline data relating to the components, character and quality of the landscape of the study area. This is followed by an assessment of the likely effects of the proposals and of the significance of these effects, on the landscape, during both the construction and operational stages.

6.1.3 A Visual Impact Assessment in relation to road proposals consists initially of the collection of baseline data relating to the visual quality of the study area. This is followed by an assessment of the likely effects of the proposals and of the significance of these during both the construction and operational stages.

6.1.4 The purpose of assessment is to assess how the Sha Tin Trunk Road T3 will affect the existing landscape and visual quality of the study area in respect to the following factors;

- the extent to which the road will be visible in the landscape;
- the character of the landscape and its capacity to accept changes of the type and scale proposed;
- and the extent to which impacts can be mitigated and the road can be integrated into the landscape.

6.1.5 Finally, it will be possible to reach an overall judgment on the impact of the route, allowing for likely or proposed mitigation, which considers the responsibility to visually integrate the road proposal with the surrounding landscape and maintain a balanced environment.

6.2 Study Area

6.2.1 The Sha Tin Trunk Road T3 is an essential proposed component of the territory wide trunk road network, forming one of the main corridors for north south movements in Hong Kong. It is required to serve both the Sha Tin Area and the north eastern portions of the New Territories and provides an important link for traveling between Kowloon/ Hong Kong and the northern parts of New Territories and Guangdong.

6.2.2 There has been a marked increase of traffic levels within the Sha Tin area and the movement from Sha Tin through to Kowloon in recent times, which has created problems in respect to traffic flow, especially within Tai Wai. It has been established that improvements to the road infrastructure are required. Generally, the Sha Tin Trunk Road T3 follows the existing transport corridor between Sha Tin Heights / Route 16 Interchange and Central Sha Tin New Town, from southwest to northeast. As a result it is predominantly a new road running within an existing vehicular corridor. In places, the road will be supported on elevated concrete structures raised above the existing roads.

6.2.3 For the purposes of the assessment the *Study Area* has been defined by the *visual envelope*. The visual envelope is the extent of the landscape or townscape (all residential buildings, including work places, recreational buildings and outdoor locations) across which the road is visible, defined either by the ridgeline/watershed or intervisibility. Intervisibility being where viewlines are blocked by localized topography, building mass or vegetation. In respect to Road T3, the visual envelope is defined by the Lion Rock Tunnel to the south and the ridgeline at the north and west of Sha Tin. However this varies where vegetation; localized topography and in particular building mass creates intervisibility. The extent of spatial environment covered by the assessment is illustrated in Figure 6.1 - Study Area

6.2.4 In respect to the physical structure of the Study Area, ie. The sequence of spaces and built forms, there are a variety of land uses. Sha Tin Heights and Tai Wai New Village comprises luxury low-rise housing and modern village housing, respectively. Tai Wai is composed of a mixture of high-rise and medium residential uses interspersed with community facilities and circulation networks. Tung Lo Wan Village and the foothills behind, comprise old village housing and luxury housing low-rise housing, respectively. The area between Tai Wai and Sha Tin includes industrial, utility operations and community facilities. Sha Tin Town Centre is composed wholly of high-rise residential uses. The broad land uses within the Study Area have been identified and are illustrated in **Figures 6.2. a and b - Land Uses Within Landscape Of Study Area**

6.2.5 The proposed road commences from Sha Tin Heights located on a foothill of the mountainous Shing Mun Country Park and follows the northern edge of the Shing Mun River Valley. The foothills of Cham Shan (Needle Hill) provides the backdrop towards the north along the length of the proposed road alignment. Towards the south lies the Shing Mun River Valley which includes large areas of flat land, at ~ +7mPD, reclaimed from the Tolo Harbour, upon which is built Greater Sha Tin New Town. In the distance there are the hills of Ma On Shan Country Park.

6.3 Methodology

6.3.1 The contents of the Landscape Assessment consist of the following steps;

- (a) Collection of site data, primarily in the field with associated desk studies;
- (b) Landscape classification utilizing a ranking scale of landscape quality;
- (c) Description of the components and character of the landscape;
- (d) Identification of the potential positive and negative impacts of the scheme;

6.3.2 The contents of the Visual Impact Assessment consist in sequence of the following steps;

- (a) Collection of site data primarily in the field with associated desk studies;
- (b) Identification of the sensitive receivers, ie. A spatial area or built mass which maintain facades or viewing positions which are visually affected by the road proposals;
- (c) Outline of the mitigation measures that could be incorporated.

Landscape Assessment

6.4 Collection of site data

6.4.1 The collection of site data was undertaken in two stages;

- Detailed site visits were undertaken to develop a full understanding of the Study Area. The site visits incorporated detailed investigation of the urban area bordering the proposed alignment and enabled the development of a physical and photographic analysis of the landscape.

  The site visits examined the following landscape character components:-
  ~ Building design, height and massing;
  ~ Streetscape design;
  ~ Vegetation character - from street planting to natural woodland groupings;
  ~ Relationship between land uses e.g.: Residential/ Open Space;
  ~ Visual interest - complexity of physical landscape character and the on-going physical changes and people usage of spaces;
  ~ Significant cultural or physical landmarks.

- Desk - top studies were subsequently undertaken of the relevant documents including; the "Design Manual for Decks and Bridges, Volume 11 - Environmental Assessment", published by the Department of Transport, United Kingdom, June 1993; the Final Environmental Impact Assessment Report: Sha Tin New Town Stage II - Trunk Road T3 (Tai Wai) and governmental strategic and local planning documents.

6.5 Landscape Classification Utilizing A Ranking Scale Of Landscape Quality

6.5.1 **Table 6.1 - Land Uses / Landscape Quality** outlines the main land uses and their landscape classification within the Study Area according to the standard five point scale as outlined in the "Design Manual for Decks and Bridges, Volume 11 - Environmental Assessment", Department of Transport, United Kingdom. For assessment purposes the Study Area has been sub-divided into land uses, based on their similarities, in respect to their landscape and townscape characteristics and distance from the road. These have been listed in order from the commencement of the Sha Tin Trunk Road in southwest to the termination in the northeast. The reference in brackets is for identification purposes in **Figures 6.3 - Landscape Quality Within Landscape Of Study Area** (Numbers) and **Figures 6.4 a-d - Landscape Quality Within Urban Area Bordering Sha Tin Trunk Road T3** (Letters)

6.5.2 The land uses are ranked according to their landscape quality. The relative value placed on a landscape or feature may relate to its location, rarity or particular attributes. Therefore a landscape which may not seem particularly attractive using general criteria could be important in the context of an unattractive surrounding area. The landscape quality has been categorized according to the following scale:-

- Highest Quality Landscape (HQL) - The landform, vegetation and urban form, which in combination create the landscape character, are of a unique superior quality.

- Very Attractive Landscape (VAL) - The landscape character is particularly attractive but does not have a significant uniqueness and importance, in respect to the surrounding area.
- Good Landscape (GL) - The landscape character may not seem particularly attractive, but it is important in the context of the unattractive surrounding area.
- Ordinary Landscape (OL) - The landscape character is of a standard which, with sensitive planning, will not be vulnerable to degradation through the introduction of inappropriate new features.
- Poor Landscape (PL) - The landscape character is of an inferior quality and is particularly able to accept change.

Table 6.1 - Land Uses / Landscape Quality

Land Use	Landscape Quality
Sha Tin Heights (1)	Highest Quality Landscape
Residential Estates in Sha Tin Southwest (2)	Ordinary Landscape
Route 16 / T3 Interface (A)	Very Attractive Landscape
Cheng Wing Gee College / Lau Pau Lok Secondary School (B)	Ordinary Landscape
Holford Garden / Tai Po Road - Tai Wai(C)	Ordinary Landscape
Tai Wai New Village (D)	Good Landscape
Mei Tin Road (E)	Good Landscape
Sha Tin Public School / Tai Po Road - Tai Wai(F)	Ordinary Landscape
Glamour Garden / Grandeur Garden (G)	Ordinary Landscape
Che Kung Miu Road / KCR (3)	Good Landscape
Shing Mun Tunnel Road / May Shing Court (4)	Good Landscape
Kam Shan Building (H)	Poor Landscape
Chik Chuen Street / Shing Ho Road (I)	Good Landscape
Mei Lam Estate (J)	Ordinary Landscape
Wong Wan Tin College (K)	Ordinary Landscape
Shing Chuen Road (L)	Poor Landscape
Man Lai Court (5)	Good Landscape
Government Offices / Tung Lo Wan Hill Road (6)	Very Attractive Landscape
Tung Lo Wan Village / Harmony Lodge (M)	Good Landscape
Pristine Villa (7)	Very Attractive Landscape
Mantex Villa / On Lok Villa (8)	Very Attractive Landscape
Villa Maria / Villa Augustan (N)	Very Attractive Landscape
To Fung Shan (9)	Very Attractive Landscape
Caritas School/Telephone Exchange/Sha Tin Clinic (O)	Good Landscape
Residential Estates in Sha Tin South (10)	Ordinary Landscape
Villa Le Parc (P)	Highest Quality Landscape
Lion Rock Tunnel Road (11)	Poor Landscape
Scenery Court / Hilton Plaza (12)	Ordinary Landscape
Residential Estates in Sha Tin Town Centre (13)	Ordinary Landscape
Residential Areas within Tai Wai Town Centre (Q)	Good Landscape
Shing Mun River Channel : North / South (R)	Good Landscape
Shing Mun River Channel : East / West / Sha Tin Park (14)	Very Attractive Landscape

6.5.4 A detailed description, to delineate the components and character of the main land uses listed in Table 6.1 is provided in *Appendix 10: Landscape Character Assessment: Landscape Quality* and an example of these five categories, as indicative photographs, are provided in **Figures 6.4 e and f**.

6.6 Identification of the potential positive and negative impacts of the scheme and assessment of the significance of the impacts identified

6.6.1 **Table 6.2 (Land Uses / Landscape Impact)** indicates the landscape impact of the road proposals on the land uses according to the standard three point scale as outlined in the "Design Manual for Decks and Bridges, Volume 11 - Environmental Assessment", Department of Transport, United Kingdom. The reference in brackets is for identification purposes in **Figures 6.5 - Landscape Impact Landscape Of Study Area** (Numbers) and **Figures 6.6 a-d - Landscape Impact Within Urban Areas Bordering Sha Tin Trunk Road T3** (Letters)

6.6.2 The land uses are ranked according to the potential landscape impact of the road proposals on these land uses. The assessment of the landscape impact compares the quality of the scene which would remain without the scheme (allowing for any developments which have received planning permission, but which have not been built), with that which would result if the scheme were constructed, and then states the degree of change. The impact on the landscape quality has been categorized according to the following scale:-

- Substantial Landscape Impact (SULI) - Adverse impact, where the alignment of Sha Tin Trunk Road T3 would cause a significant deterioration in the landscape in respect to the land use component.
- Moderate Landscape Impact (MOLI) - Adverse impact, where the alignment of Sha Tin Trunk Road T3 would cause a noticeable deterioration in the landscape in respect to the land use component.
- Slight Landscape Impact (SLLI) - Adverse impact, where the alignment of Sha Tin Trunk T3 would cause a barely perceptible deterioration in the landscape in respect to the land use component.

Table 6.2 - Land Uses / Landscape Impact

Land Use	Landscape Impact
Sha Tin Heights (1)	Slight Landscape Impact
Residential Estates in Sha Tin Southwest (2)	Moderate Landscape Impact
Route 16 / T3 Interface (A)	Substantial Landscape Impact
Cheng Wing Gee College / Lau Pau Lok School (B)	Substantial Landscape Impact
Holford Garden / Tai Po Road - Tai Wai (C)	Moderate/Substantial Landscape Impact
Tai Wai New Village (D)	Slight Landscape Impact
Mei Tin Road (E)	Moderate/Substantial Landscape Impact
Sha Tin Public School / Tai Po Road - Tai Wai (F)	Substantial Landscape Impact
Glamour Garden / Grandeur Garden (G)	Slight Landscape Impact
Che Kung Miu Road / KCR (3)	Slight Landscape Impact
Kam Shan Building (H)	Moderate Landscape Impact
Chik Chuen Street / Shing Ho Road (I)	Substantial Landscape Impact
Mei Lam Estate (J)	Moderate Landscape Impact
Wong Wan Tin College (K)	Substantial Landscape Impact
Shing Chuen Road (L)	Slight Landscape Impact
Man Lai Court (5)	Moderate Landscape Impact
Shing Mun Tunnel Road / May Shing Court (4)	Moderate Landscape Impact

Table 6.2 (Cont'd)

Land Use	Landscape Impact
Government Offices / Tung Lo Wan Hill Road (6)	Slight Landscape Impact
Tung Lo Wan Village / Harmony Lodge (M)	Moderate Landscape Impact
Pristine Villa (7)	Slight Landscape Impact
Mantex Villa / On Lok Villa (8)	Slight Landscape Impact
Villa Maria / Villa Augustan (N)	Substantial Landscape Impact
To Fung Shan (9)	Slight Landscape Impact
Caritas School / Telephone Exchange / Sha Tin Clinic (O)	Moderate Landscape Impact
Residential Estates in Sha Tin South (10)	Slight/ Moderate Landscape Impact
Villa Le Parc (P)	Moderate Landscape Impact
Lion Rock Tunnel Road (11)	Slight/ Moderate Landscape Impact
Scenery Court / Hilton Plaza (12)	Slight Landscape Impact
Residential Estates in Sha Tin Town Centre (13)	Slight/ Moderate Landscape Impact
Residential Areas within Tai Wai Town Centre (Q)	Slight Landscape Impact
Shing Mun River Channel: North-South (R)	Moderate Landscape Impact
Shing Mun River Channel: East-West (14)	Slight/ Moderate Landscape Impact

6.6.4 The construction stage impacts are likely to be similar to those for the operational phase, but more severe, as proposed planting and mitigation measures will not yet be implemented and there will be the additional effect of road construction vehicles, equipment etc..

6.6.5 A detailed assessment of the potential positive and negative effects caused by the landscape quality impact of the road proposal, are described in *Appendix 11: Landscape Character Assessment: Landscape Quality Impact* pertaining to the main land uses as indicated in Figures 6.6 a-d.

Visual Impact Assessment

6.7 Collection of baseline data

6.7.1 The collection of site data was undertaken in two stages;

- Detailed site visits were undertaken to develop a full understanding of the Study Area. The site visits incorporated detailed investigation of the urban area bordering the proposed alignment and enabled the development of a physical and photographic analysis of the landscape.

  The site visits examined the following visual assessment criteria:-
  ~ Building location, height and massing;
  ~ Topography;
  ~ Existing buffers e.g. building, vegetation, topography;
  ~ Land use;
  ~ Existing sightlines and focal points;
  ~ Existing visual fabric.

- Desk - top studies were subsequently undertaken of the relevant documents including; the "Design Manual for Decks and Bridges, Volume 11 - Environmental Assessment", published by the Department of Transport, United Kingdom, June 1993; the Final Environmental Impact Assessment Report: Sha Tin New Town Stage II - Trunk Road T3 (Tai Wai) and governmental strategic and local planning documents.

6.8 Evaluation of existing landscape or townscape quality so as to establish the visual envelope

6.8.1 For the purposes of the visual impact assessment the study area has been defined by the visual envelope. The visual envelope is the extent of the landscape or townscape (all residential buildings, including work places and recreational buildings and outdoor locations) across which the road is visible, defined either by the ridgeline/watershed/horizon or intervisibility (refer to paragraph 6.2.3.). The extent of the visual envelope is indicated in **Figure 6.7 - Visual Envelope**

6.9 Identification of the sensitive receivers

6.9.1 A sensitive receiver is a spatial area or built mass which has facades or viewing positions which are visually affected by the road proposals. In respect to the Visual Impact Assessment the sensitive receivers correlate to the land uses within the urban areas bordering the Sha Tin Trunk Road T3.

6.9.2 The source of the visual impact on the visual receiver will vary depending on the form and elevation of Route T3 adjacent to the location of that receiver. The various components of the scheme which will cause impact, are the following items:-

~ loss of vegetation/ open space;
~ visual prominence of road deck; columns; underside of flyover;
~ visual prominence of high vertical noise barriers; and prominent air quality mitigation barriers/ enclosures.

6.9.3 The sensitive receivers are ranked according to their landscape quality and the expected visual impact created by the road scheme. In respect to the visual impact they are delineated by a standard three point scale. The relative value placed on a sensitive receiver will relate to the potential sensitivity to impact, based on their nature, spatial location and landscape quality, as follows:-

- High Sensitive Receiver (HSR) - Adverse impact, where the road scheme would cause a significant visual deterioration.
- Medium Sensitive Receiver (MSR) - Adverse impact, where the road scheme would cause a noticeable visual deterioration.
- Low Sensitive Receiver (LSR) - Adverse impact, where the road scheme would cause a barely perceptible visual deterioration.

6.9.4 **Table 6.3 - Sensitive Receiver / Visual Impact** identifies the sensitive receivers and delineates their classification in respect to visual impact potentially created by Sha Tin Trunk Road T3. The sensitive receivers have been identified and listed in spatial order from the commencement of the Sha Tin Trunk Road in the southwest to the termination in the northeast. The reference in brackets is for identification purposes in **Figure 6.8 a-d - Location of Sensitive Receivers / Visual Impact** (Letters)

Table 6.3 - Sensitive Receiver / Visual Impact

Sensitive Receiver	Visual Impact
Route 16 / T3 Interface (A)	High Sensitive Receiver
Cheng Wing Gee College / Lau Pau Kok Secondary School (B)	High Sensitive Receiver
Holford Garden (C)	Medium Sensitive Receiver
Tai Wai New Village (D)	High Sensitive Receiver
Mei Tin Road (E)	Low Sensitive Receiver
Sha Tin Public School / Tai Po Road - Tai Wai (F)	Medium Sensitive Receiver
Glamour Garden / Grandeur Garden (G)	Low Sensitive Receiver
Kam Shan Building (H)	Low Sensitive Receiver
Chik Chuen Street / Shing Ho Road (I)	High Sensitive Receiver
Mei Lam Estate (J)	Medium Sensitive Receiver
Wong Wan Tin College (K)	High Sensitive Receiver
Shing Chuen Road (L)	Low Sensitive Receiver
Tung Lo Wan Village / Harmony Lodge (M)	Medium Sensitive Receiver
Villa Maria / Villa Augustan (N)	Low Sensitive Receiver
Caritas School / Telephone Exchange / Sha Tin Clinic (O)	Medium Sensitive Receiver
Villa le Parc (P)	Medium Sensitive Receiver
Residential Areas within Tai Wai Town Centre (Q)	Low Sensitive Receiver
Shing Mun River Channel: North-South (R)	Medium Sensitive Receiver

6.10 Outline of the mitigation measures that will be utilized

6.10.1 Due to the proposed alignment and the nature of the elevated structures, the extent and diversity of mitigation measures are limited. Physically, there is not the space available to create earth mounding and extensive buffer planting in most situations, therefore the most effective mitigation measures will be as described in the following paragraphs.

6.10.2 The visual appearance of the structural finishes and forms of the elevated structures, overpasses, buttress walls, requires careful consideration in respect of the landscape and architectural design, so that there is a positive impact or a reduced negative impact on the surrounding urban landform. At the detailed design stage the outline, tone and perspective effect of the Sha Tin Trunk Road T3 will be formulated. However a variety of different textures including the following; use of rubber mound (RECKLI), off-form concrete and washed pebble finish, could be utilized to enhance the texture, form and line of the structure. A variety of different types of tiles provide the flexibility to create murals and repetitive but interesting graphics with the advantage of requiring low maintenance. The chromatic scheme would be selected to relate either to a theme to continue throughout the T3 Route and/or the context/immediate surroundings of particular sections of the Route. This would be utilized in such a way which create vitality and increases the sense of people's "well being".

6.10.3 The extent and form of the noise mitigation measures have been formulated following a detailed Impact Assessment. The Assessment proposed that at a number of critical locations, the mitigation measures would be required, for particular Noise Sensitive Receiver's (NSRs) where Noise Quality Objectives were exceeded. In respect of these critical locations, the new elements will create an additional visual impact on the surrounding areas. The locations and types of noise barriers are illustrated in **Figures 6.9 a-e - Proposed Noise Barrier Locations**

Depending on the severity of the noise impact in respect to a geographical location, the form of the mitigation measures, ranked from low noise impact to high noise impact, will be as follows;

a) **Vertical Plan Noise Barrier** - These will vary in height between 7 and 11 metres. The lower 2.5 metres will comprise of absorptive panels composed of brightly coloured perforated aluminum panels with internal mineral wool absorption slabs. The detailed pattern of these panels will be considered at the detailed stage. The upper portion of the noise barriers will utilize transparent panels within a steel frame.

b) **Inverted L Shape Noise Barrier** - This will be approximately 7 metres in height with a 5 metre cantilevered canopy. The side wall will follow the same design intent as the Vertical Plan Noise Barrier with the canopy being comprised of a steel subframe with self cleansing transparent panels.

c) **Partial Enclosure Noise Barrier** - This will be approximately 11 metres in height with a slightly curved steel canopy with transparent cladding to allow for drainage and to provide a more visually attractive appearance, both for motorists and surrounding sensitive receivers. The vertical panels enclosing the roadway are only to occur on the one facade and are to be similar in appearance to the vertical barriers.

d) **Full-Enclosure Noise Barrier** - This will be approximately 11 metres in height with a slightly curved steel canopy with transparent cladding to allow for drainage and to provide a more visually attractive appearance both for motorists and surrounding sensitive receivers. The vertical panels enclosing the carraigeway are to occur on both sides of the carriageway and are to be similar in appearance to the vertical barriers.

6.10.4 In the case of each noise barrier form, the approach will be to provide a structure which:-

- is 'light' in appearance and unobtrusive in its form and composition;
- is not visually 'cluttered' but still interesting;
- enhances the quality of the surrounding landscape/ townscape for both the stationary and transient observers, through its colour; pattern and form and;
- maximizes natural light.

With these objectives as a basis, the detailed design of the noise barriers will be carefully considered as apart of the total urban environment, so as to provide a positive visual contribution. The proposed noise barrier types are illustrated in **Figures 6.10 a-c - Proposed Noise Barrier Systems**

6.10.5 In situations where areas under the elevated structures are limited in scope for providing recreational space and effective planting areas, an important factor to increase the positive contribution Route T3 will have, is to implement townscape features, such as the following:-

- feature lighting
- flexible areas for market space e.g. flower market
- urban sculpture/ art

6.10.6 Where possible all existing vegetation will be preserved and supplementary hydroseeding and planting will be undertaken for all amenity areas and slope protection zones. All existing trees will be surveyed and full detailed compensatory planting schemes will be submitted to Government at a later stage. Sensitive soft and hard landscaping will be provided where the opportunity arises to enhance the landscape and townscape.

6.10.7 Where the road scheme affects passive recreational facilities, such as sitting out areas and seating, an assessment will be undertaken to identify the opportunities available for reprovisioning these facilities and providing additional passive open space. Close liason with District Lands Office (DLO) and Regional Council (RC) will be undertaken to ensure effective, useable and safe recreational areas can be incorporated within the contract works.

6.10.8 The impact of road lighting will affect the characteristics of all the land use components to a certain extent. The form of lighting design will be central lighting columns with lanterns on both carriageways. The column lighting will be ~12m in height and located at 30-35m intervals, unless affected by the barriers and enclosures. The daytime visual impact will be due to the height and spacing of the light fittings and columns. However the impact is considered minor as the lighting system will be visually integrated with the carriageway. The nighttime visual impact will include glare and reflection. However the lighting system will include shielding and interms of the surrounding growing urban area of Tai Wai the impact will be negligible.

6.10.9 At location of footpath/cycle track which are underneath the elevated structures and with no provision of sunlight, amenity lighting system will be provided to mitigate the sunlight problem.

6.11 Delineate the specific mitigation measures that will be utilized to minimize the visual impact of the road scheme on the sensitive receivers

6.11.1 **Table 6.4 - Mitigation Measures / Visual Impact** outlines the mitigation measures and their visual impact on the sensitive receivers according to a standard three point scale as outlined in the "Design Manual for Decks and Bridges, Volume 11 - Environmental Assessment", Department of Transport, United Kingdom. The reference in brackets is for identification purposes in **Figures 6.11 a-d - Proposed Mitigation Measures for Sensitive Receivers** (Letters)

A number of perspective views and sections have been provided to indicate the proposed landscape design intent for the mitigation measures in respect to the sensitive receivers. These are illustrated in Figures 6.12 and 6.13.

6.11.2 The specific mitigation measures are ranked according to their visual impact on the Sensitive Receivers. The assessment of the visual impact mitigation compares the quality of the scene which would pertain without the mitigation measures, with that which would result when the measures are implemented. The relative value placed on a critical location will relate to the visual prominence of the noise mitigation measures based on their nature and spatial location. The visual impact mitigation measures are categorized according to the following scale:-

- Substantial Benefit (SUB) - Where the mitigation measures would cause a significant improvement in the future view of the road proposals for the sensitive receivers.
- Moderate Benefit (MOB) - Where the mitigation measures would cause a noticeable improvement in the future view of the road proposals for the sensitive receivers.
- Slight Benefit (SLB) - Where the mitigation measures would cause a barely perceptible improvement in the future view of the road proposals for the sensitive receivers.

Table 6.4 - Mitigation Measures / Visual Impact

Sensitive Receiver	Mitigation Measure	Visual Impact
Rout 16/ T3 Interface (A)	Compensation Re-planting/ Design Techniques for Elevated Structure/ Revitalization of Townscape	Moderate Benefit
Cheng Wing Gee College/ Lau Pau Kok Secondary School (B)	Additional Screen Planting / Enhancement of Vertical Barrier	Substantial Benefit
Holford Garden/ Tai Po Road - Tai Wai (C)	Compensation Re-planting/ Screen Planting/ Enhancement of Barrier and Semi-enclosures/ Revitalization of Townscape	Moderate Benefit
Tai Wai New Village (D)	Woodland Planting/ Enhancement of Vertical Barrier	Substantial Benefit
Mei Tin Road (E)	Compensation Re-planting/ Enhancement of Vertical Barrier and Semi-enclosure	Moderate Benefit
Sha Tin Public School/ Tai Po Road - Tai Wai (F)	Screen Planting/ Enhancement of Semi-enclosure	Substantial Benefit
Glamour Garden/ Granduer Garden (G)	Screen Planting/ Enhancement of Semi-enclosure	Moderate Benefit
Kam Shan Building (H)	Screen Planting/ Enhancement of Full-enclosure	Substantial Benefit
Chik Cheun Street/ Shing Ho Road (I)	Revitalization of Townscape/ Enhancement of Full-enclosure; Semi-enclosure and Vertical Barrier	Slight Benefit
Mei Lam Estate (J)	Screen Planting/ Enhancement of Semi-enclosure	Moderate Benefit
Wong Wam Tin College (K)	Screen Planting/ Enhancement of Semi-enclosure	Moderate Benefit
Shing Chuen Road (L)	Inclusion of Open Space/ Revitalization of Townscape	Slight Benefit
Tung Lo Wan Village/ Harmony Lodge (M)	Screen Planting/ Reprovision of Open Space	Substantial Benefit
Village Maria/ Villa Augustan (N)	Screen Planting/ Revitalization of Townscape	Moderate Benefit

Table 6.4 (Cont.)

Sensitive Receiver	Mitigation Measure	Visual Impact
Caritas School/ Telephone Exchange/ Sha Tin Clinic (O)	Screen Planting/ Revitalization of Townscape	Slight Benefit
Villa Le Parc (P)	Accent and Screen Planting	Substantial Benefit
Residential Areas within Tai Wai Town Centre (Q)	Enhancement of Vertical Barriers and Full-enclosures	Slight Benefit
Shing Mun River Channel: North-South (R)	Enhancement of Vertical Barriers/ Screen Planting/ Revitalization of Townscape	Moderate Benefit

6.11.4 A detailed description of the possible mitigation measures for each visual sensitive receiver is outlined in *Appendix 12: Visual Impact Assessment: Proposed mitigation measures.*

6.11.5 An indication of the mitigation measures is illustrated in **Figures 6.14 a-i - Section Location Plans 1 and 2; and Sections AA to GG**

6.12 Summary

6.12.1 The visual appearance of structural finishes and form will need to be carefully considered during the detailed design process to reduce the impact that Sha Tin Trunk Road T3 will have on the local environment. The mitigation measures for the traffic noise purposes will be specifically designed to ameliorate any adverse impacts in respect to the landscape quality and visibility of the sensitive receivers.

6.12.2 From positions throughout the visual envelope, the proposed route of Sha Tin Trunk Road T3 is already dramatically influenced by the Tai Po Road - Tai Wai, Tai Po Road - Sha Tin and the Shing Mun Tunnel Road. The route is perceived as a major transport corridor with heavy traffic usage. From positions throughout the southern area of the visual envelope, i.e. medium to high-rise residential areas in Tai Wai and Sha Tin New Towns, the impact is effectively reduced by intermediate building mass. From the north, (i.e. high-rise residential areas adjacent to Shing Mun Valley Road and low to medium-rise residential areas across the foothills of the Country Park), the impact is minimal, due to the topographic formation and dense intermediate planting.

6.12.3 In respect to the sensitive receivers the immediate environment of the proposed road scheme has been dominated and modified by the existing transport corridor. Due to the scale of the elevated structures required, the road scheme will produce a significant adverse impact. However the introduction of effective mitigation and enhancement measures will reduce any "major concerns" and it is advised that the proposed Sha Tin Trunk Road T3 can effectively fit into the existing urban landscape character.

6.12.4 In many respects, it can be concluded that, in terms of the Landscape and Visual Impact, the Sha Tin Trunk Road T3 can generally be classified as medium to low impact, due to the relatively few land use components that are in close proximity and the small number of highly sensitive receivers.

The proposed mitigation measures will reduce the effect of the proposed changes resulting from the roadworks. As far as possible the Sha Tin Trunk Road T3 will be visually integrated within the surroundings to maintain a balanced environment between the transport corridors and the landscape. Further detailed investigation will be required in terms of vegetation surveys; detailed design of chromatic/ texture/ form design of main structures and barriers and inclusion/ reprovision/ enhancement of amenity/ open space design. This will be undertaken in the design stage.

Table 6.5 - Summary (SR = Sensitive Receiver)

Land Use	Landscape Quality	Landscape Impact	Visual Impact	Mitigation Measures
Sha Tin Heights (1)	High Quality	Slight	-	-
Residential Estates in Sha Tin South-west (2)	Ordinary	Moderate	-	-
Route 16/ T3 Interface -SR (A)	Very Attractive	Substantial	HSR	Compensation Re-planting/ Concrete Design Techniques for Elevated Structure/ Revitalization of Townscape
Cheng Wing Gee College/ Lau Pau Lok Secondary School - SR (B)	Ordinary	Substantial	HSR	Additional Screen Planting / Enhancement of Vertical Barrier
Holford Garden/ Tai Po Road - Tai Wai - SR (C)	Ordinary	Moderate/ Substantial	MSR	Compensation Re-planting/ Screen Planting/ Enhancement of Barrier and Semi-enclosures/, Revitalization of Townscape
Tai Wai New Village - SR (D)	Good	Slight	HSR	Woodland Planting/ Enhancement of Vertical Barrier
Mei Tin Road - SR (E)	Good	Moderate/ Substantial	LSR	Compensation Re-planting/ Enhancement of Vertical Barrier and Semi-enclosure
Sha Tin Public School/ Tai Po Road - Tai Wai - SR (F)	Ordinary	Substantial	MSR	Screen Planting/ Enhancement of Semi-enclosure
Glamour Garden/ Grandeur Garden - SR (G)	Ordinary	Slight/ Moderate	LSR	Screen Planting/ Enhancement of Semi-enclosure
Che Kung Miu Road/ KCR (3)	Good	Slight	-	-
Shing Mun Tunnel Road/ May Shing Court (4)	Good	Moderate	-	-
Kam Shan Building - SR (H)	Poor	Moderate	LSR	Screen Planting/ Enhancement of Full-enclosure
Chik Shuen Street/ Shing Ho Road - SR (I)	Good	Substantial	HSR	Revitalization of Townscape/ Enhancement of Full-enclosure; Semi-enclosure and Vertical Barrier
Mei Lam Estate - SR (J)	Ordinary	Moderate	MSR	Screen Planting/ Enhancement of Semi-enclosure

Table 6.5. (Cont'd)

Land Use	Landscape Quality	Landscape Impact	Visual Impact	Mitigation Measures
Wong Wan Tin College - SR (K)	Ordinary	Substantial	HSR	Screen Planting/ Enhancement of Semi-enclosure
Shing Chuen Road - SR (L)	Poor	Slight	LSR	Inclusion of Open Space/ Revitalization of Townscape
Man Lai Court (5)	Ordinary	Moderate	-	-
Government Offices/ Tung Lo Wan Hill Road (6)	Very Attractive	Slight	-	-
Tung Lo Wan Village/ Harmony Lodge - SR (M)	Good	Moderate	MSR	Screen Planting/ Reprovision of Open Space
Pristine Villa (7)	Very Attractive	Slight	-	-
Mantex Villa/ On Lok Villa (8)	Very Attractive	Slight	-	-
Villa Maria/ Villa Augustan - SR (N)	Very Attractive	Substantial	LSR	Screen Planting/ Revitalization to Townscape
To Fung Shan (9)	Very Attractive	Slight	-	-
Caritas School/ Telephone Exchange/ Sha Tin Clinic - SR (O)	Ordinary	Moderate	MSR	Screen Planting/ Revitalization of Townscape
Residential Estates in Sha Tin South (10)	Good	Slight/ Moderate	-	-
Villa Le Parc - SR (P)	High Quality	Moderate	MSR	Accent and Screen Planting
Lion Rock Tunnel Road (11)	Poor	Slight/ Moderate	-	-
Scenery Court/ Hilton Plaza - SR (12)	Ordinary	Slight	-	-
Residential Estates in Sha Tin Town Centre (13)	Ordinary	Slight/ Moderate	-	-
Residential Areas within Tai Wai Town Centre (Q)	Good	Slight	LSR	Enhancement of Vertical Barriers and Full-enclosure
Shing Mun River Channel: North-South (R)	Good	Moderate	MSR	Enhancement of Vertical Barriers / Screen Planting/ Revitalization of Townscape
Shing Mun River Channel: East-West (14)	Very Attractive	Slight/ Moderate	-	-
Footpath / Cycle Tracks under elevated structures	Ordinary	Substantial	HSR	Provision of amenity lighting

7 ECOLOGICAL REVIEW

7.1 Existing Situation

The study area is predominantly urban with residential and industrial land uses. There are small patches of trees and shrubs planted for amenity or landscape purposes, comprising mostly introduced species (*Acacia* spp, *Casuarina equisetifolia*, *Melaleuca leucadendron*, *Bauhinia* spp and *Ficus microcarpa*) subject to high disturbance, of low species diversity and of low ecological value. Other habitats include scattered housing with allotments, a small abandoned area of grass and ephemeral herbs, and the Shing Mun River Channel which is concrete lined with no natural substrate. All these habitats are of low ecological value. A habitat map is given in Figure 7.1a and 7.1b.

Areas of tree planting are more frequent to the southern end of the study area, including steep shotcrete slopes adjacent to the existing road. Some of these areas are more mature than others and have developed an understory layer of shrubs (areas include below Tai Po Road at Sha Tin Heights, and an area between Tai Po Road and Mei Tin Road).

There are two areas of more natural vegetation: an area of tall shrub habitat above Tai Po Road near Sha Tin Heights, and a small area of mature woodland (approximately 0.4 ha) which is of low species diversity and exposed to high levels of disturbance.

There are no sites protected for nature conservation interest (eg. Site Of Special Scientific Interest, Special Area, Country Park) within 1 km of the project area. No protected species were found on the site.

7.2 Construction Phase Impacts

Direct impacts will include the clearance of some vegetation. An external link slip road is required at the southern end of the trunk road, which will eliminate an amenity tree-planted sitting out area, and some of the more mature plantation area below Tai Po Road at Sha Tin Heights. The alignment will also pass through an existing ornamental park area and adjacent planted woodland area between Tai Po Road and Mei Tin Road to accommodate the southbound carriageway and the slip road to Mei Tin Road. Small fragments of amenity planting alongside the existing road will also be removed, as will some of the allotment area and the small abandoned area of grass and ephemeral herbs. These are all areas of low ecological value.

Habitats adjoining the project site are likely to be indirectly impacted by increased disturbance. However most of the areas are already subject to high levels of disturbance. Therefore the level of impact likely is considered to be low.

Impacts upon fauna are likely to comprise habitat loss and disturbance. These are predicted to be minimal as the habitat quality is poor, and fauna which are more susceptible to disturbance are currently unlikely to occur in the study area, due to the existing high level of disturbance.

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7.3 Operational Phase

The alignment is along an existing transport corridor. The area is currently subject to disturbance of a similar nature as that which would be expected to occur during the operation of the project, therefore the impact of the operational phase of Trunk Road T3 on the local ecology is considered to be low.

7.4 Mitigation

Although the existing areas of amenity planting are of low ecological value there is little vegetation in the urban areas. Therefore it is recommended that compensatory amenity planting should be provided as part of the site rehabilitation, preferably with native as opposed to introduced species. Where possible, roadside trees should be replaced and the sitting out areas be returned to their pre-construction state or enhanced. As a considerable amount of the existing sitting-out areas will be affected, alternative sites in the vicinity may need to be identified as substitutes.

7.5 Summary

Construction and operational ecological impacts are considered to be low. The majority of the site is urban. The existing habitat quality is poor, with the existing vegetation comprising fragmented, predominantly planted areas of introduced amenity species. Some of these areas will be removed to accommodate the road construction, especially in the southern area. It is recommended that these areas are replanted and/ replaced as appropriate, preferably with native species.

Impacts upon fauna are likely to comprise habitat loss and disturbance. These are predicted to be minimal as the habitat quality is poor, and fauna which are more susceptible to disturbance are currently unlikely to occur in the study area, due to the existing high level of disturbance.

8 CONCLUSIONS

8.1 Introduction

A preferred option for the road alignment was established in the Traffic and Transport Review for Trunk Road T3 in 1993/4. This alignment was based on an engineering feasibility study which included a preliminary environmental assessment. At the conclusion of the preliminary environmental assessment it was recommended that the route alignment be subject to a detailed environmental impact assessment.

The proposed alignment for the Sha Tin T3 runs north-south through Sha Tin along the existing transport corridor formed by Tai Po Road (Tai Wai), Tai Po Road (Sha Tin) and the Shing Mun Tunnel Road. The road will be largely on elevated structures above the existing roads.

In order to minimise additional environmental disturbance, the alignment was selected to follow the existing transport corridor. This was considered preferable to opening up an otherwise unaffected corridor and introducing planning constraints or noise and air impacts at locations which are relatively problem free.

The focus of the EIA has been to establish potential impacts on the existing corridor and to identify means to reduce these to levels no worst than the existing conditions. The findings of the EIA are summarised in the following sections.

8.2 Noise

8.2.1 Construction Phase

Construction noise is likely to exceed the 75 dB(A) daytime guideline at some sensitive receivers at some period during the construction phase. For the unmitigated situation, the worst affected receivers would experience in the range of Leq(30min.) 68 to 93 dB(A). This is due to the linear site and the close proximity of receivers to the construction plants.

8.2.2 Operational Phase

Operational noise levels will exceed the HKPSG recommendations, however, the predictions based on 2011 forecasts show that most of the sensitive facades would have noise levels above the recommended levels along the existing transport corridor. Mitigation to below HKPSG criteria would required quiet road surfacing, a series of noise barriers, semi-enclosures or full coverage of the new road network. However, the overall noise improvement is limited by the dominant noise contribution from the existing roads, in spite of the provision of extensive noise barriers.

No practical direct technical measures can be provided to meet the HKPSG for Sha Tin Government School, Sha Tin Clinic and Caritas School because of the large exceedance above the standards. All sensitive receivers had been tested against the eligibility for indirect technical remedies under the ExCo criteria and the results have shown that non of the representative NSRs within the Study Area are eligible.

The costs and quantities associated with the various noise barriers, semi-enclosures and full enclosures are summarised in Table 8.1.

Table 8.1 Summary of Proposed Noise Barriers

Type of Noise Barriers	Road Section	Location	Length
Noise Barriers to be constructed under T3 Project			
Plain Vertical Barrier	Slip road to N/B T3	Mei Lam Estate	125 m
Inverted L	S/B T3	Scenery Court	170 m
	Slip Road to S/B Route 16	Holford Garden	250 m
	N/B T3	Tai Wai New Village	320 m
	N/B T3	Mei Lam Estate	105 m
Partial Enclosure	S/B T3	Tai Wai Centre	250 m
	S/B T3	Sha Tin Public School	230 m
	S/B T3	Holford Garden	185 m
	S/B Route 16	Holford Garden	350 m
	N/B T3	Mei Lam Estate	200 m
Full Enclosure	S/B T3	Tai Wai Centre	130 m
		Total Estimated Cost	**$350 M**
Noise Barriers to be constructed under T4 Project			
Plain Vertical Barrier	E/B T4	Tung Lo Wan	370 m
		Total Estimated Cost	**$9 M**

Note ; S/B indicates southbound; N/B indicates northbound; E/B indicates eastbound.

The estimates exclude the costs for increase of foundation and bridge structure works to support these noise barriers/enclosures. The costs are in 1997 prices The noise mitigation measures will provide protection for approximately 1670 affected sensitive dwellings. Preliminary barrier/enclosures designs are indicated in Figures 2.4 to 2.9.

8.3 Air

8.3.1 Construction Phase

Dust generated during the construction phase should not cause exceedance of the AQO's. However, because dust levels will be raised, controls should be included in contract documentation, and monitoring and audit should be undertaken.

8.3.2 Operational Phase

With the provision of mitigation in the form of semi-enclosure, nitrogen dioxide levels are predicted to be within the AQO levels.

8.4 Water Quality

Water quality is not considered to be a key issue, provided normal controls are applied to meet statutory objectives.

8.5 Waste Disposal

Waste disposal is not considered to be a key issue, this is subject to statutory and guideline controls.

8.6 Landscape

It is generally concluded that in terms of the Landscape and Visual Impact the Sha Tin Trunk Road T3 can generally be classified as medium to low due to the relatively few land use components that are in close proximity and the small number of highly sensitive receivers. The proposed mitigation measures will reduce the effect of the proposed changes resulting from the roadworks. As far as possible the Sha Tin Trunk Road T3 will be visually integrated within the surroundings to maintain a balanced environment between the carriageways and the landscape.

8.7 Visual

The visual impact on the identified visual sensitive receivers is generally classified as medium. The provision of Trunk Road T3 within the existing transport corridor minimises the visual impact on the surrounding area, however as the trunk road will be elevated the impact will have a high to medium impact on certain sensitive receivers. The scheme, though does allow, through the provision of space and use of topography, potential to provide screening; upgrading of existing recreational facilities and general visual enhancement of the corridor zone.

8.8 Ecology

Detailed ecological survey and review is not considered necessary because this road is essentially in an urban area.

9 RECOMMENDATIONS

9.1 Noise

9.1.1 Construction Phase

In view of the potentially high predicted noise levels, the use of silences powered mechanical equipment (PME) and mobile screens is recommended. The use of full enclosures over the construction sites and restrictions in the numbers of PME which operate concurrently should also be considered.

Recommendations are made for monitoring and audit and including noise control measures as part of the contract. The use of efficient exhaust system and mobile screens would reduced the impact of construction noise. Noisy operations near educational institutions during the teaching hours should be avoid and scheduled in the holiday periods.

The contractor should be given the 75 dB(A) daytime noise limit as a performance specification. General measures for noise reduction and contractual controls (as provided in Appendix 2 of the EIA report) should be included in the works contract. An Environmental Monitoring and Audit (EM&A) programme should be implemented.

9.1.2 Operational Phase

The proposed noise barriers, canopies, semi and full enclosures at the locations shown in Figure 2.4 should be implemented with the bridge contract.

9.2 Air Quality

9.2.1 Constructional Phase

A commitment to adopt good operational practices for dust minimisation is required by the contractor to reduce the dust nuisance to a minimum. A number of practical measures are listed in Section 3.5.4 of the EIA report. These should be incorporated into the works contract, along with the dust control clauses in Appendix 2.

Monitoring and auditing should be undertaken by the contractor during the construction period. An outline programme is provided in a separate report.

9.2.2 Operational Phase

The assessment concluded that no specific mitigation for air quality in the operational phase is considered necessary.

9.3 Water Quality

It is recommended that construction should be carried out during the dry season and the mitigation measures listed in Section 4.5.1 implemented to prevent construction waste from entering the water course. Sewage arising from the construction workforce should be treated and disposed of to the satisfaction of EPD.

Sumps and soakaways should be incorporated in the road design to mitigate potential impacts from road runoff and accidental spillage. Best Management Practices should also be implemented to treat stormwater runoff during operation.

9.4 Waste Disposal

Waste should be segregated on-site and re-used and recycled where possible.

The contractor should ensure that only approved licensed waste collectors are used, and that appropriate measures to minimise adverse impacts from windblown litter and dust from the transportation of these wastes are employed. The contractor must also ensure that all the necessary waste disposal permits are obtained.

9.5 Landscape Assessment

It is recommended that consultation with DLO and RC be undertaken to determine the impact on existing open space and the reprovisioning requirements at an early stage. The potential for providing further recreational facilities and upgrading/revitalisation of existing open space needs to be examined.

Revitalisation of townscape and potential for enhancement of existing affected townscape areas should be examined including provision of street furniture; special signage amenity planting; feature lighting; urban sculpture; advertising opportunities; and architectural finishes treatment to create urban landscape character.

In certain naturalistic areas such as Sha Tin Heights, Route 16/T3 interface and the Shing Mun Tunnel Road zone the proposed scheme should emphasise the natural woodland and sloping topography character.

9.6 Visual Impact

The generation of the proposed mitigation measures on the visual impact require further detailed investigation such as vegetation surveys, finalisation of site formation levels and detailed definition of view corridors.

The mitigation measures that need to be implemented are defined by the space available, the context of the sensitive receivers and the final landform. These measures are proposed as the following :

- careful consideration of the visual appearance of the main elevated structure in respect to line, form and mass ;
- either a visually integrating or visual enhancing treatment of the noise mitigation barriers and noise/air quality mitigation semi-enclosures depending on the context;
- enhancing or introducing additional screen planting;
- use of the existing topography to visually integrate the structure with the landscape; and
- mass woodland planting of adjacent slopes and certain areas under the more highly elevated structures.

9.7 Ecological Review

Some of the existing vegetation will be removed to accommodate the road construction, especially in the southern area. It is recommended that these are replanted/replaced as appropriate, preferably with native species. However, exotic species which are fast growing should be utilised to reduce the visual impact of Trunk Road T3 within a relatively short period of time.

9.8 Implementation of Mitigation Measures

This EIA Study has investigated various options of mitigation measures and the proposal is summarised in Table 9.1.

Table 9.1 Implementation Schedule of Environmental Mitigation Measures

Location	Resp.	Description	Timing
Southbound Trunk Road T3 adjacent to Scenery Court	TDD	Inverted L Barrier	Before Trunk Road T3 is open to traffic
Southbound Trunk Road T3 adjacent to Tai Wai Centre	TDD	Inverted L Barrier	Before Trunk Road T3 is open to traffic
Southbound Trunk Road T3 at Tai Wai Centre	TDD	Full Enclosure	Before Trunk Road T3 is open to traffic
Southbound Trunk Road T3 adjacent to Sha Tin Public School	TDD	Partial enclosure	Before Trunk Road T3 is open to traffic
Southbound Trunk Road T3 connecting to Route 16 adjacent to Holford Garden and Grandeur Garden	TDD	Partial enclosure	Before Trunk Road T3 is open to traffic
Southbound Trunk Road T3 connecting to Tai Po Road (Sha Tin Heights) adjacent to Holford Garden and Grandeur Garden	TDD	Partial enclosure	Before Trunk Road T3 is open to traffic
Slip Road from Mei Tin Road to Route 16 S/B adjacent to Holford Garden and Lau Pak Lok Secondary School	TDD	Inverted L Barrier	Before Trunk Road T3 is open to traffic
Northbound Trunk Road T3 adjacent to Tai Wai New Village	TDD	Inverted L Barrier	Before Trunk Road T3 is open to traffic
Northbound Trunk Road T3 prior to joining Slip Road from Mei Tin Road adjacent to Mei Lam Estate	TDD	Inverted L Barrier	Before Trunk Road T3 is open to traffic
Northbound Trunk Road T3 after joining Slip Road from Mei Tin Road adjacent to Mei Lam Estate	TDD	Partial enclosure	Before Trunk Road T3 is open to traffic
Slip Road from Mei Tin Road to N/B T3 adjacent to Mei Lam Estate	TDD	Vertical Barrier	Before Trunk Road T3 is open to traffic
Trunk Road T4 adjacent to Tung Lo Wan Village	TDD	Vertical Barrier	Before Trunk Road T4 is open to traffic
Carriageways of Trunk Road T3 and Slip Roads	TDD	Low Noise Road Surface	Before Completion of Contract
Construction works within the Site Boundary	TDD	Environmental pollution control measures for construction impacts	During the construction phase of the Project
Landscape works within the Site Boundary	TDD	Detailed Drawings for landscape and visual impact mitigation measures	During detailed design stage

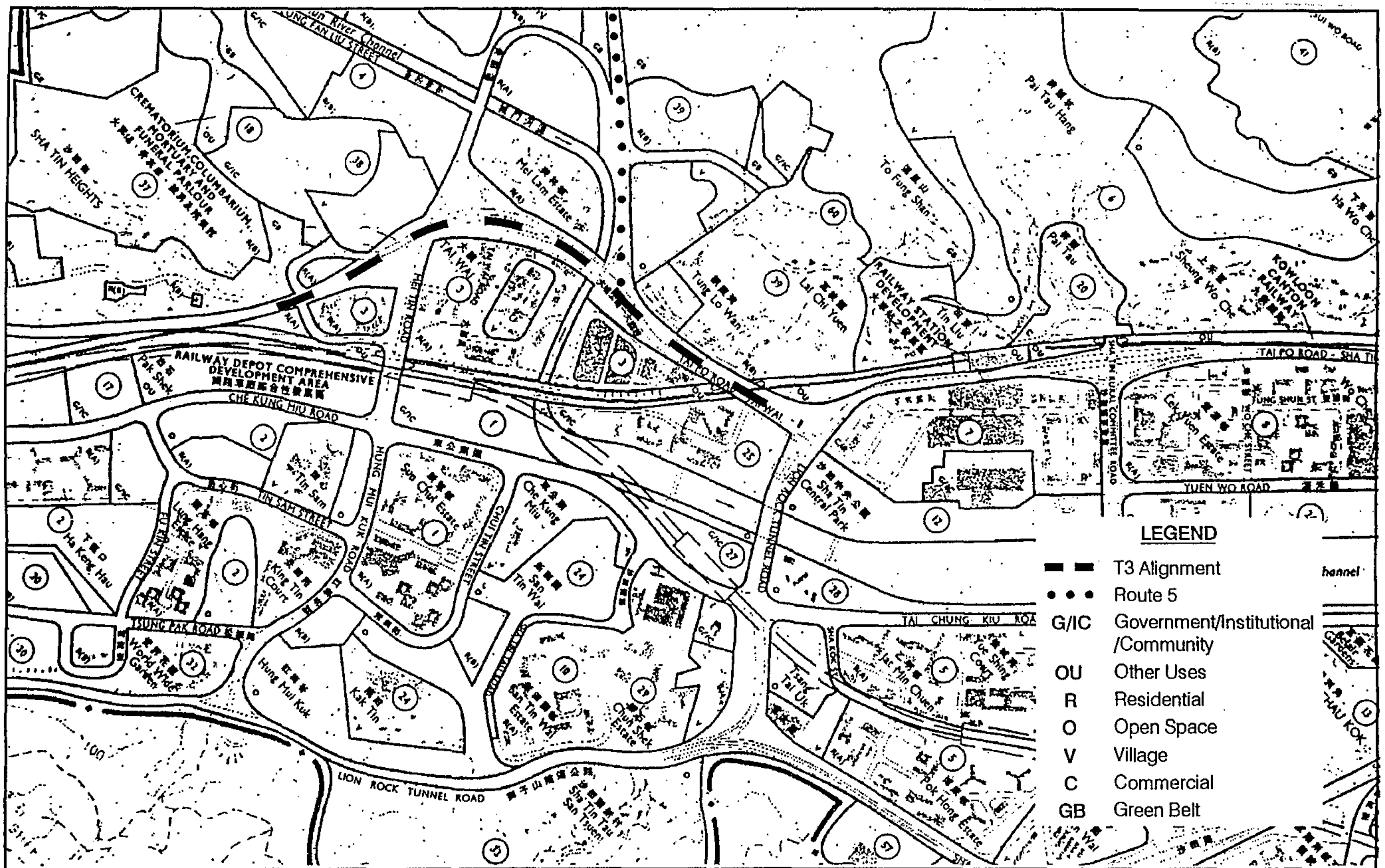

Figure 1.2 Sha Tin OZP

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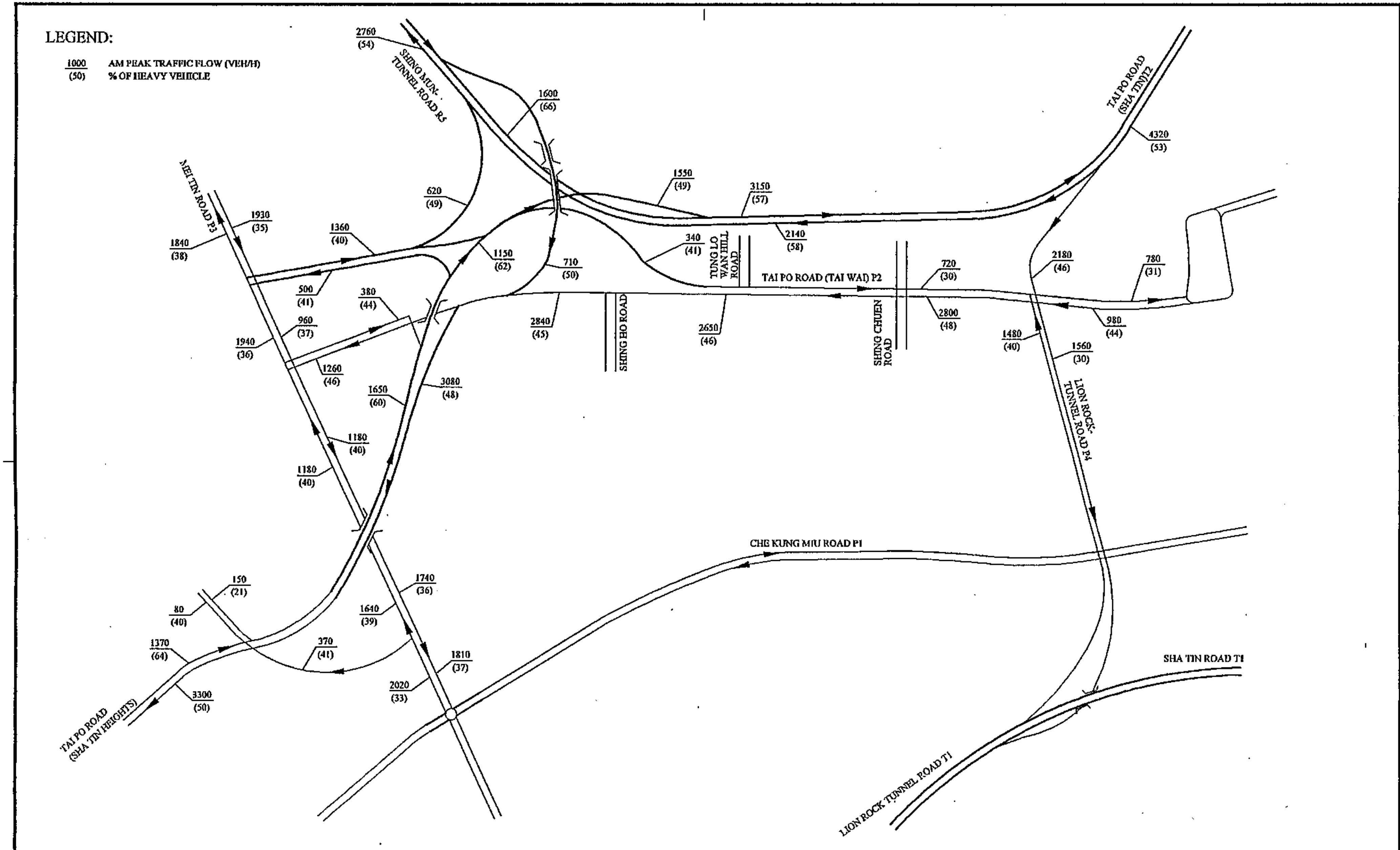

TRUNK ROAD T3 - ADDITIONAL TRAFFIC FORECAST FOR EIA UPDATE

PEAK HOUR TRAFFIC FLOWS FOR 2002 (A.M.)

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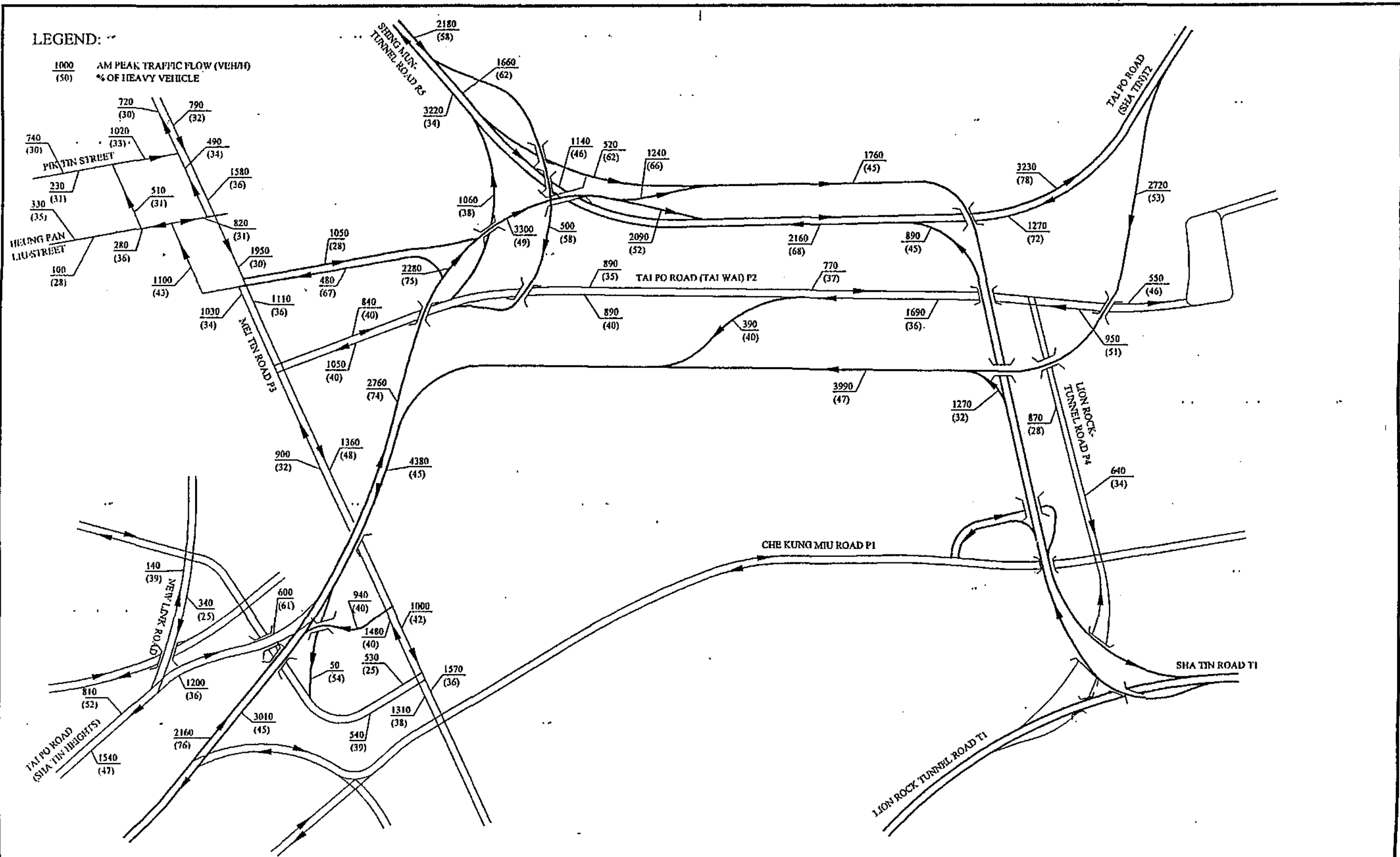
JOB NO.
63494/11

FIGURE:
2.2

P:\PROJECTS\63494\FIG2-2.DWG



TRUNK ROAD T3 - ADDITIONAL TRAFFIC REVIEW
NEW LINK ROAD TAI PO ROAD (SHA TIN HEIGHTS) TO LOWER SHING MUN ROAD

PEAK HOUR TRAFFIC FLOWS FOR 2011 (A.M.)

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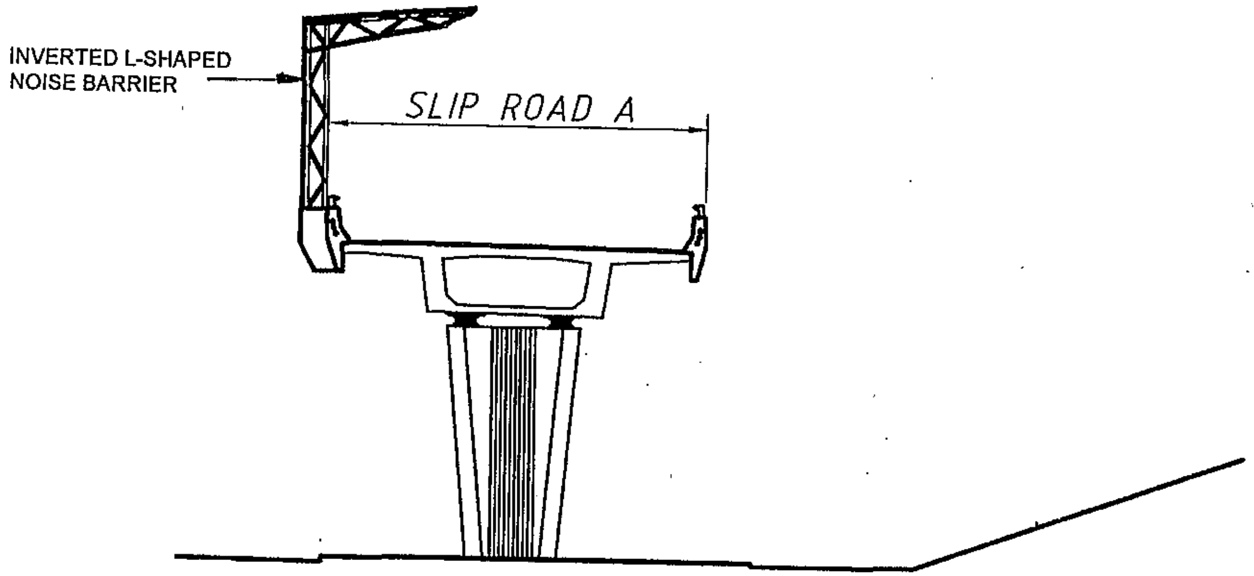
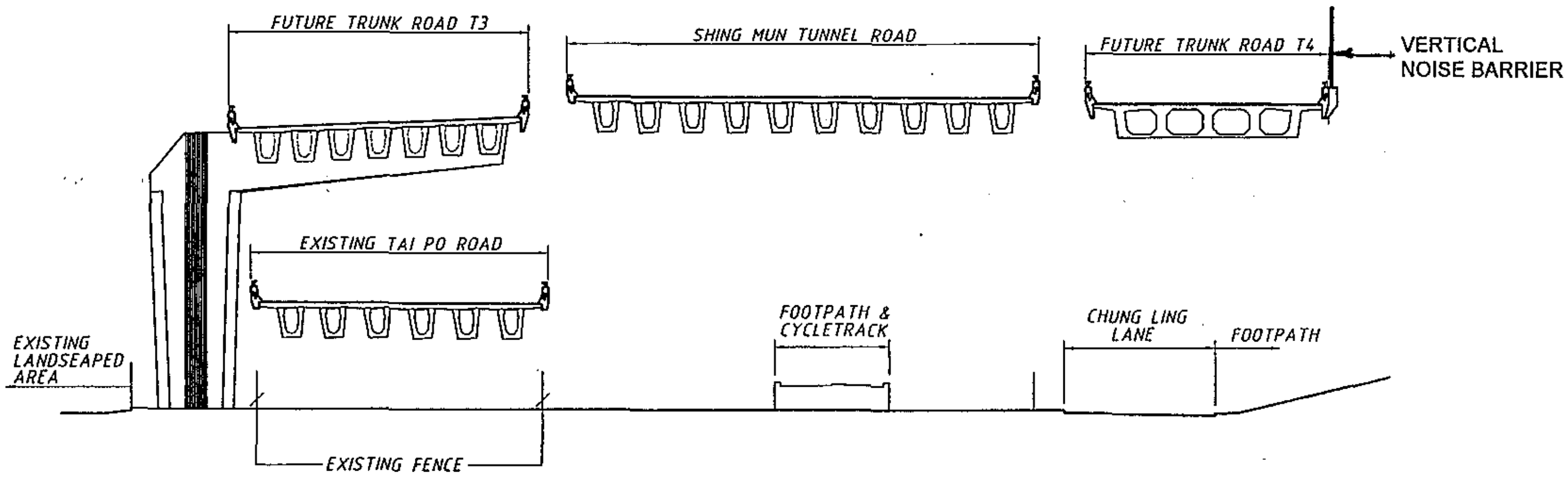
JOB NO.	FIGURE:
63494/08	2.3



NOTES :

- For location of section see Figure 2.4

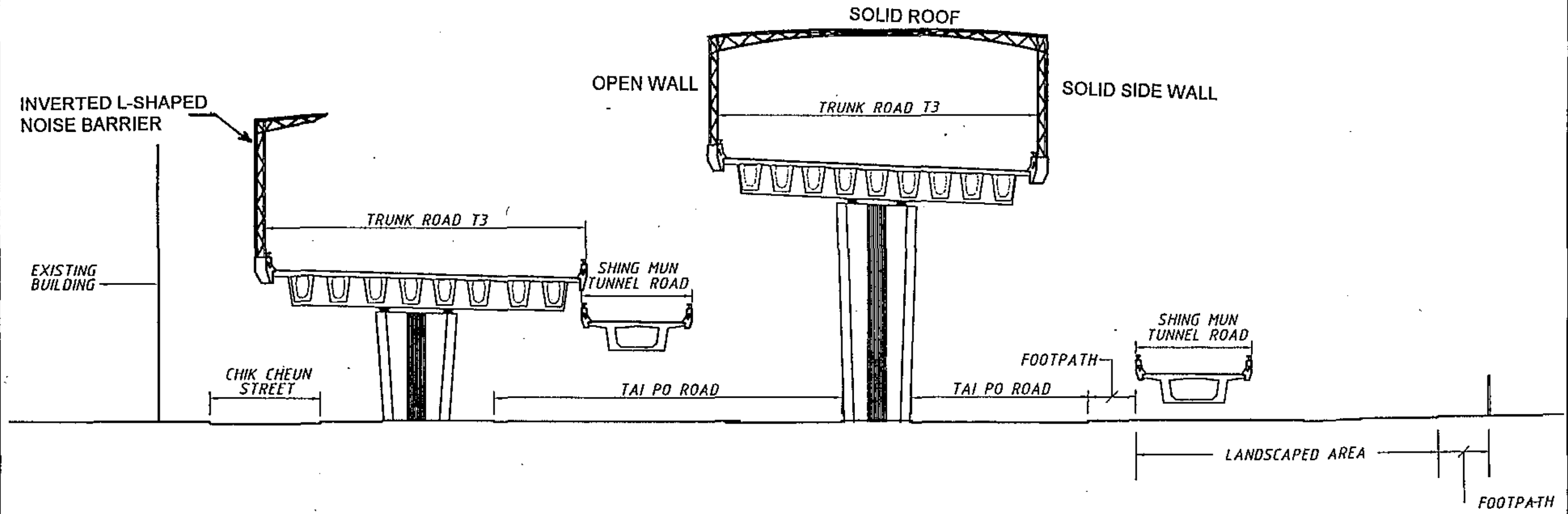
MAUNSELL	SHA TIN TRUNK ROAD T3 - SECTION 1-1	FIGURE 2.5



NOTES :

o For location of section see Figure 2.4

MAUNSELL	SHA TIN TRUNK ROAD T3 - SECTION 2-2	FIGURE 2.6



NOTES :

- For location of section see Figure 2.4

MAUNSELL	SHA TIN TRUNK ROAD T3 - SECTION 3-3	FIGURE 2.7

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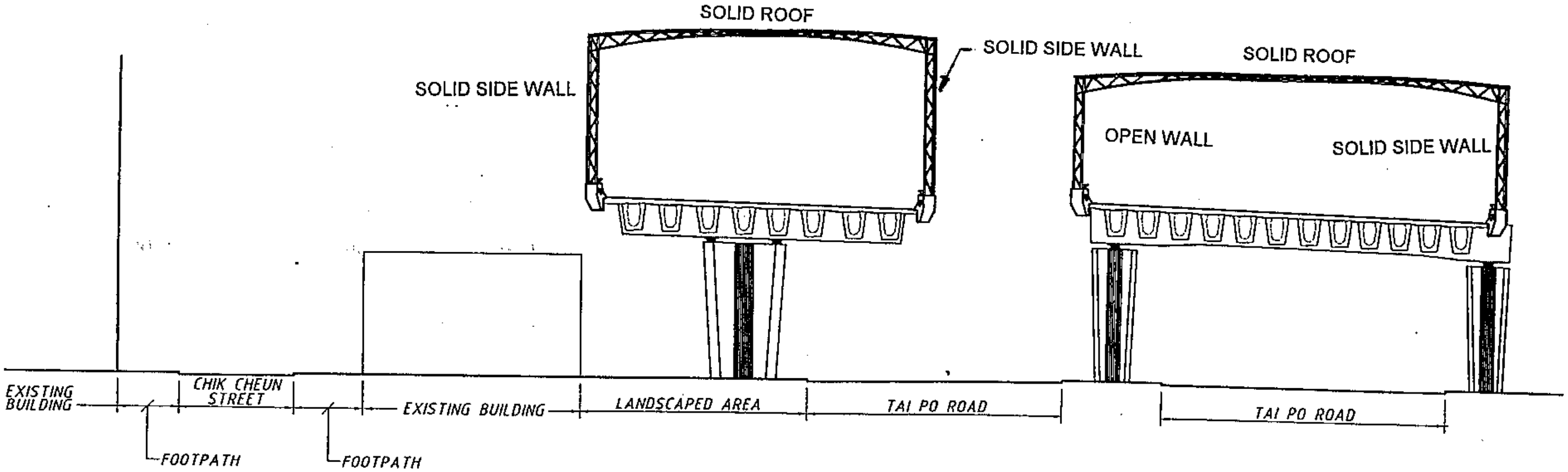

NOTES :

o For location of section see Figure 2.4

MAUNSELL	SHA TIN TRUNK ROAD T3 - SECTION 4-4	FIGURE 2.8

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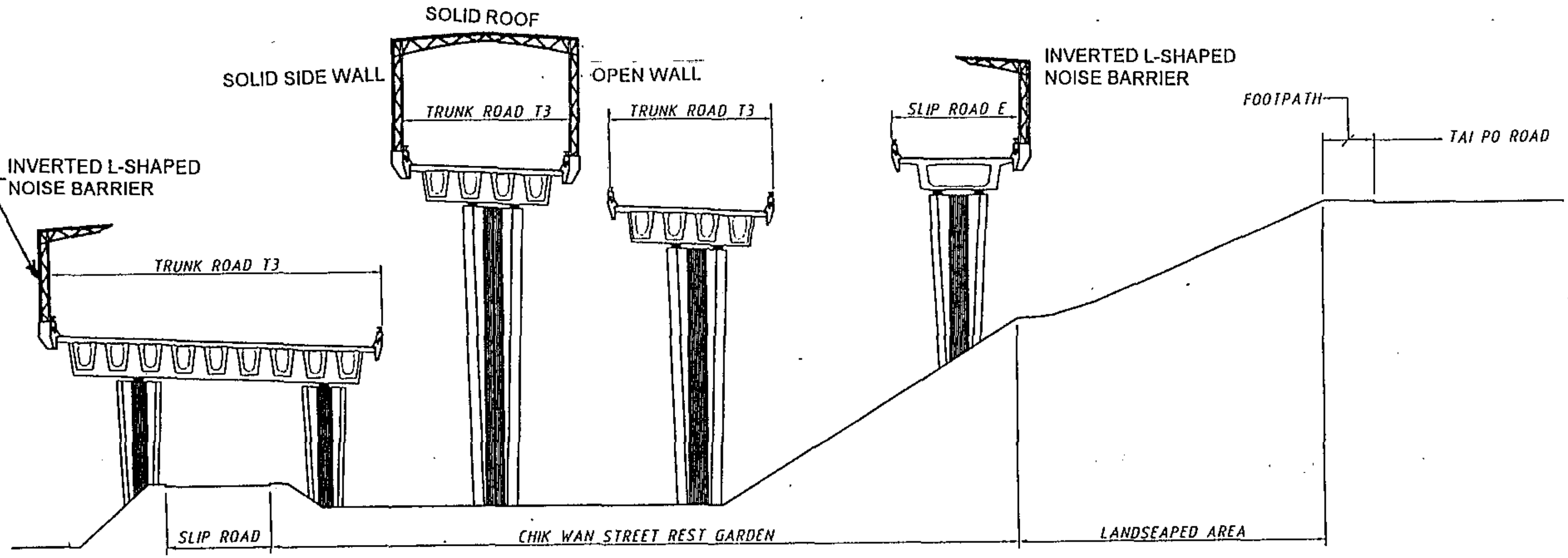
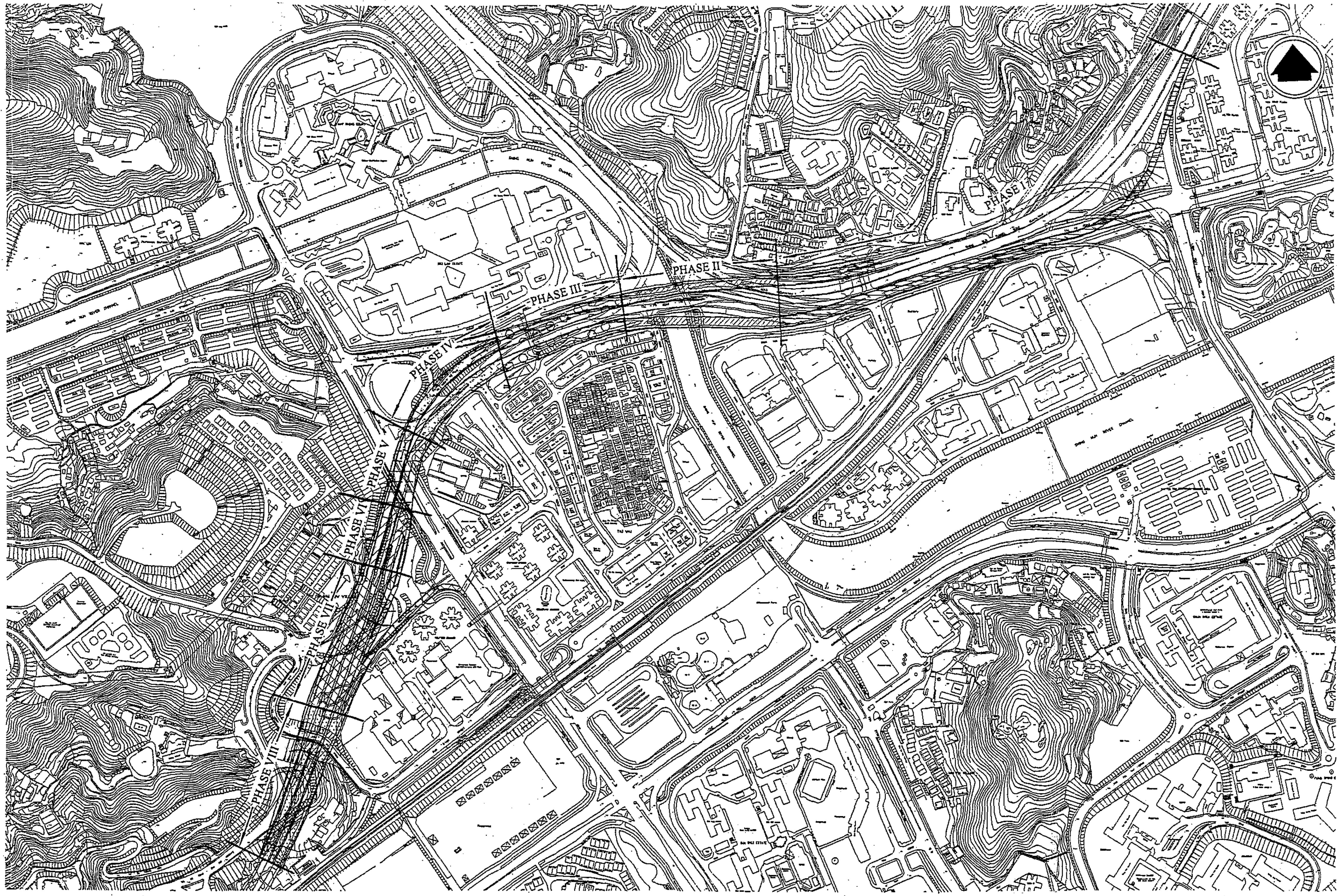


NOTES :

o For location of section see Figure 2.4

MAUNSELL	SHA TIN TRUNK ROAD T3 - SECTION 5-5	FIGURE 2.9



SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI) ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PRELIMINARY CONSTRUCTION PHASES

FIGURE NO.	
3.2	
SCALE: 1 : 5000	DATE: JANUARY 98

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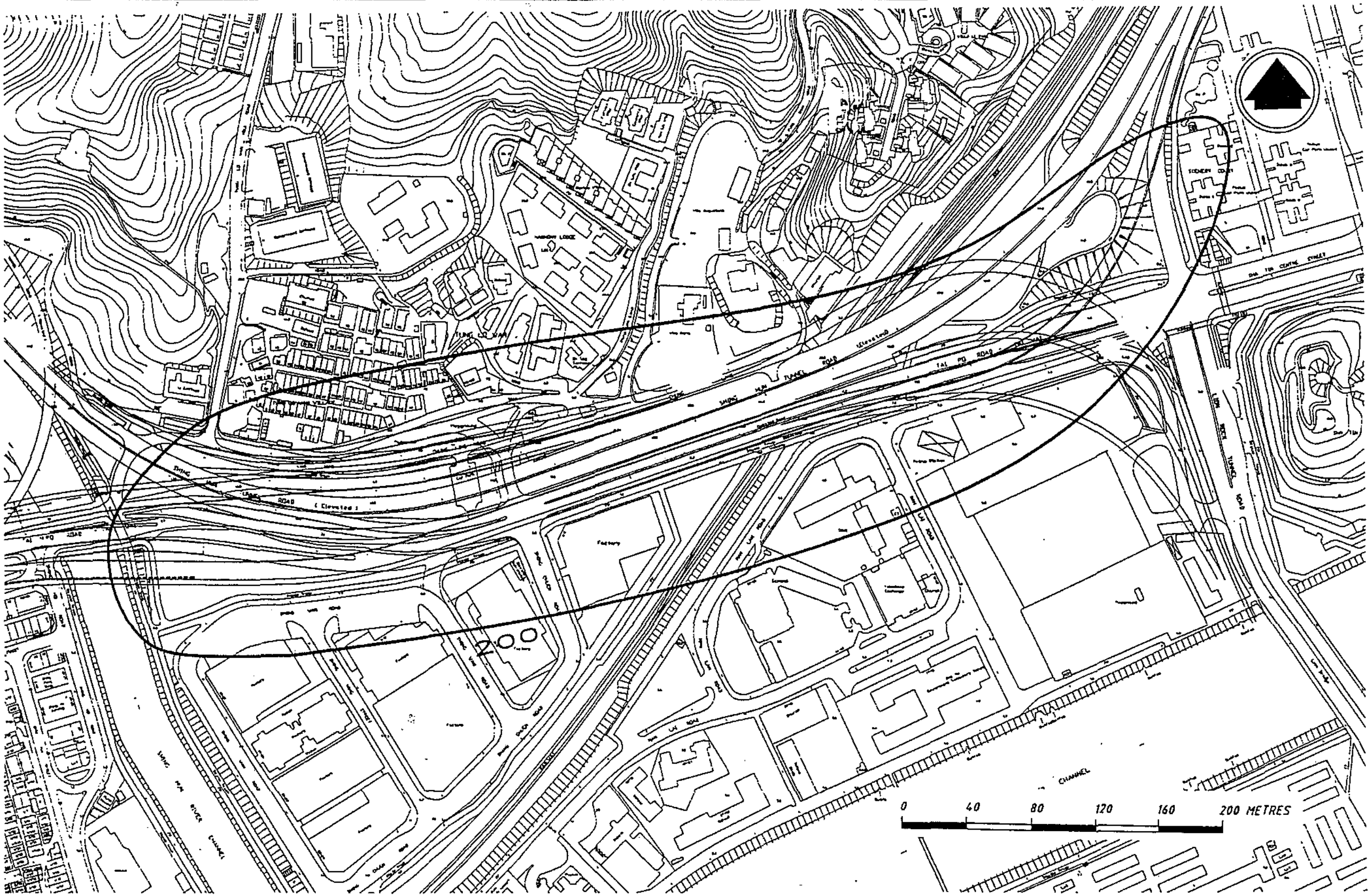

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI) ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 1.5M ABOVE LOCAL GROUND LEVEL (PHASE I)

FIGURE NO.	
3.3	
SCALE: AS SHOWN	DATE: JANUARY 98

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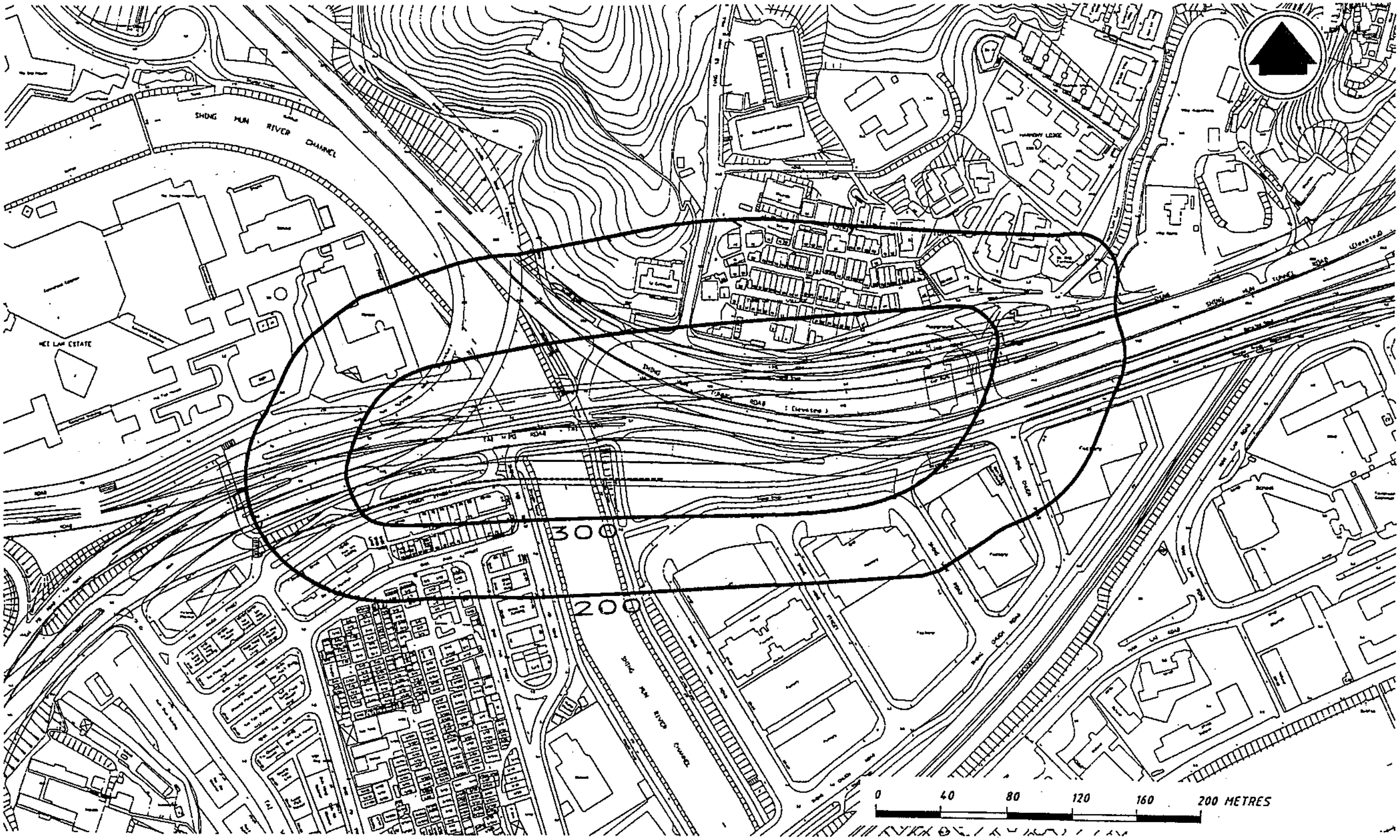

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI) ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 1.5M ABOVE LOCAL GROUND LEVEL (PHASE II)

FIGURE NO. 3.4

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DATE: JANUARY 98

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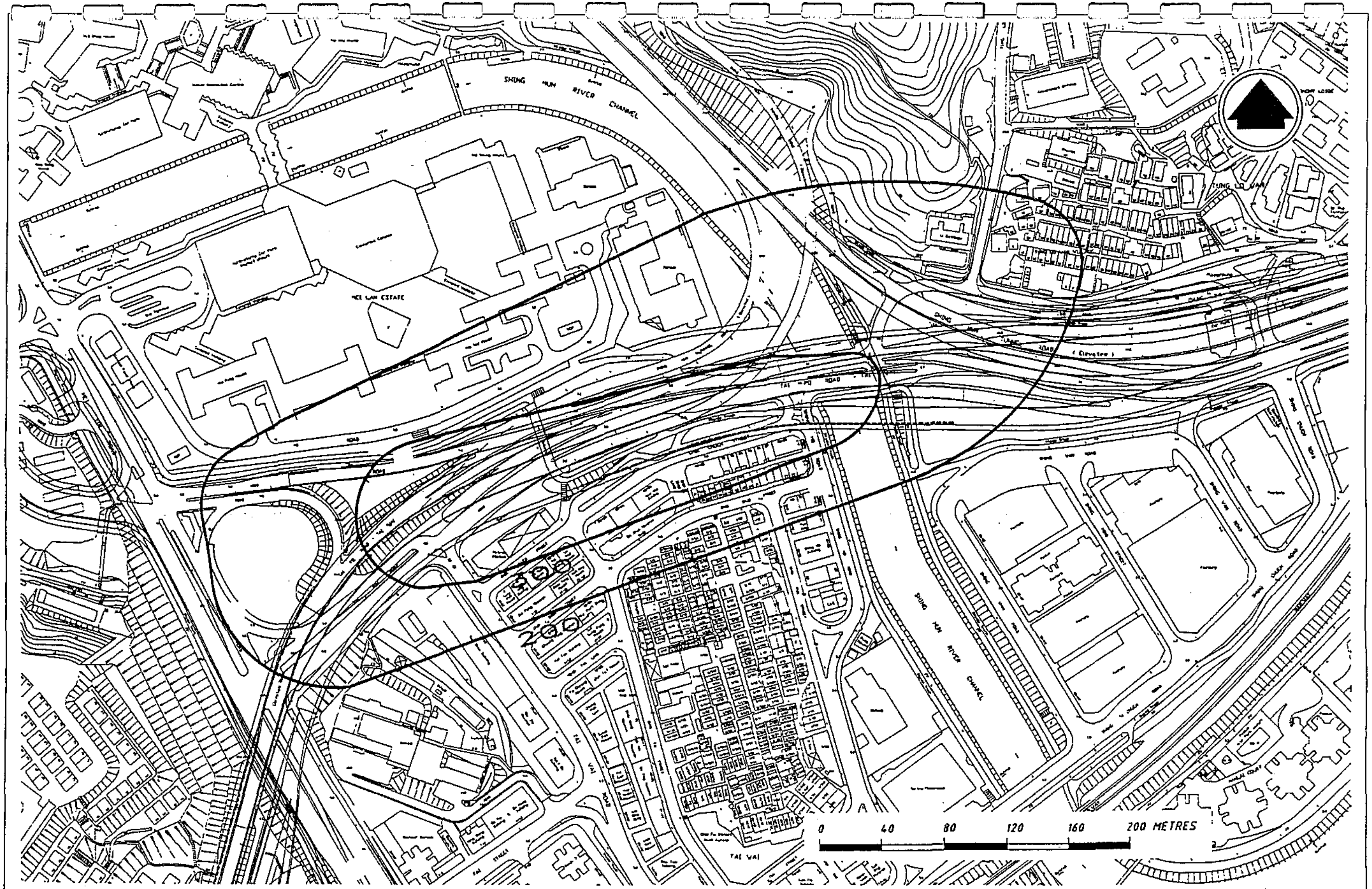

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI) ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 1.5M ABOVE LOCAL GROUND LEVEL (PHASE III)

FIGURE NO.	3.5
SCALE: AS SHOWN	DATE: JANUARY 98

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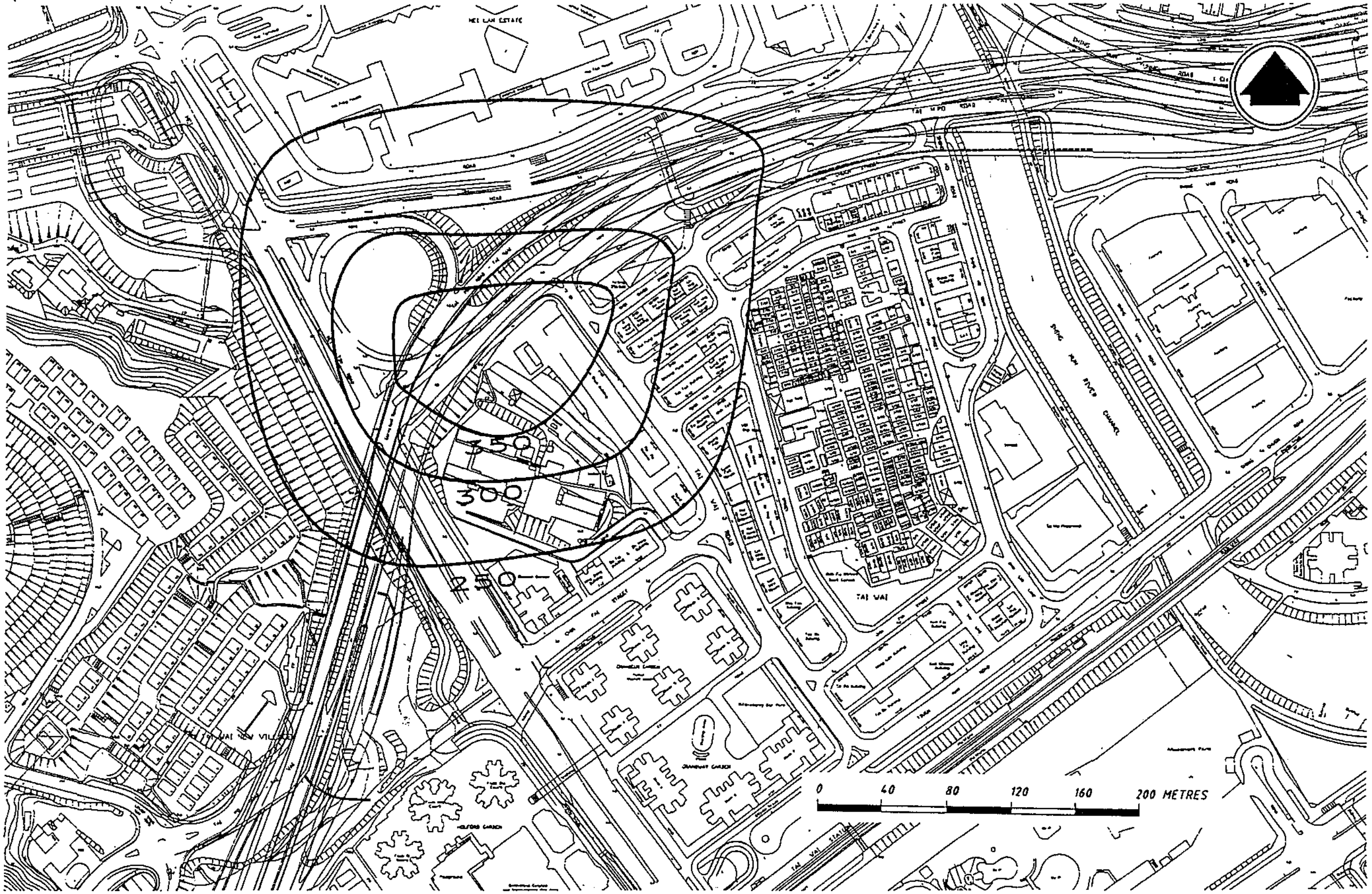

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI) ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 1.5M ABOVE LOCAL GROUND LEVEL (PHASE IV)

FIGURE NO.	3.6
SCALE. AS SHOWN	DATE: JANUARY 98

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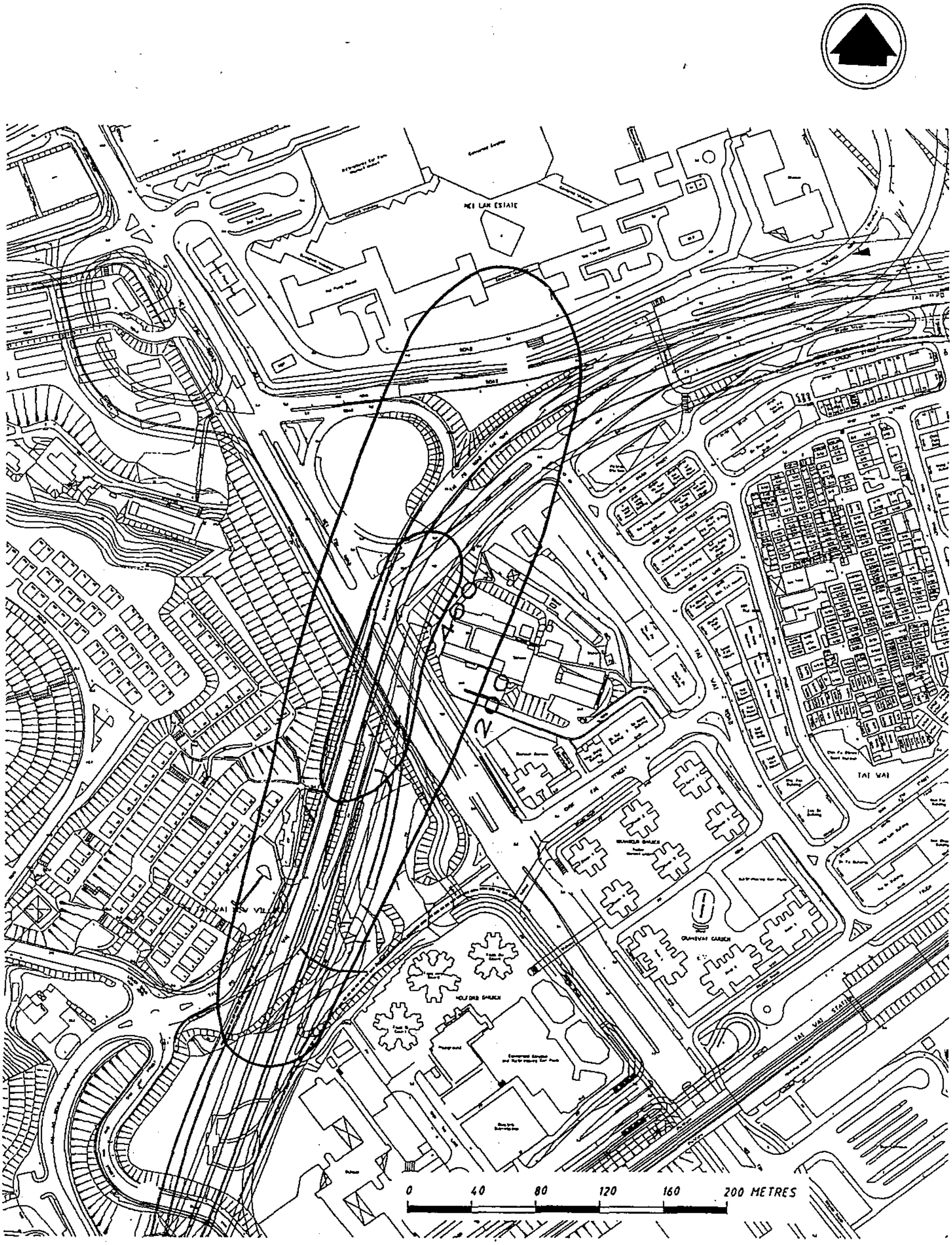

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI)
ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 1.5M ABOVE LOCAL GROUND LEVEL (PHASE V)

FIGURE NO. : 3.7

SCALE : AS SHOWN

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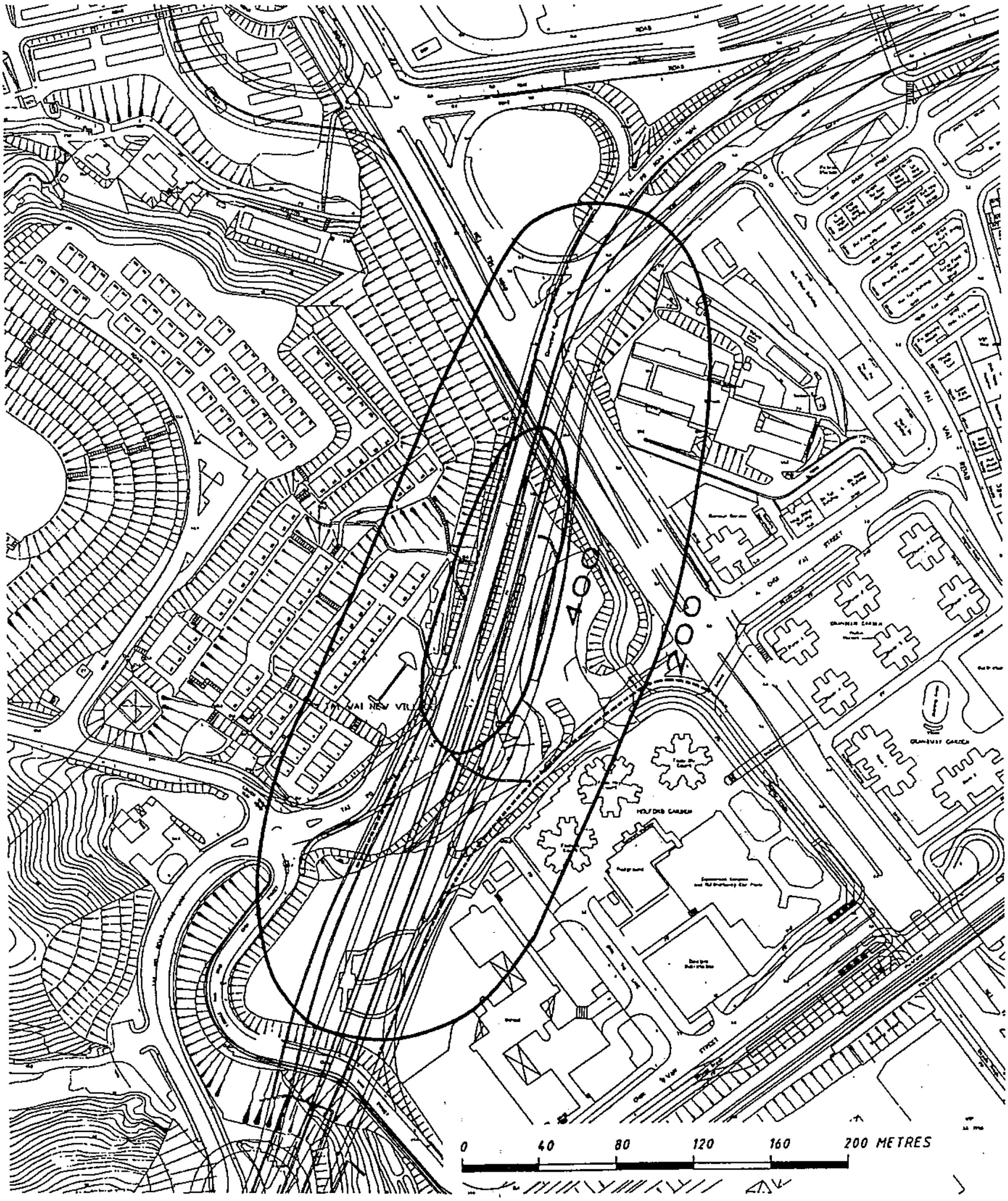

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI)
ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 1.5M ABOVE LOCAL GROUND LEVEL (PHASE VI)

FIGURE NO. : 3.8

SCALE : AS SHOWN

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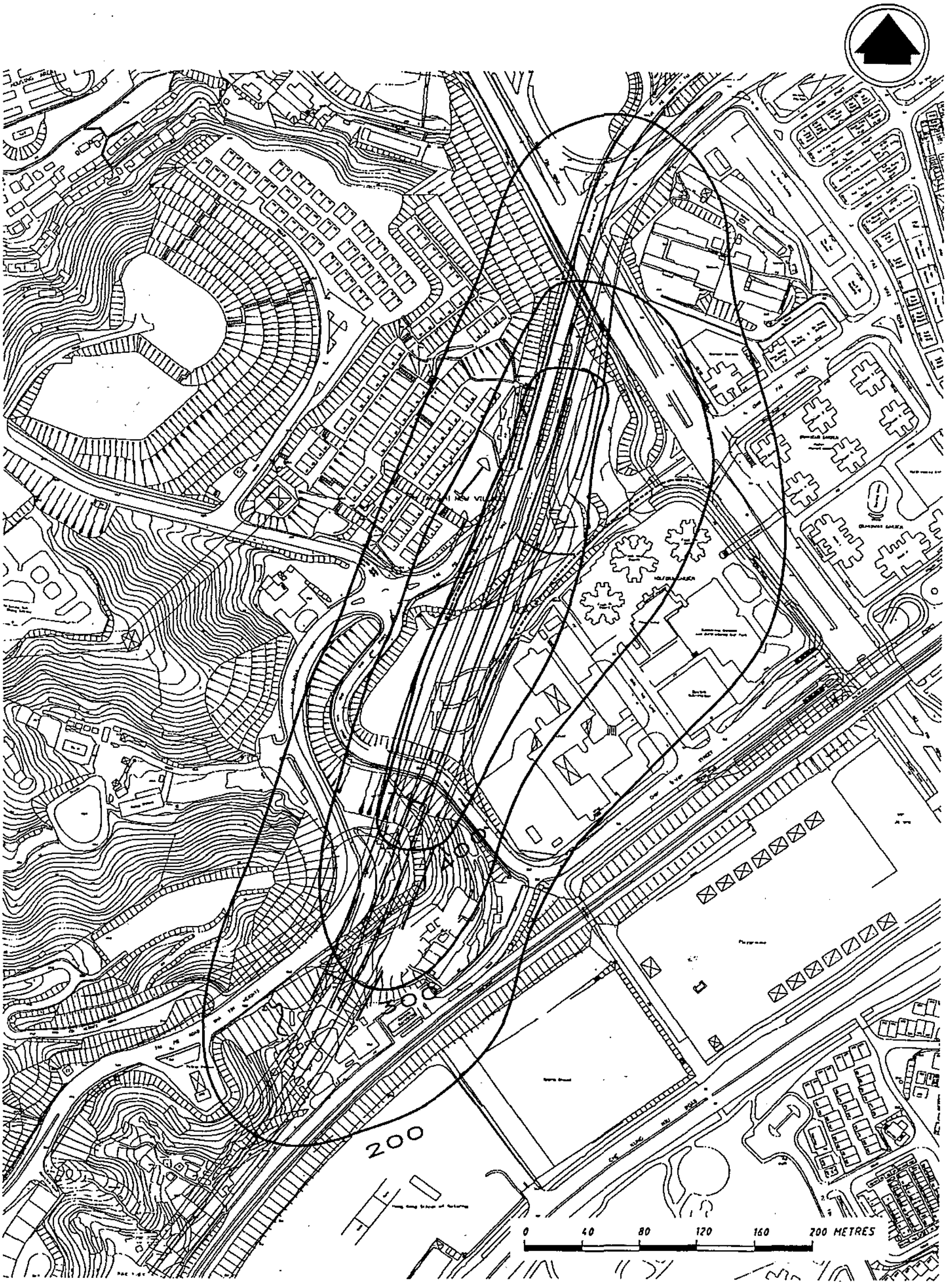

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI)
ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 1.5M ABOVE LOCAL GROUND LEVEL (PHASE VII)

FIGURE NO. :	3.9
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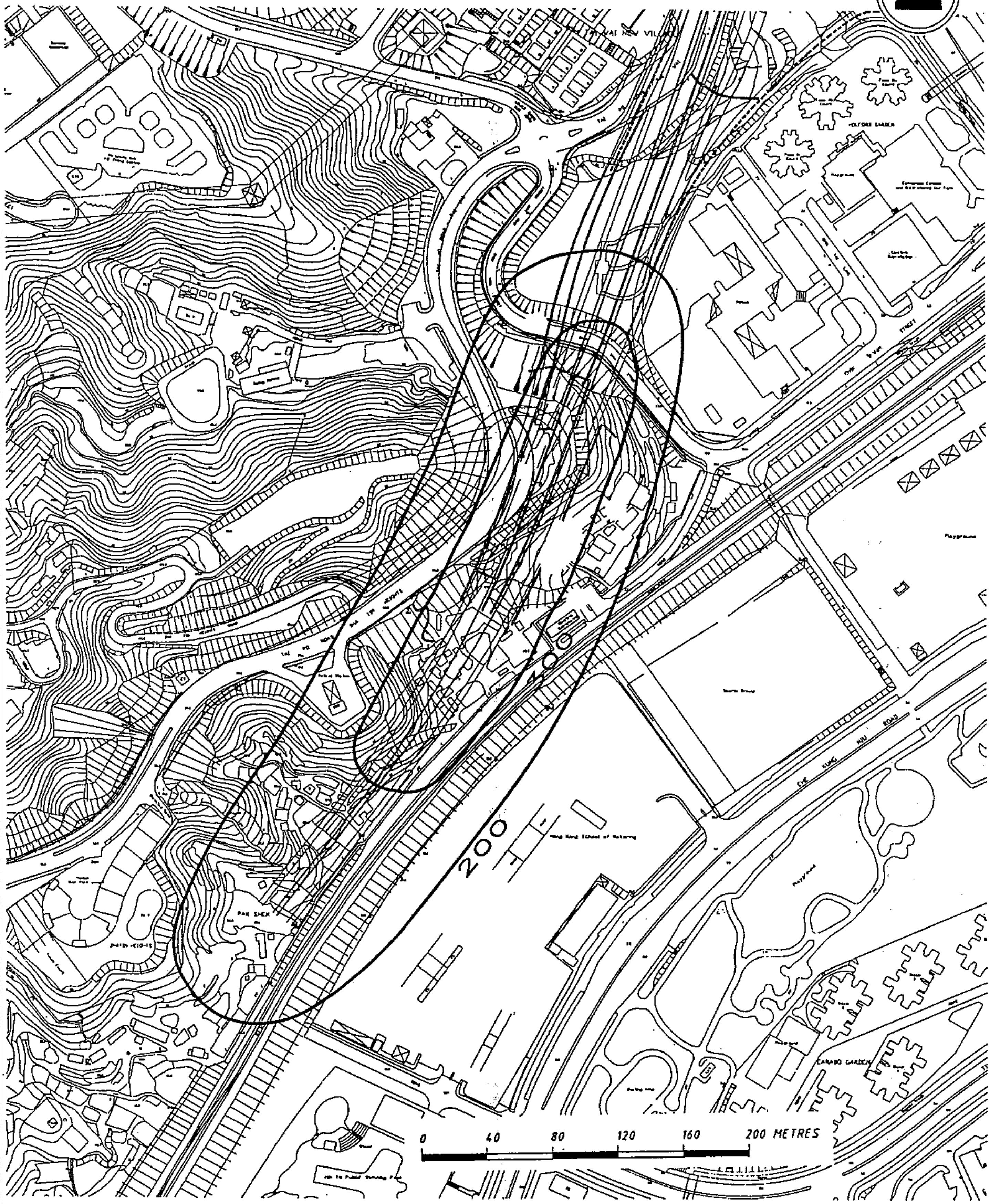

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI)
ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 1.5M ABOVE LOCAL GROUND LEVEL (PHASE VIII)

FIGURE NO. : 3.10
SCALE : AS SHOWN
DATE JANUARY 98

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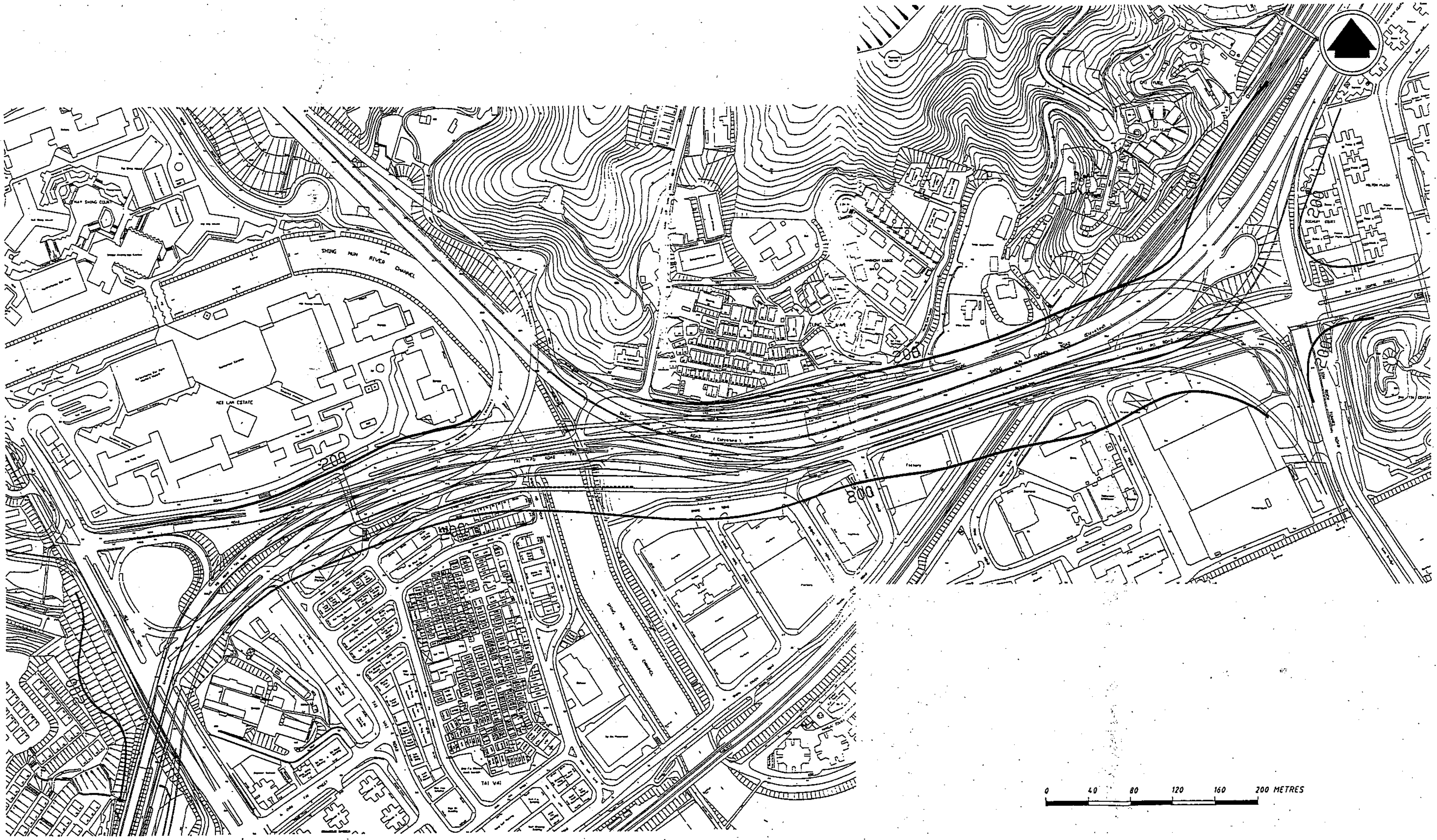

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI) ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE NO_2 CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 1.5M ABOVE LOCAL GROUND LEVEL

FIGURE NO.	3.11
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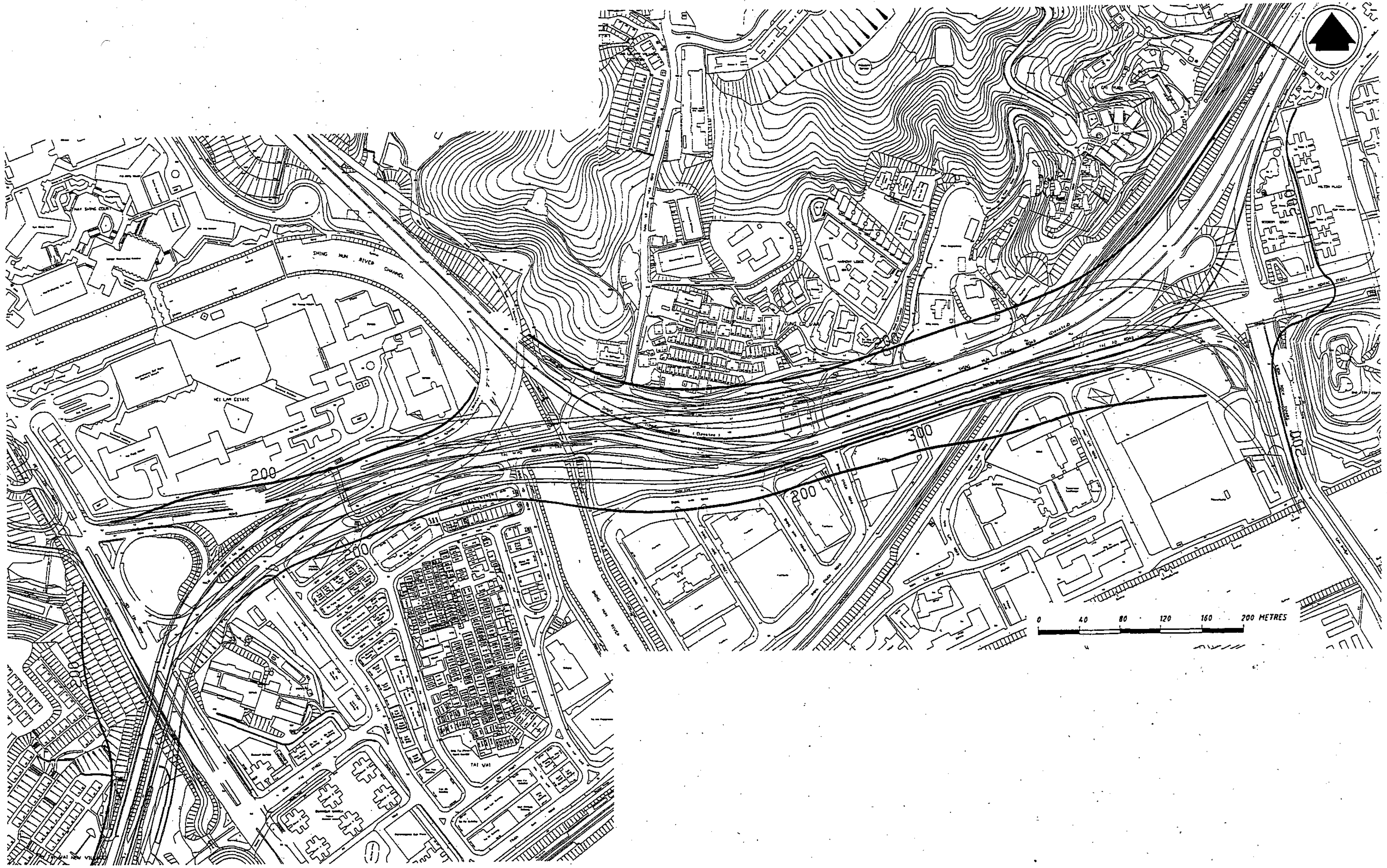

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI) ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE NO_2 CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 10M ABOVE LOCAL GROUND LEVEL (SHEET 1 OF 2)

FIGURE NO.	3.12	
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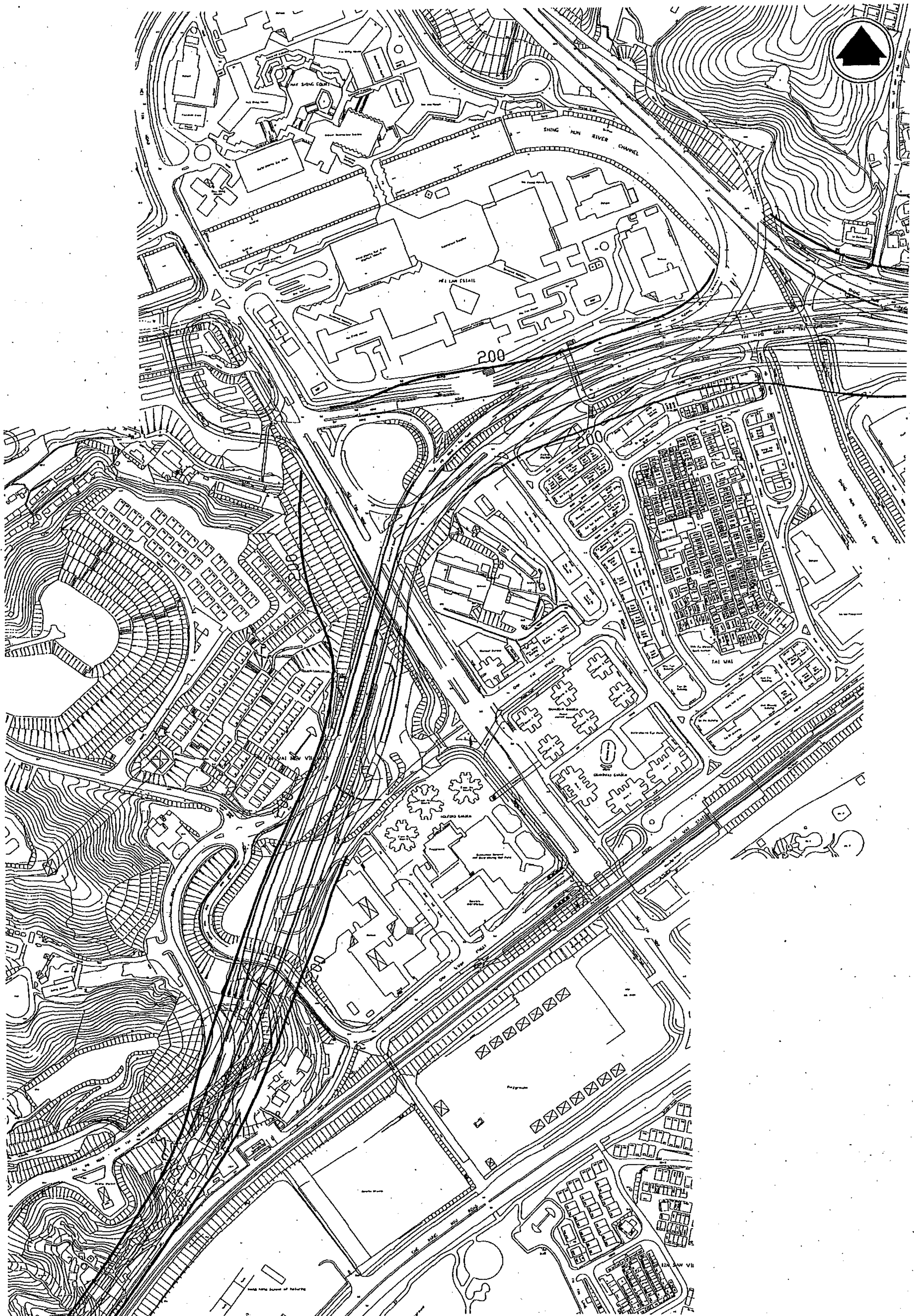

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI)
ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE NO_2 CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 10M ABOVE LOCAL GROUND LEVEL (SHEET 2 OF 2)

FIGURE NO. :	3.12
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DATE	JANUARY 98

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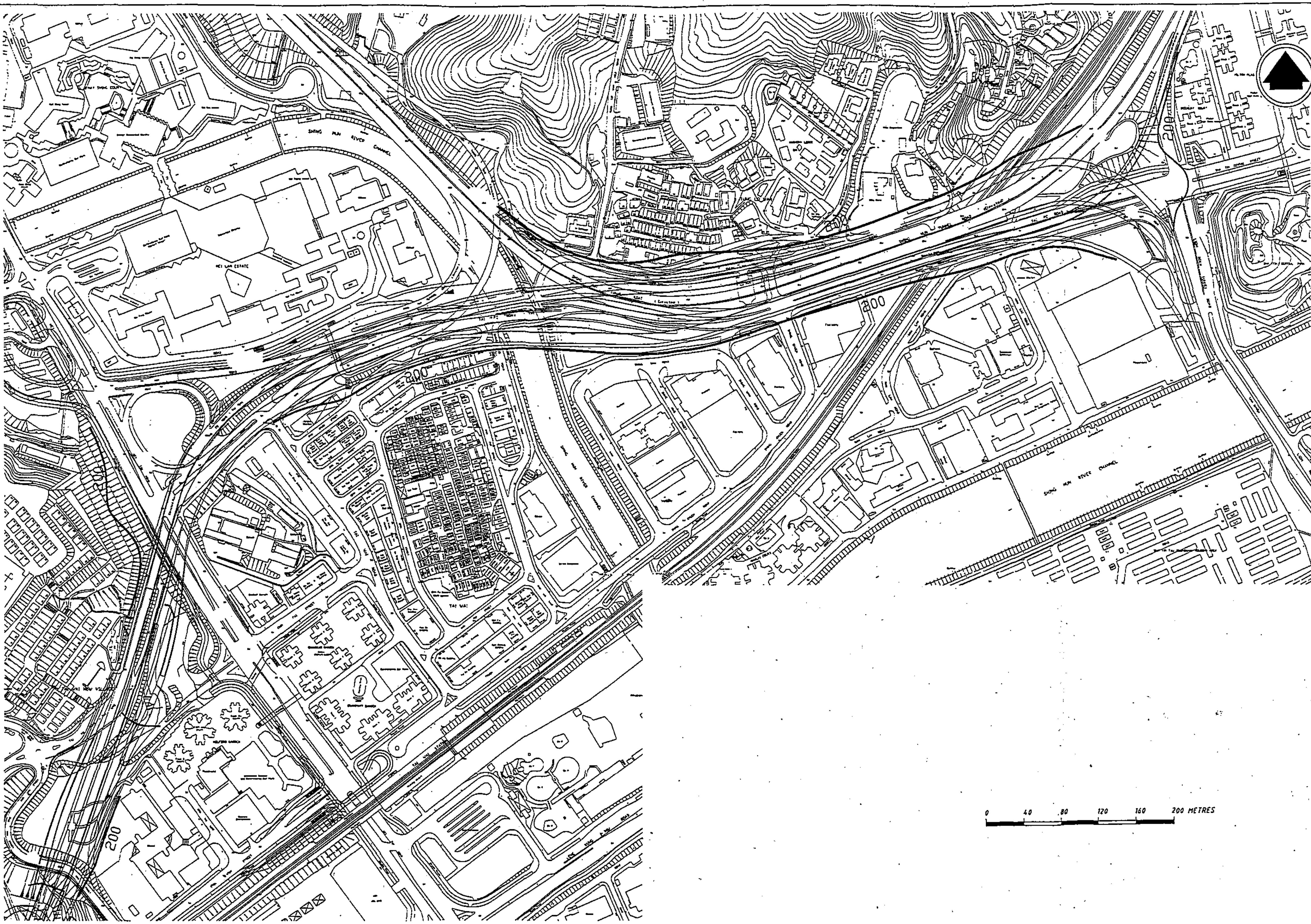

SHA TIN NEW TOWN - STAGE II TRUNK ROAD T3 (TAI WAI) ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PREDICTED 1-HOUR AVERAGE NO_2 CONCENTRATIONS($\mu g/m^3$) CONTOURS AT 20M ABOVE LOCAL GROUND LEVEL

FIGURE NO. 3.13	
SCALE: AS SHOWN	DATE: JANUARY 98

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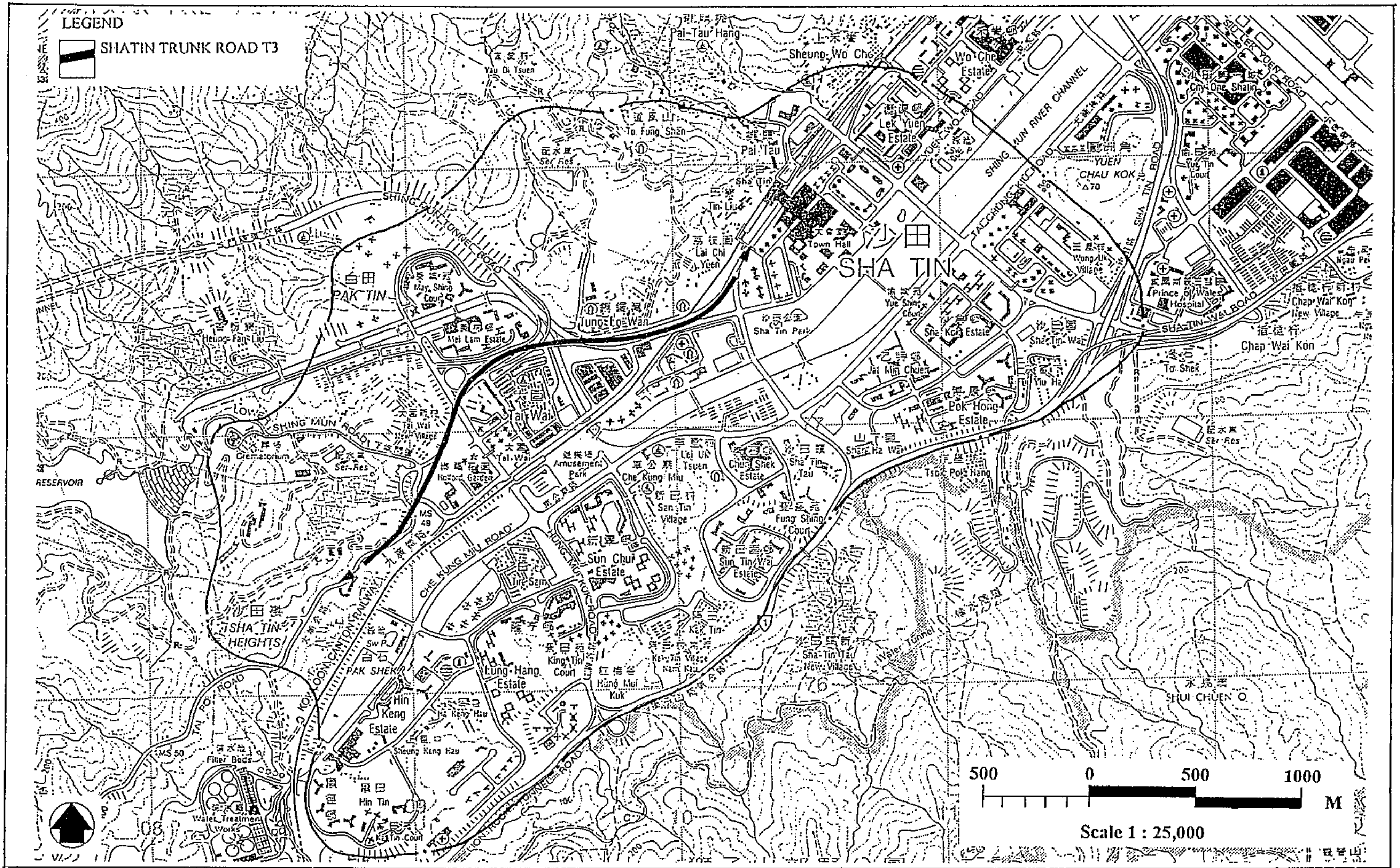

Figure 6.1 Study Area

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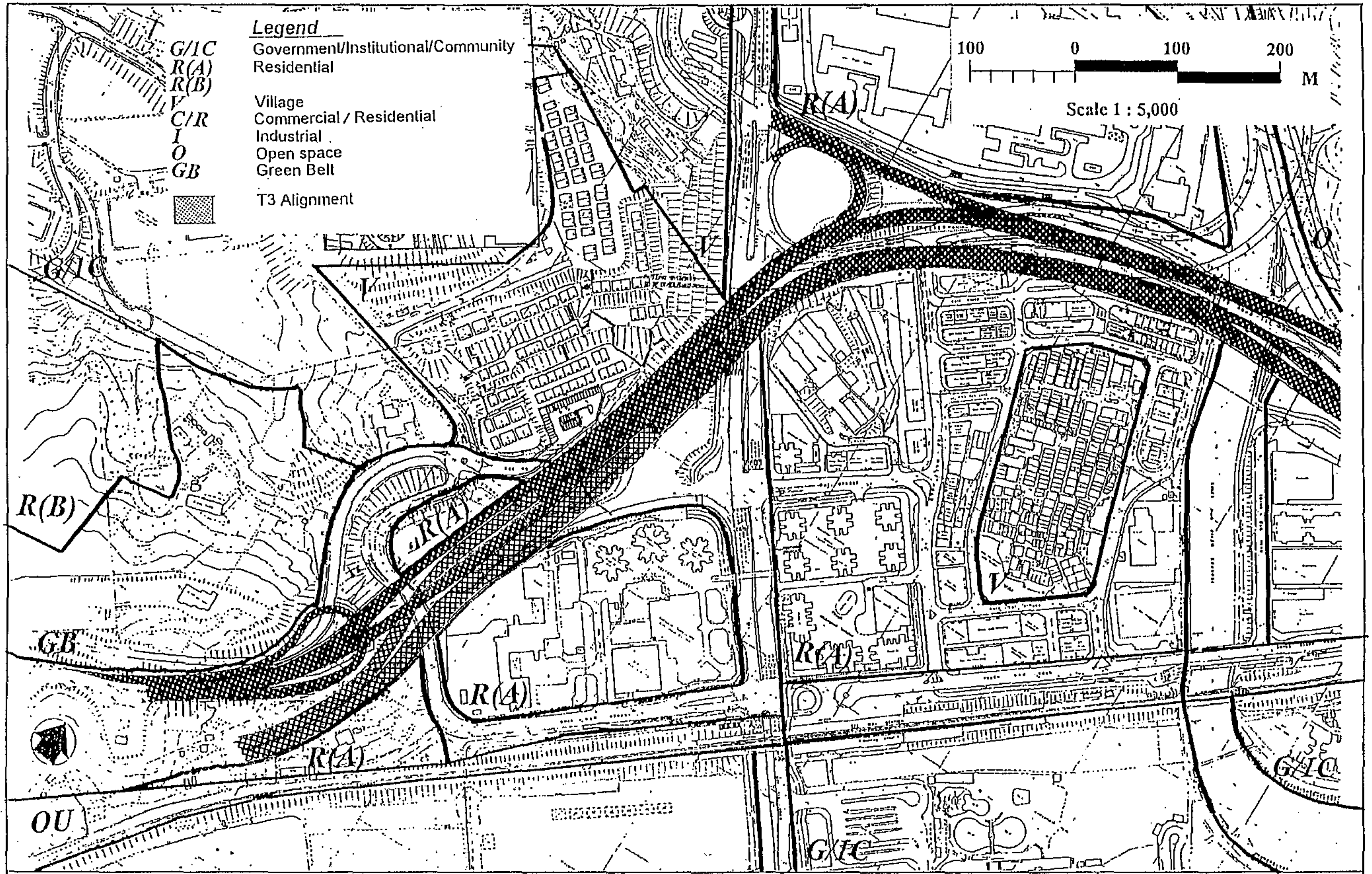

Figure 6.2a Land Uses within Landscape of Study Area

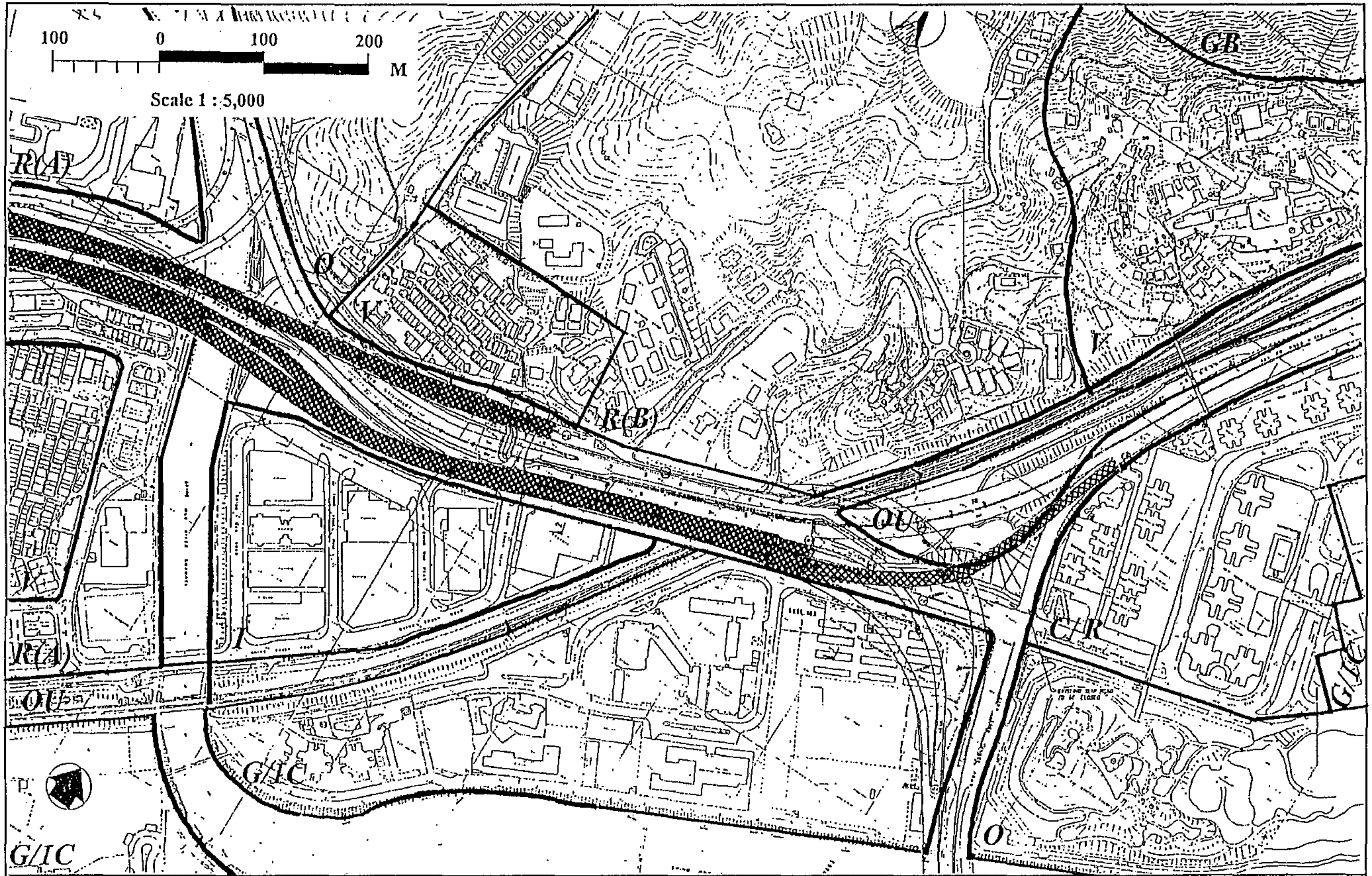

Figure 6.2b Land Uses within Landscape of Study Area

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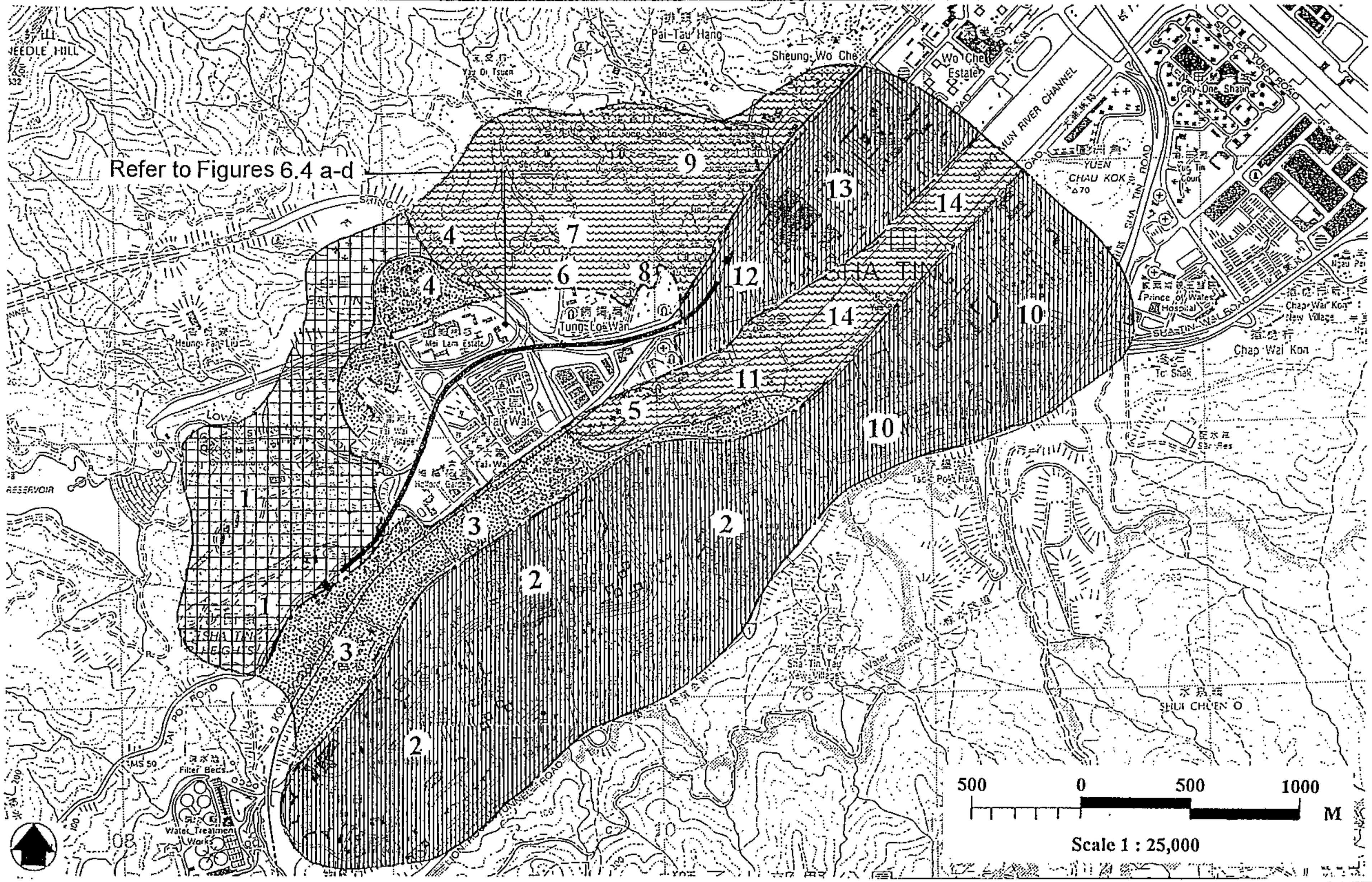

Figure 6.3 Landscape Quality Within Landscape of Study Area

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Figure 6.4a Landscape Quality Within Urban Area Bordering Sha Tin Trunk Road T3

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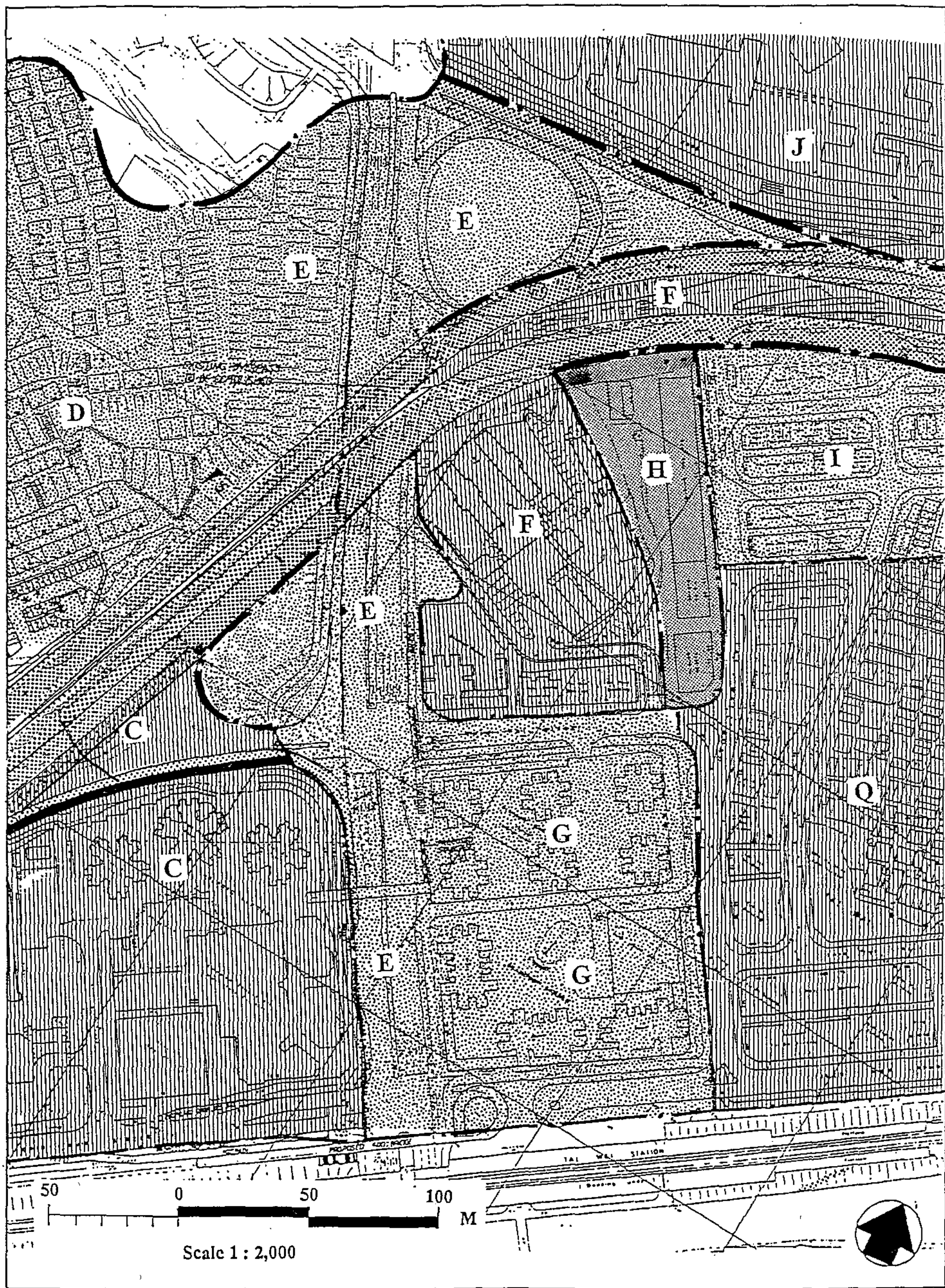

Figure 6.4b Landscape Quality Within Urban Area Bordering Sha Tin Trunk Road T3

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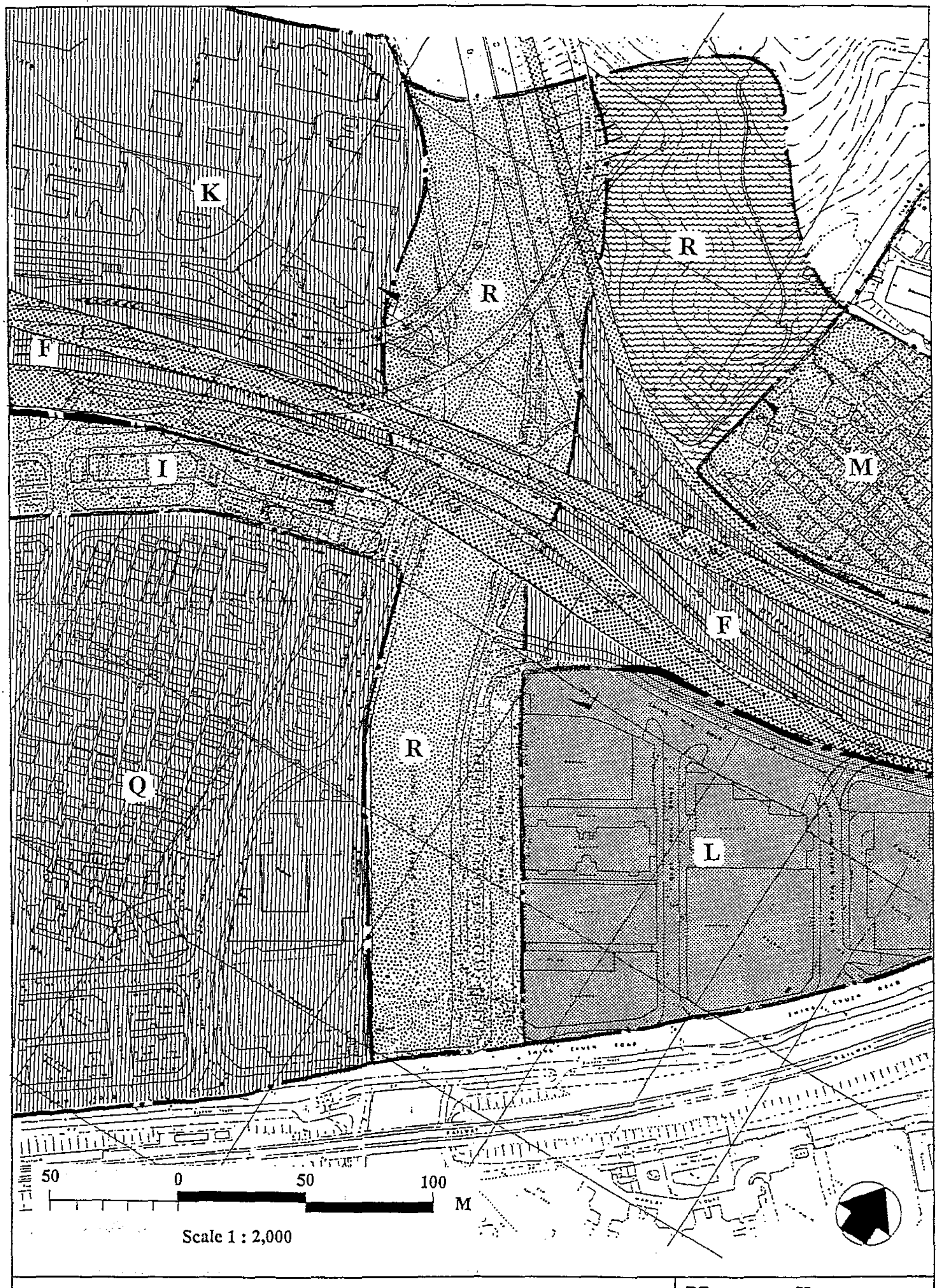

Figure 6.4c Landscape Quality Within Urban Area Bordering Sha Tin Trunk Road T3

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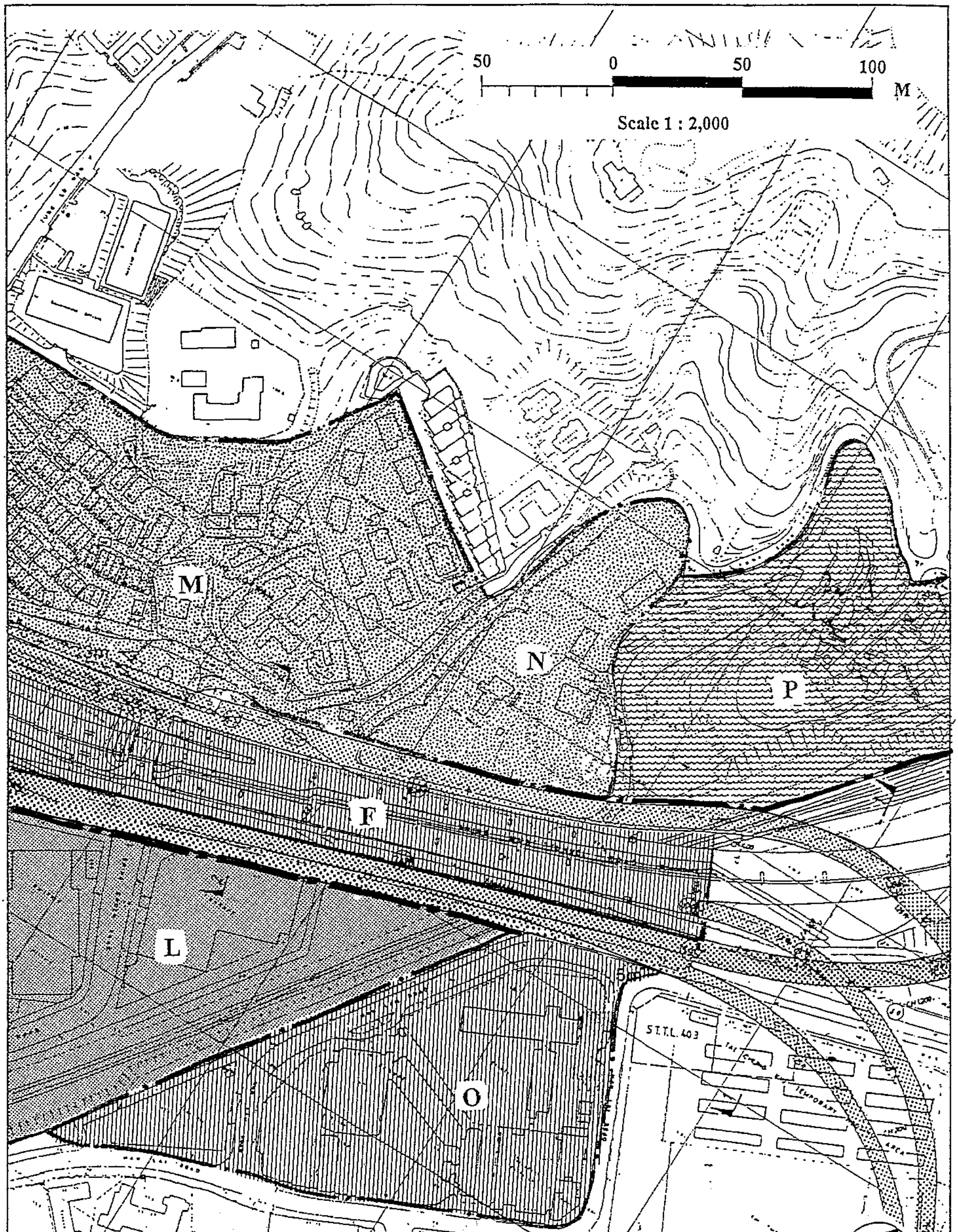

Figure 6.4d Landscape Quality Within Urban Area Bordering Sha Tin Trunk Road T3

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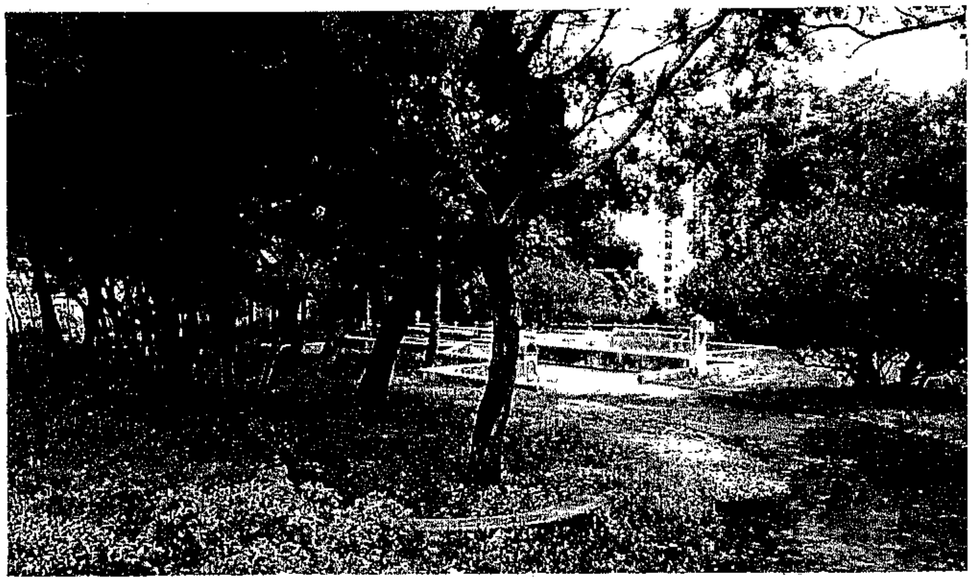
Villa Le Parc (P) (HQL)
- Highest Quality Landscape

The area incorpates dense vegetation, interesting topography; sensitive architectural forms and skyline profile, providing a unique lan dscape character quality.



Route 16/T3 Interface(A)
- Very Attractive Landscape

The area includes existing open space abutting naturalistic areas of woodland and though it is not unique within Sha Tin area it has importance within the surrounding area

Figure 6.4e Landscape Quality - Indicative Photographs

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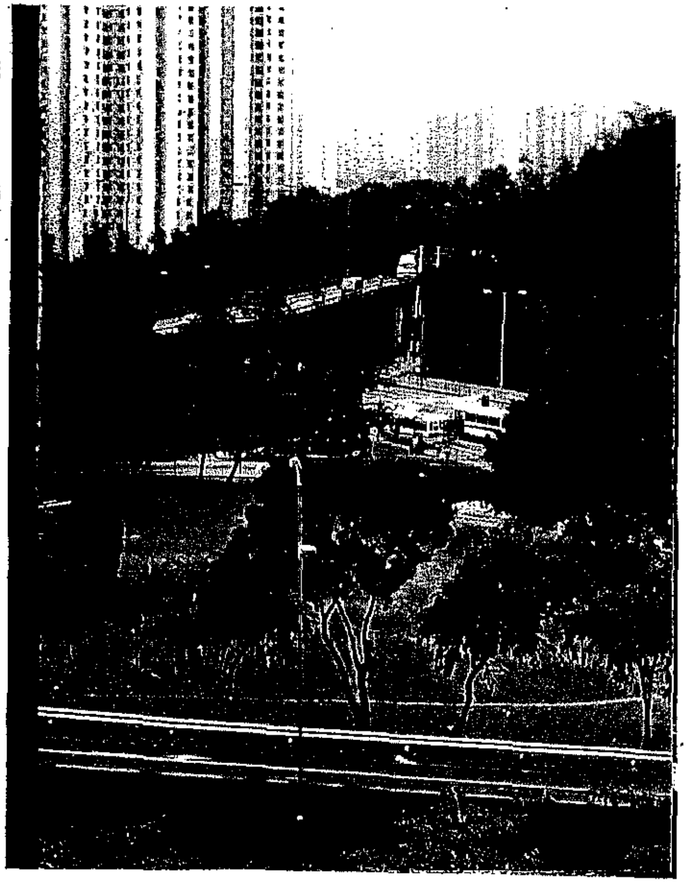

Mei Tin Road (E)
- Good Landscape

This area provides a breathing space incorporating a varied topography and dense vegetation, thus making it important in the context of the surrounding area.

Tai Po Road - Tai Wai (F)
- Ordinary Landscape

The density and architectural design combined with the existing transport corridor creates an ordinary landscape. This still incorporates a level of visual interest with pedestrian and vehicular movement. The character of the area with sensitive planning will not be vunerable to degradation through the introduction of Trunk Road T3.

Shing Chuen Road zone (L)
- Poor Landscape

View of the flatted factories in this area with rear car parking and low quality amenity planting area. The poor landscape character of this area is particularly acceptable to change and the Trunk Road T3 scheme allows for the potential to upgrade the visual and landscape quality.

Figure 6.4f Landscape Quality - Indicative Photographs

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Legend - Figure 6.3 *Figures 6.4 a-d*

T3 Alignment (Figure 6.3)

T3 Alignment (Figure 6.4 a-d)

Route 16 and Trunk Road T4 Connections
(R16 at Western End / T4 at Eastern End)

Highest Quality Landscape (HQL)

Ordinary Landscape (OL)

Very Attractive Landscape (VAL)

Poor Landscape (PL)

Good Landscape (GL)

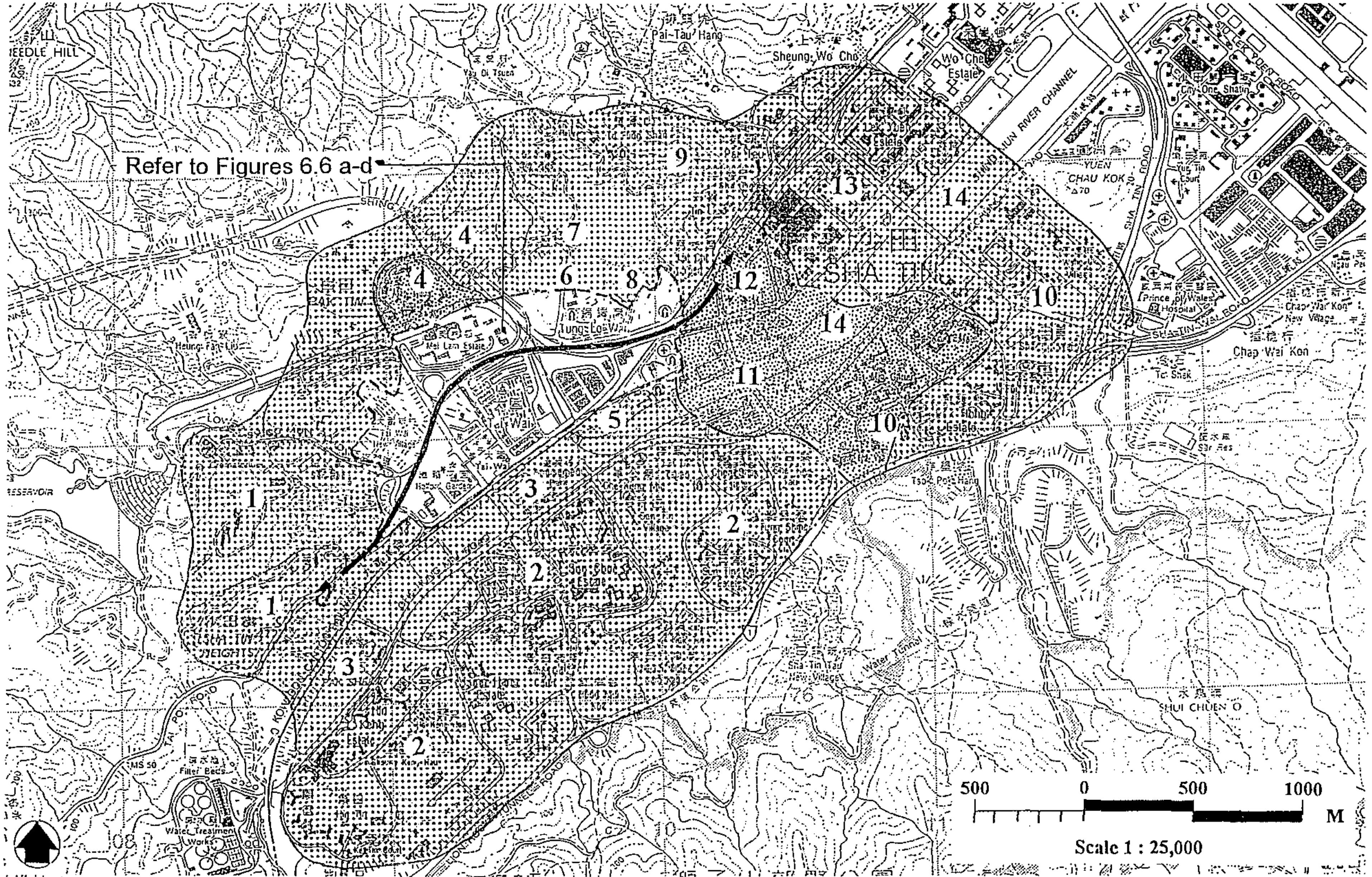

Figure 6.5 Landscape Impact of Study Area

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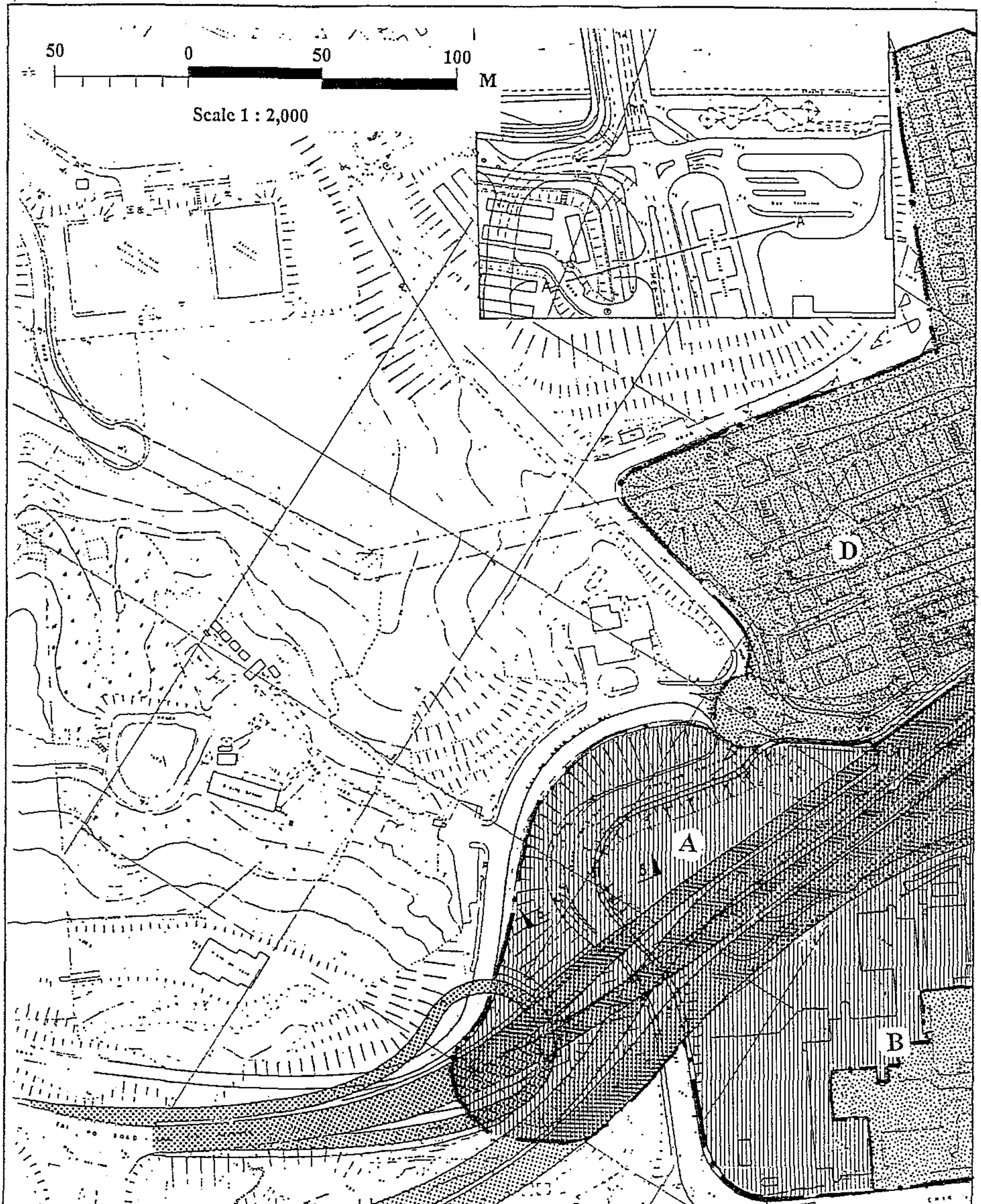

Figure 6.6a Landscape Impact Within Urban Areas Bordering Sha Tin Trunk Road T3

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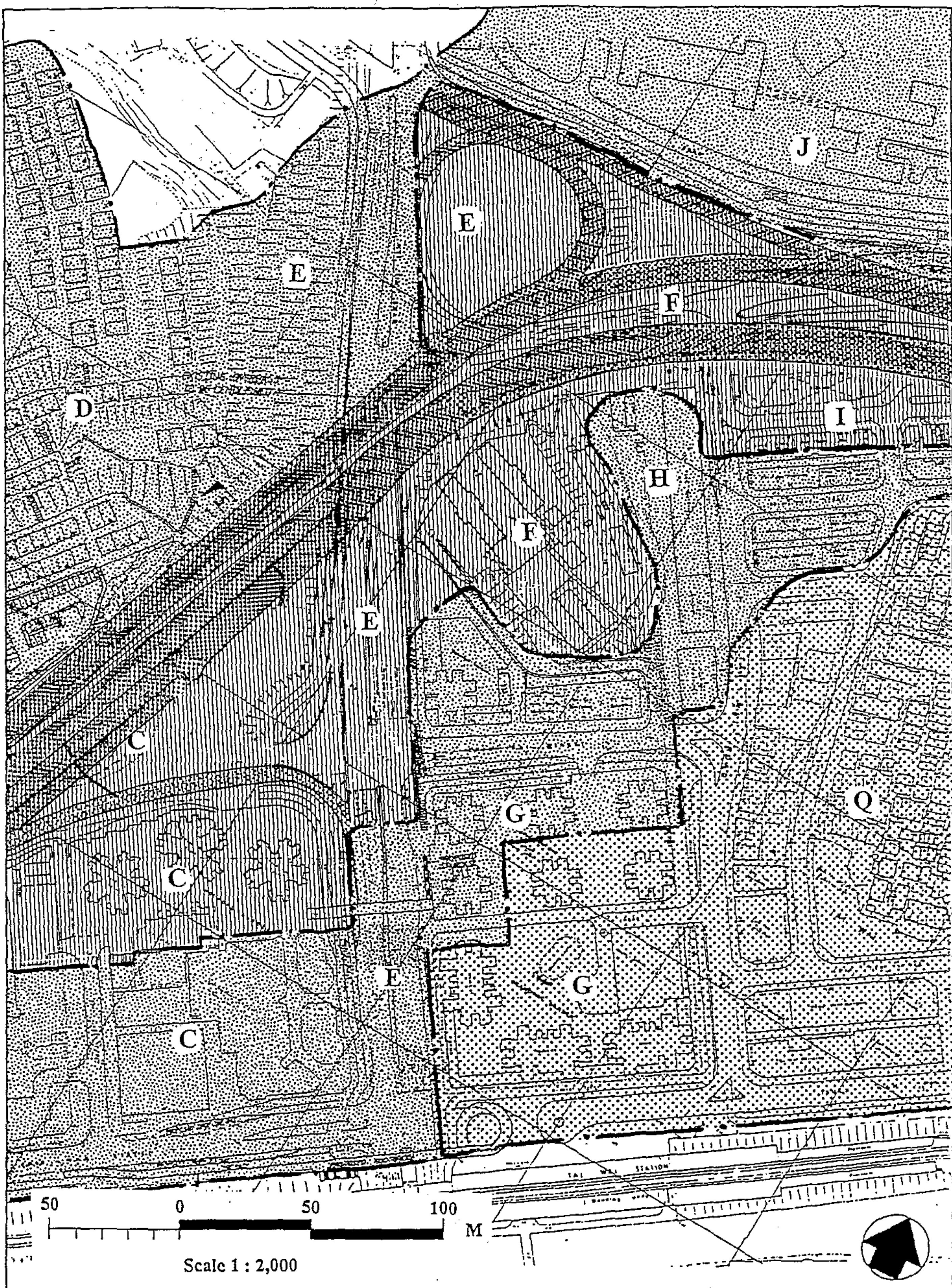

Figure 6.6b Landscape Impact Within Urban Areas Bordering Sha Tin Trunk Road T3

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茂盛(亞洲)工程顧問有限公司 in association with
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地利環境顧問事務所

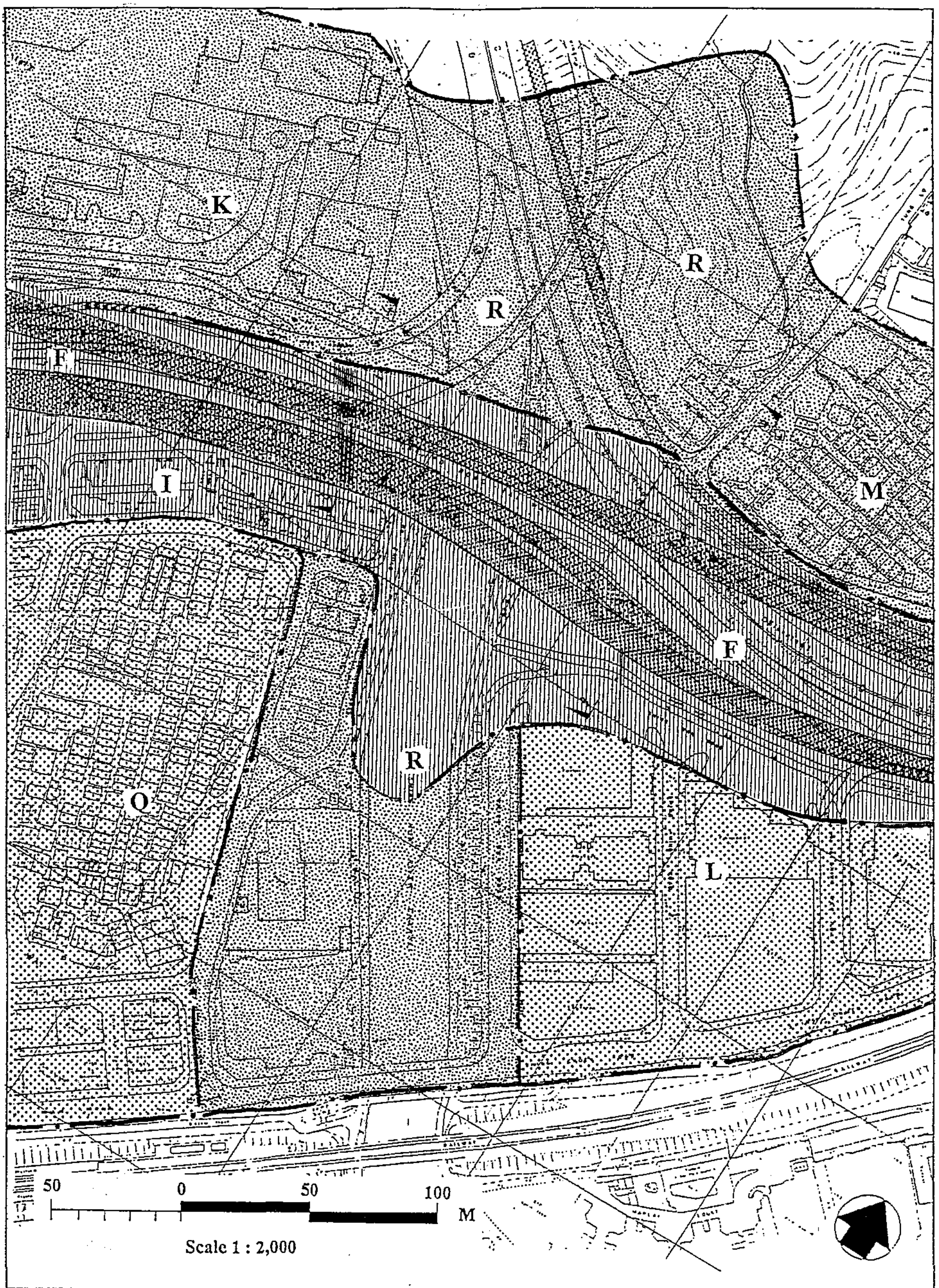

Figure 6.6c Landscape Impact Within Urban Areas Bordering Sha Tin Trunk Road T3

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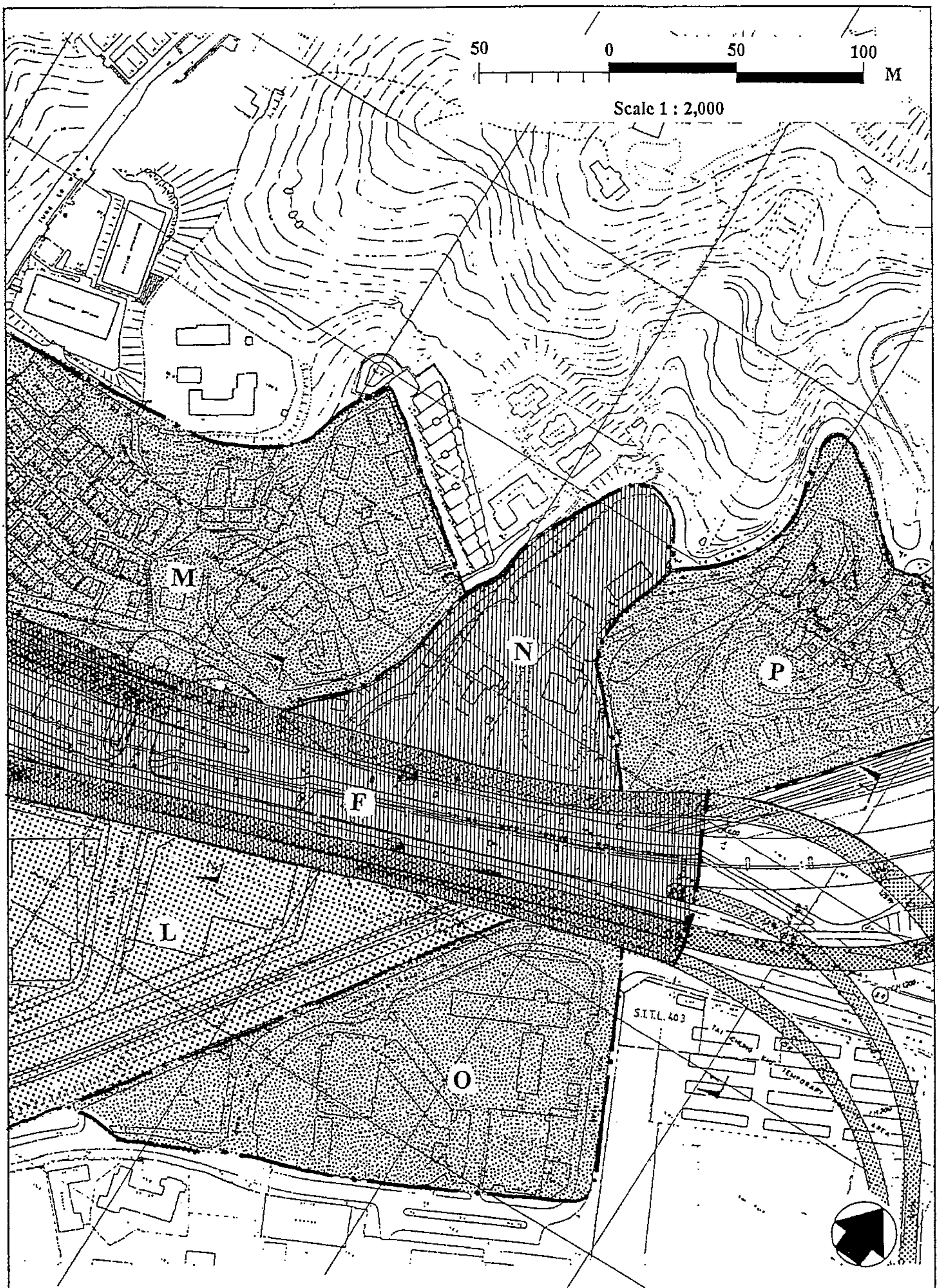

Figure 6.6d Landscape Impact Within Urban Areas Bordering Sha Tin Trunk Road T3

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Legend - Figure 6.5 *Figures 6.6 a-d*

(arrow)	T3 Alignment (Figure 6.5)
(dense dot pattern)	T3 Alignment (Figure 6.6 a-d)
(dot pattern)	Route 16 and Trunk Road T4 Connections (R16 at Western End / T4 at Eastern End)
(vertical lines)	Substantial Landscape Impact (SULI)
(stipple pattern)	Moderate Landscape Impact (MOLI)
(dot pattern)	Slight Landscape Impact (SLLI)

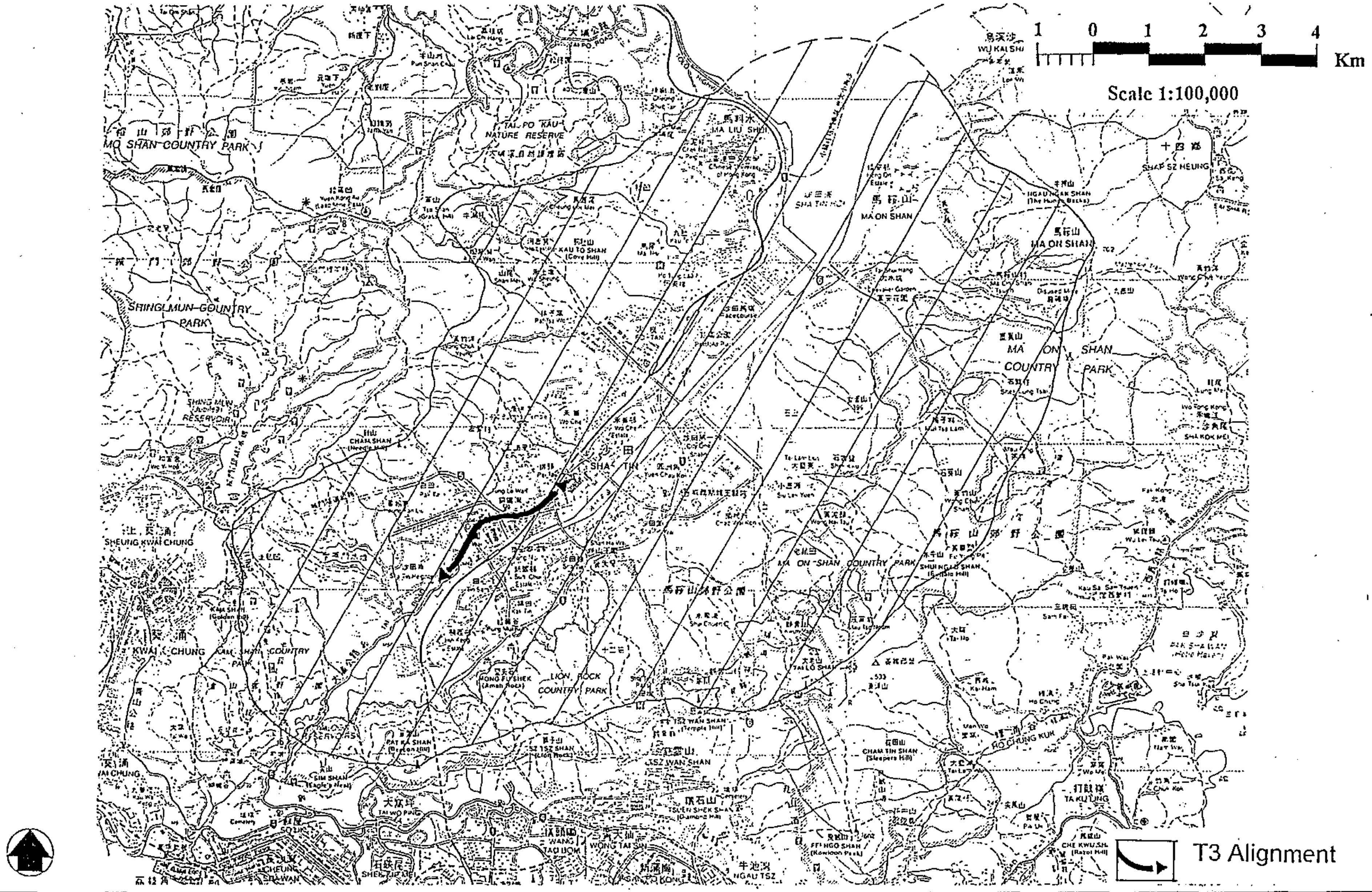

Figure 6.7 Visual Envelope

Maunsell 茂盛(亞洲)工程顧問有限公司 in association with TEAM 73 HK 地利環境顧問事務所

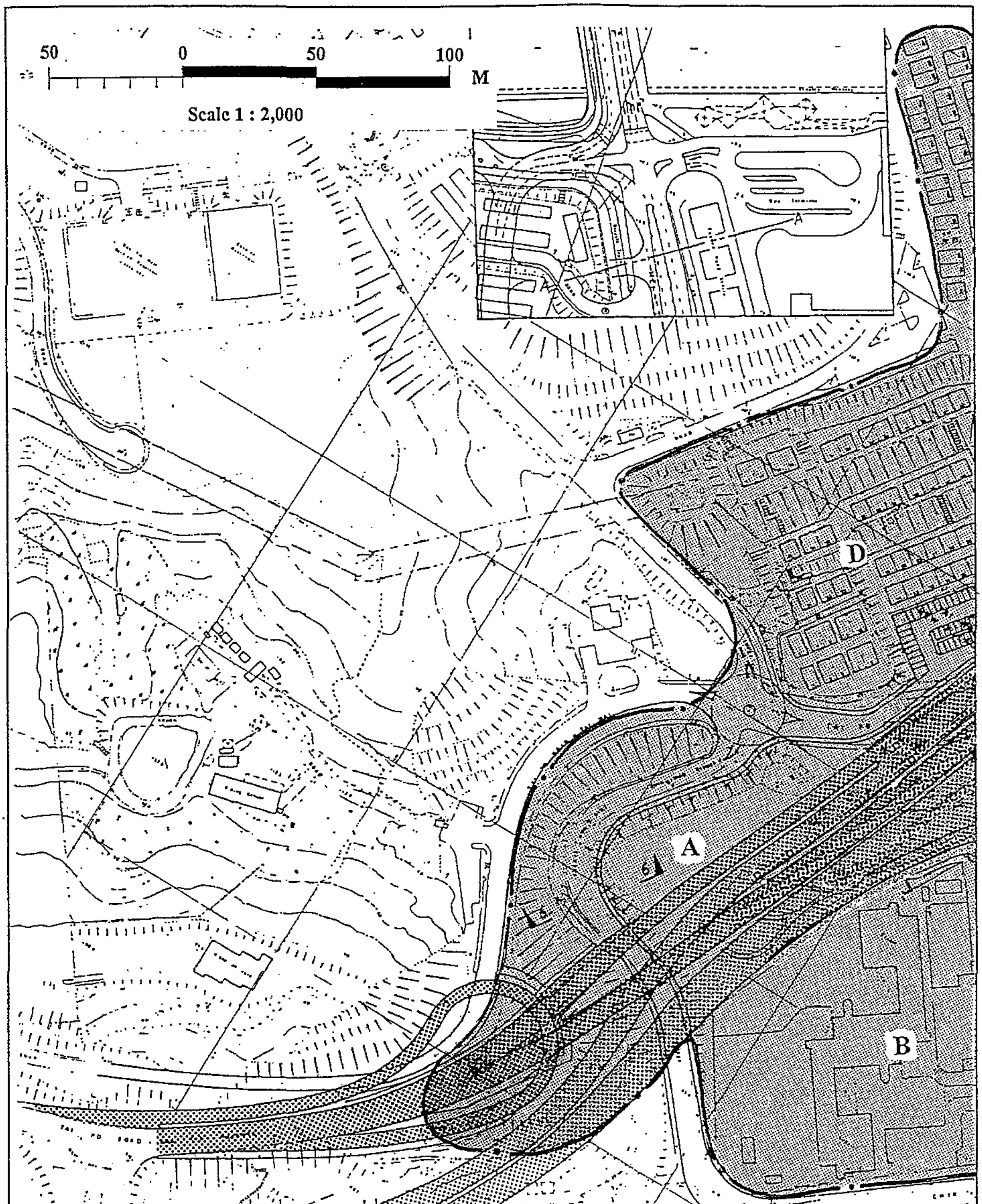

Figure 6.8a Location of Sensitive Receivers/Visual Impact

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茂盛(亞洲)工程顧問有限公司 in association with
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地利環境顧問事務所

Figure 6.8b Location of Sensitive Receivers/Visual Impact

Maunsell 茂盛(亞洲)工程顧問有限公司 in association with TEAM 73 HK 地利環境顧問事務所

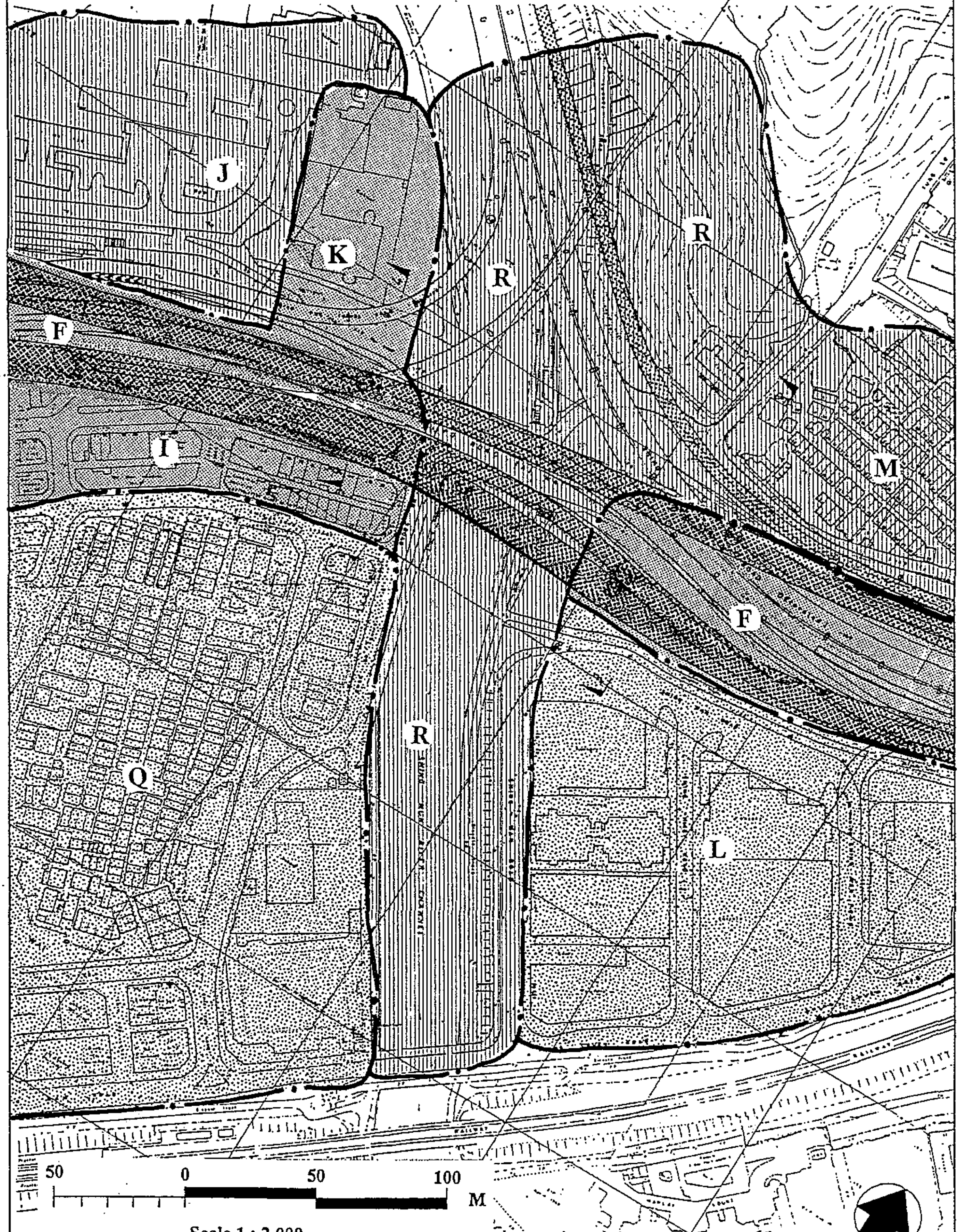

Figure 6.8c Location of Sensitive Receivers/Visual Impact

Maunsell
茂盛(亞洲)工程顧問有限公司 in association with
TEAM 73 HK
地利環境顧問事務所

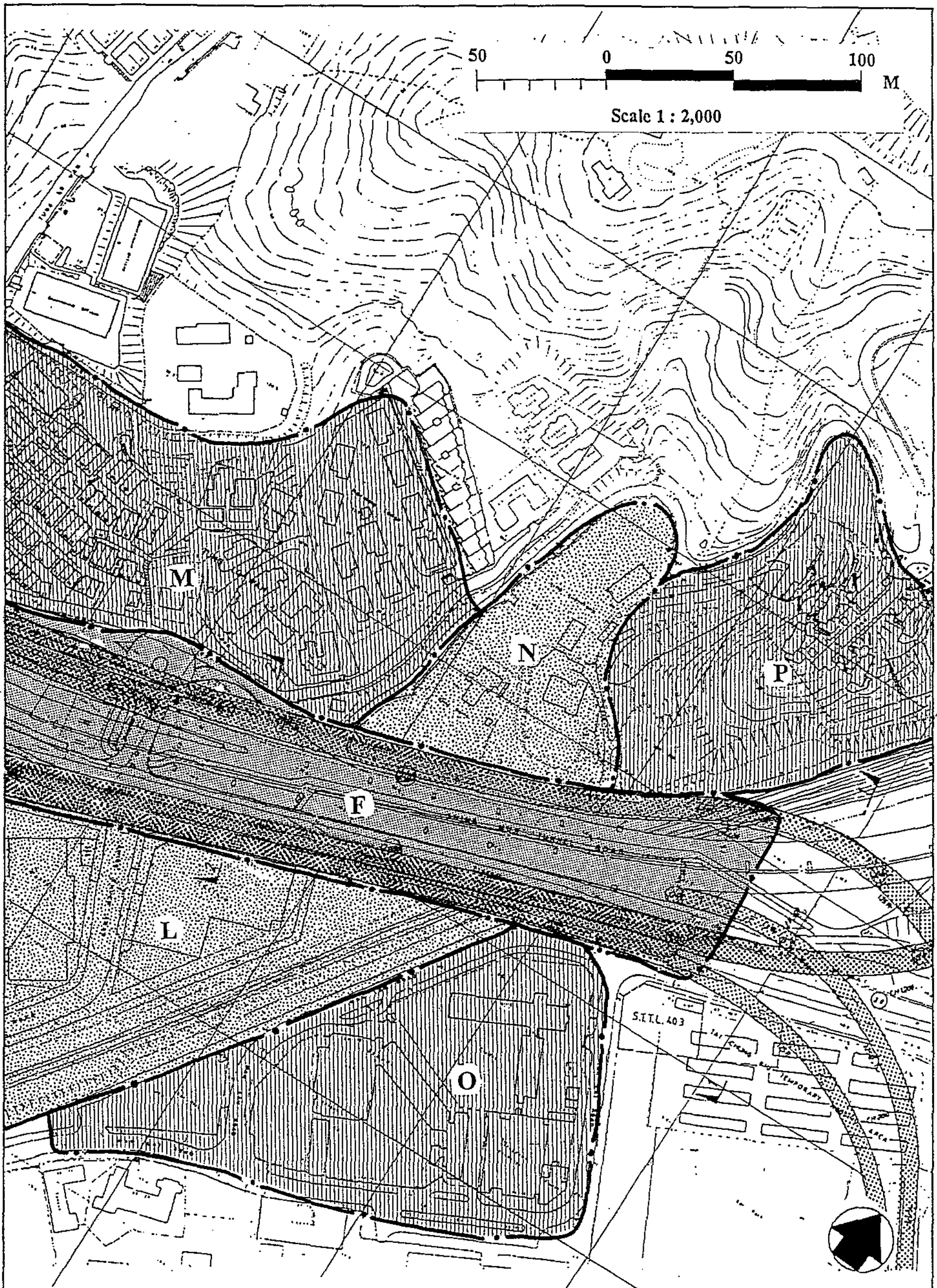

Figure 6.8d Location of Sensitive Receivers/Visual Impact

Maunsell 茂盛(亞洲)工程顧問有限公司 in association with TEAM 73 HK 地利環境顧問事務所

Legend - Figure 6.8 a-d

T3 Alignment

Route 16 and Trunk Road T4 Connections
(R16 at Western End / T4 at Eastern End)

High Sensitive Receiver (HSR)

Medium Sensitive Receiver (MSR)

Low Sensitive Receiver (LSR)

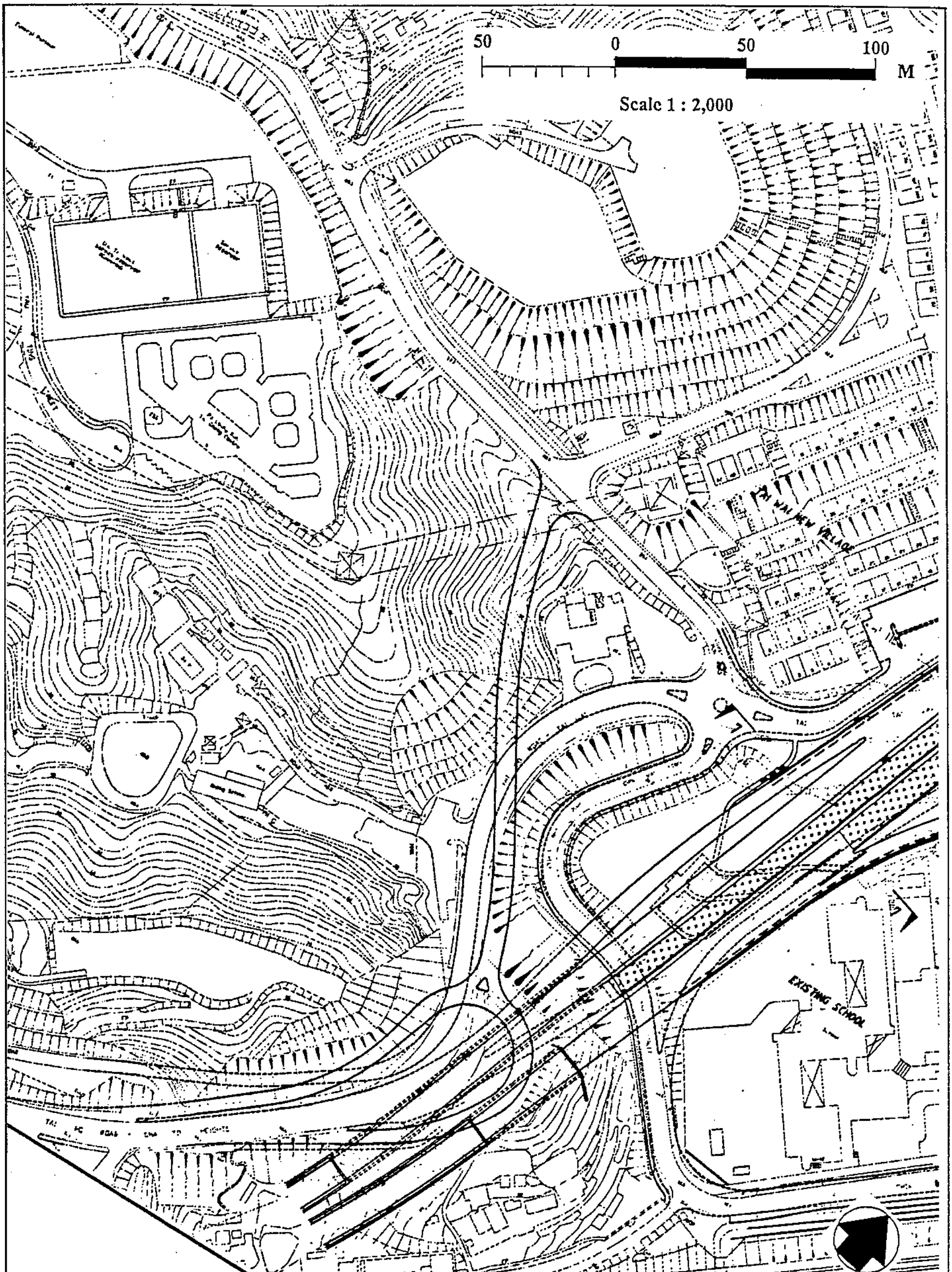

Figure 6.9a Proposed Mitigation Measures

Maunsell
茂盛(亞洲)工程顧問有限公司 in association with
TEAM 73 HK
地利環境顧問事務所

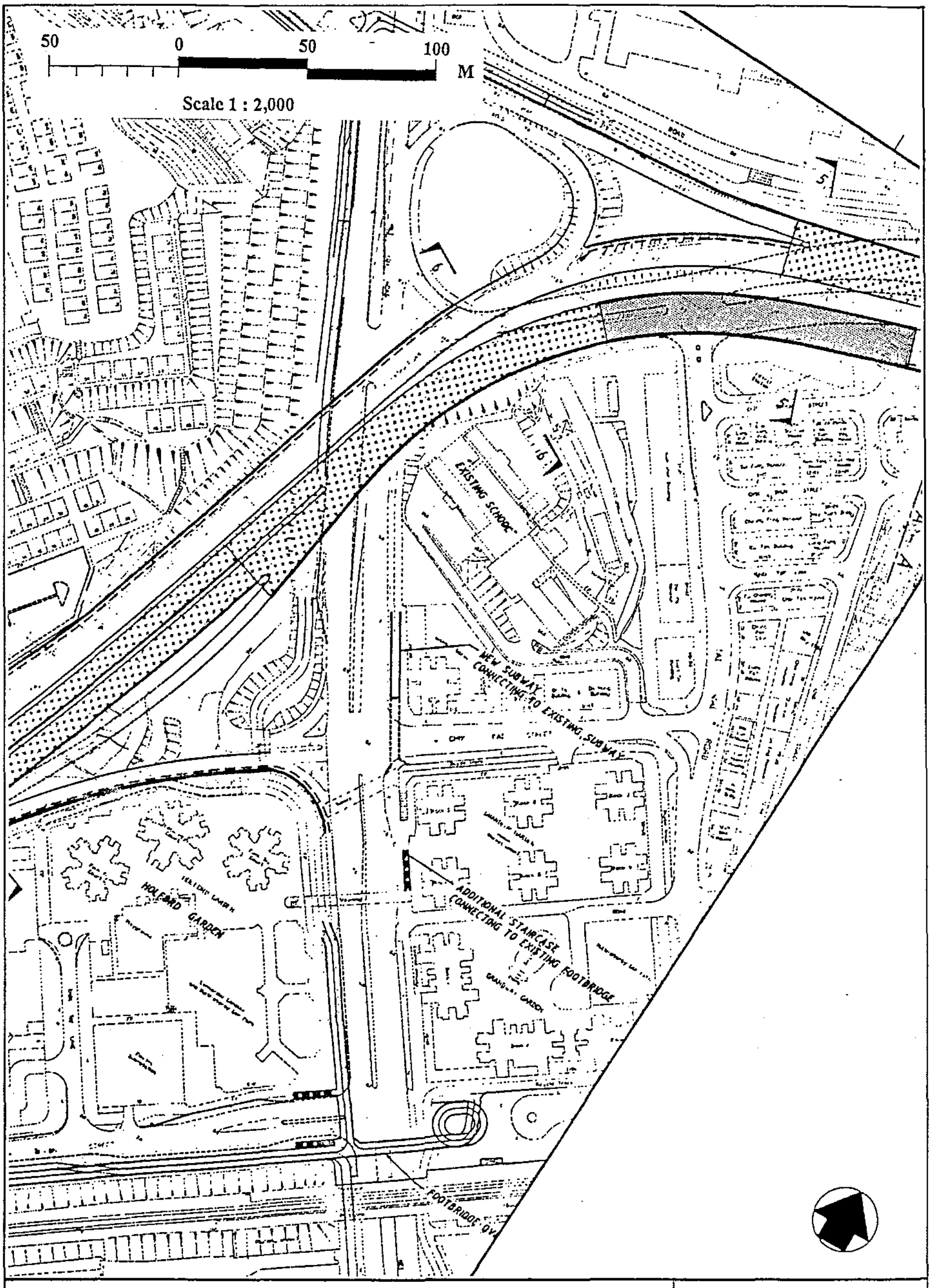

Figure 6.9b Proposed Mitigation Measures

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茂盛(亞洲)工程顧問有限公司 in association with
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地利環境顧問事務所

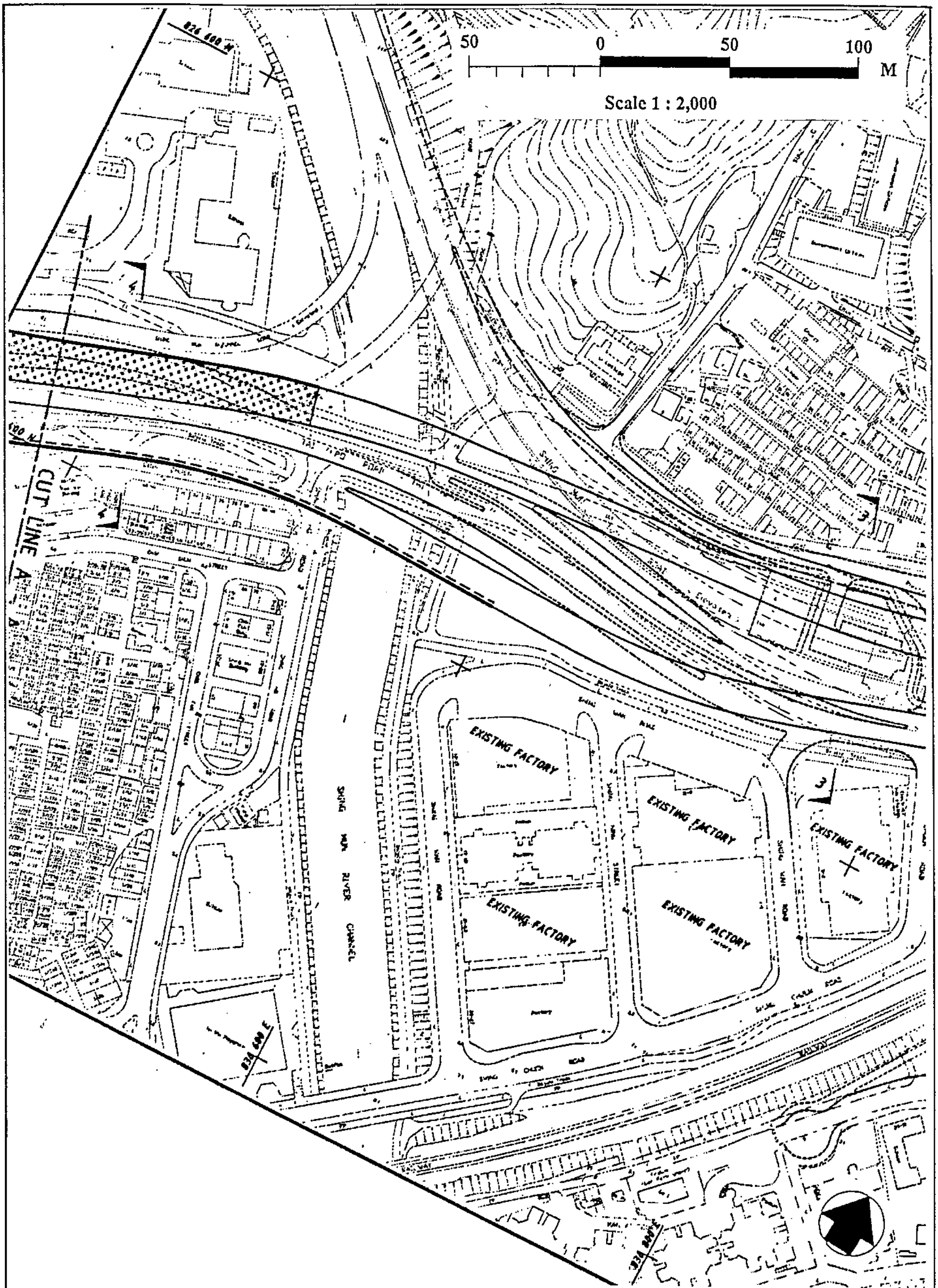

Figure 6.9c Proposed Mitigation Measures

Maunsell
茂盛(亞洲)工程顧問有限公司 in association with
TEAM 73 HK
地利環境顧問事務所

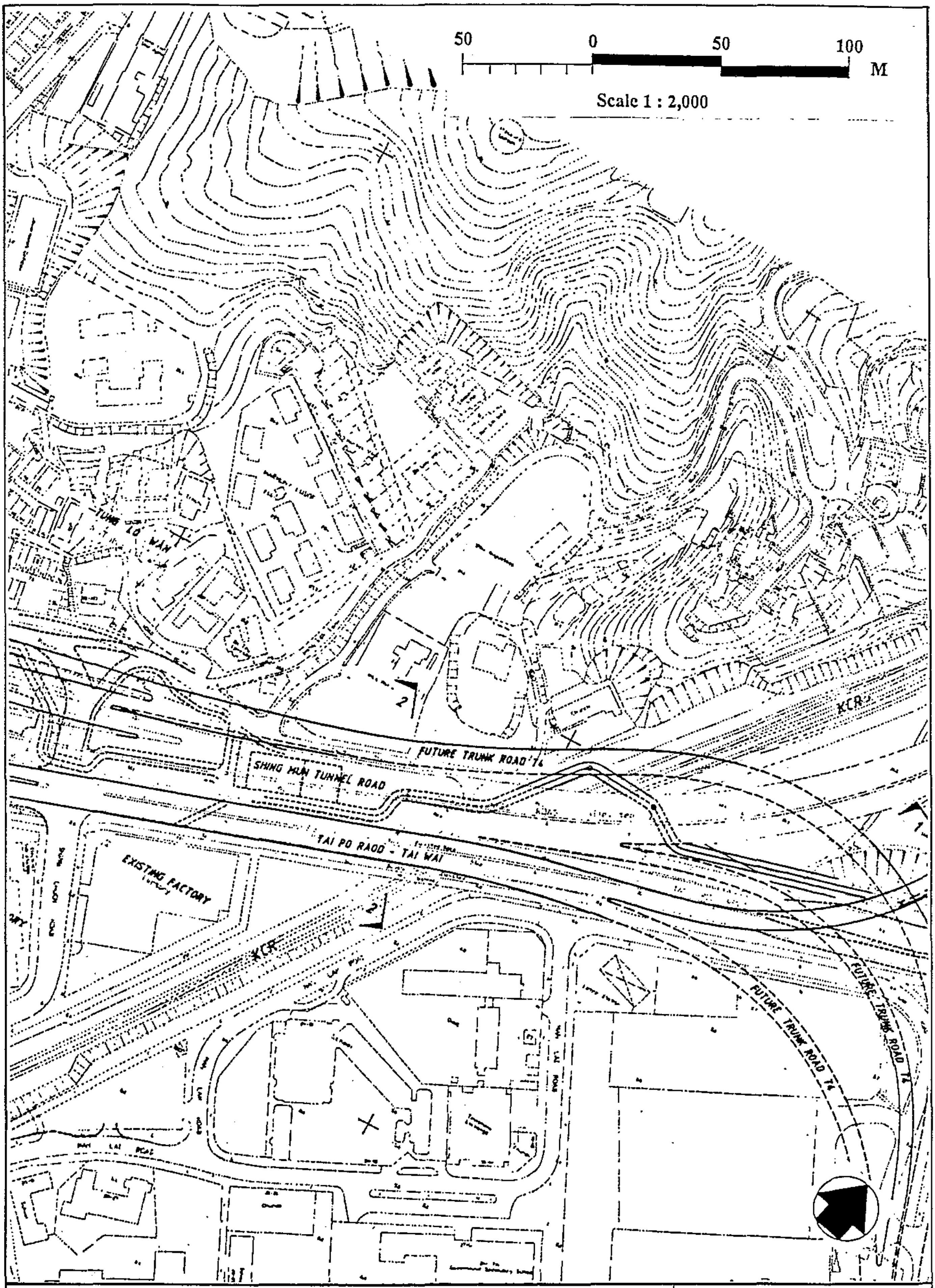

Figure 6.9d Proposed Mitigation Measures

Maunsell
茂盛(亞洲)工程顧問有限公司 in association with
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地利環境顧問事務所

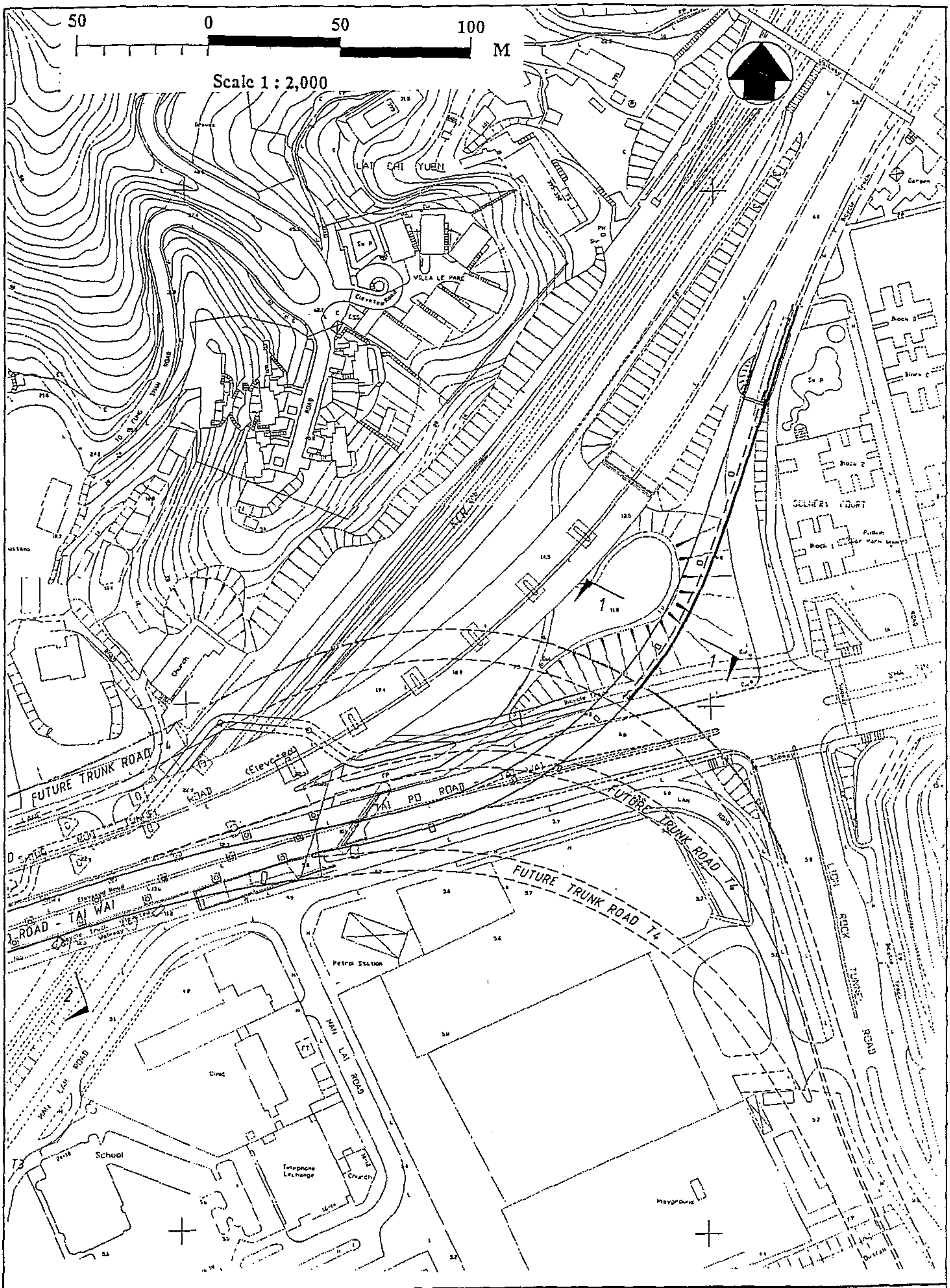

Figure 6.9e Proposed Mitigation Measures

Maunsell
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Legend - Figure 6.9 a-e

Vertical Plain Noise Barrier

Inverted L Shape Noise Barrier

Partial Enclosure Noise Barrier

Full Enclosure Noise Barrier

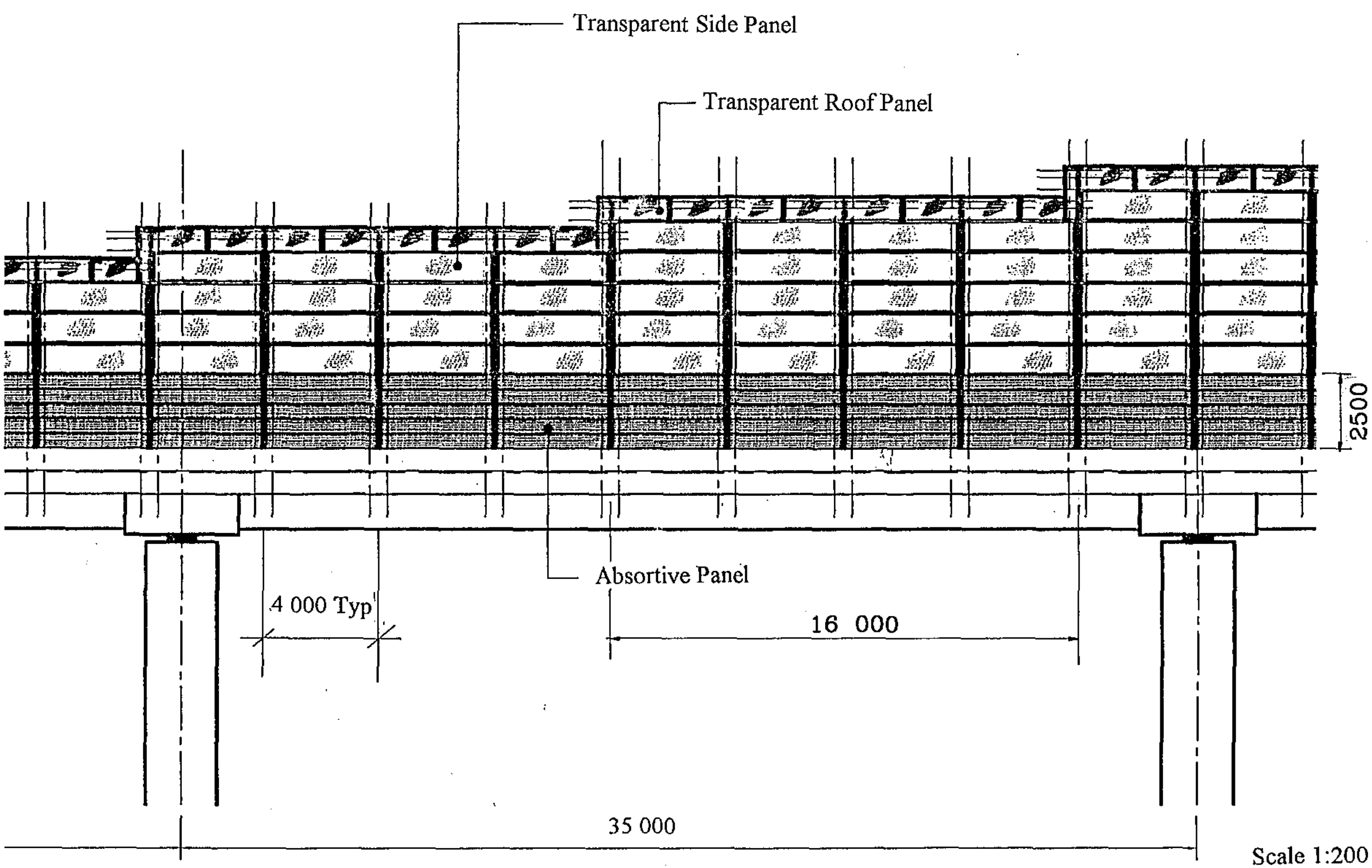

Figure 6.10a Typical Elevation of Noise Barrier

Maunsell
茂盛亞洲工程顧問有限公司 in association with
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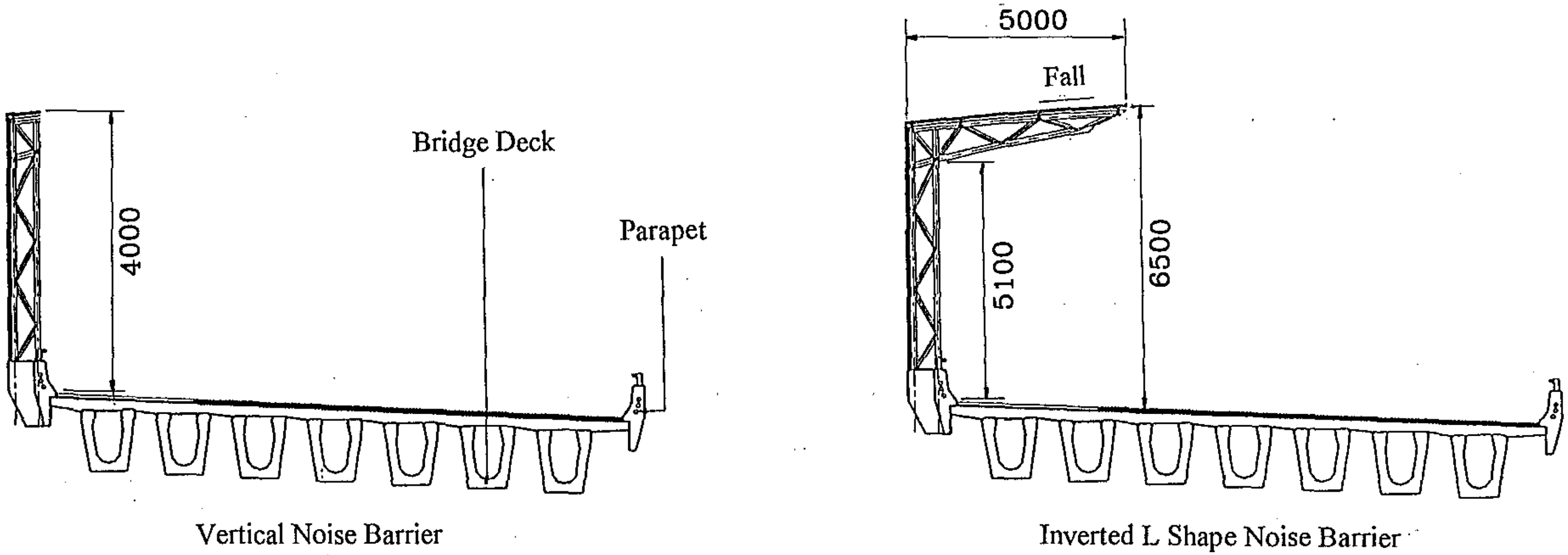
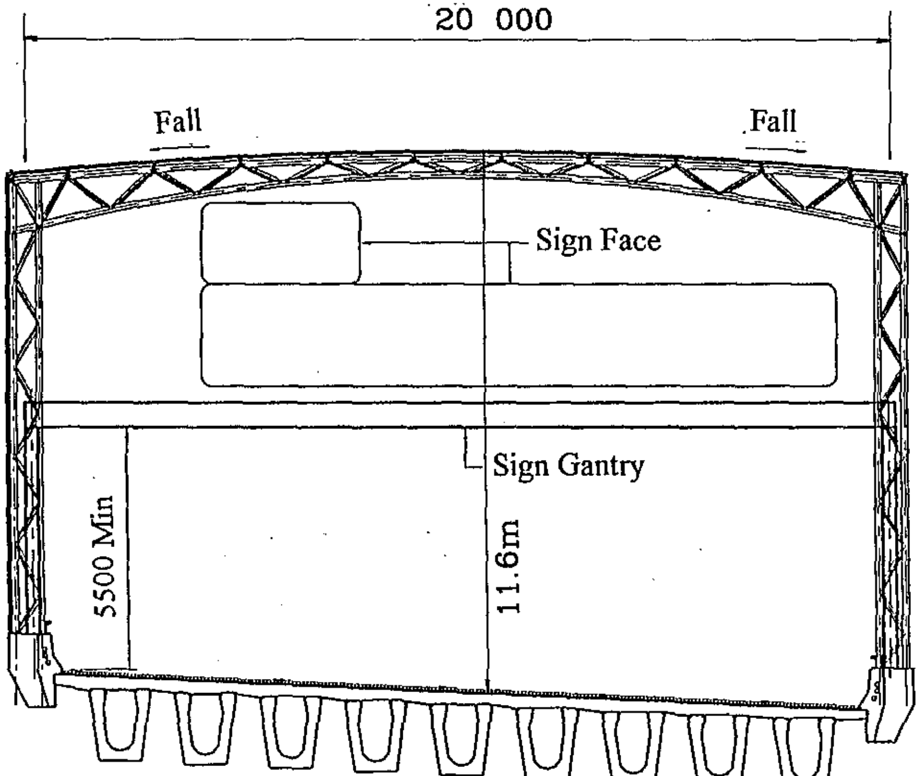
地利環境顧問事務所



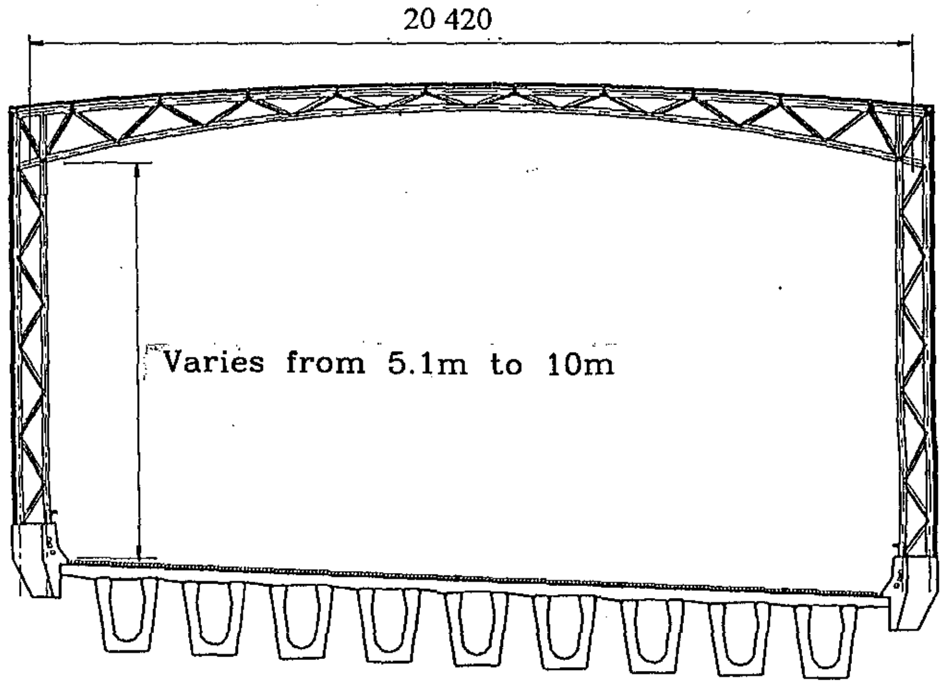
Not To Scale

Figure 6.10b Typical Section of Vertical / Inverted L Shape Noise Barriers

Maunsell
茂盛(亞洲)工程顧問有限公司 in association with
TEAM 73 HK
地利環境顧問事務所



Partial Enclosure Noise Barrier



Full Enclosure Noise Barrier

Not To Scale

Figure 6.10c Typical Section of Partial / Full Enclosure Noise Barriers

Maunsell 茂盛(亞洲)工程顧問有限公司 in association with TEAM 73 HK 地利環境顧問事務所

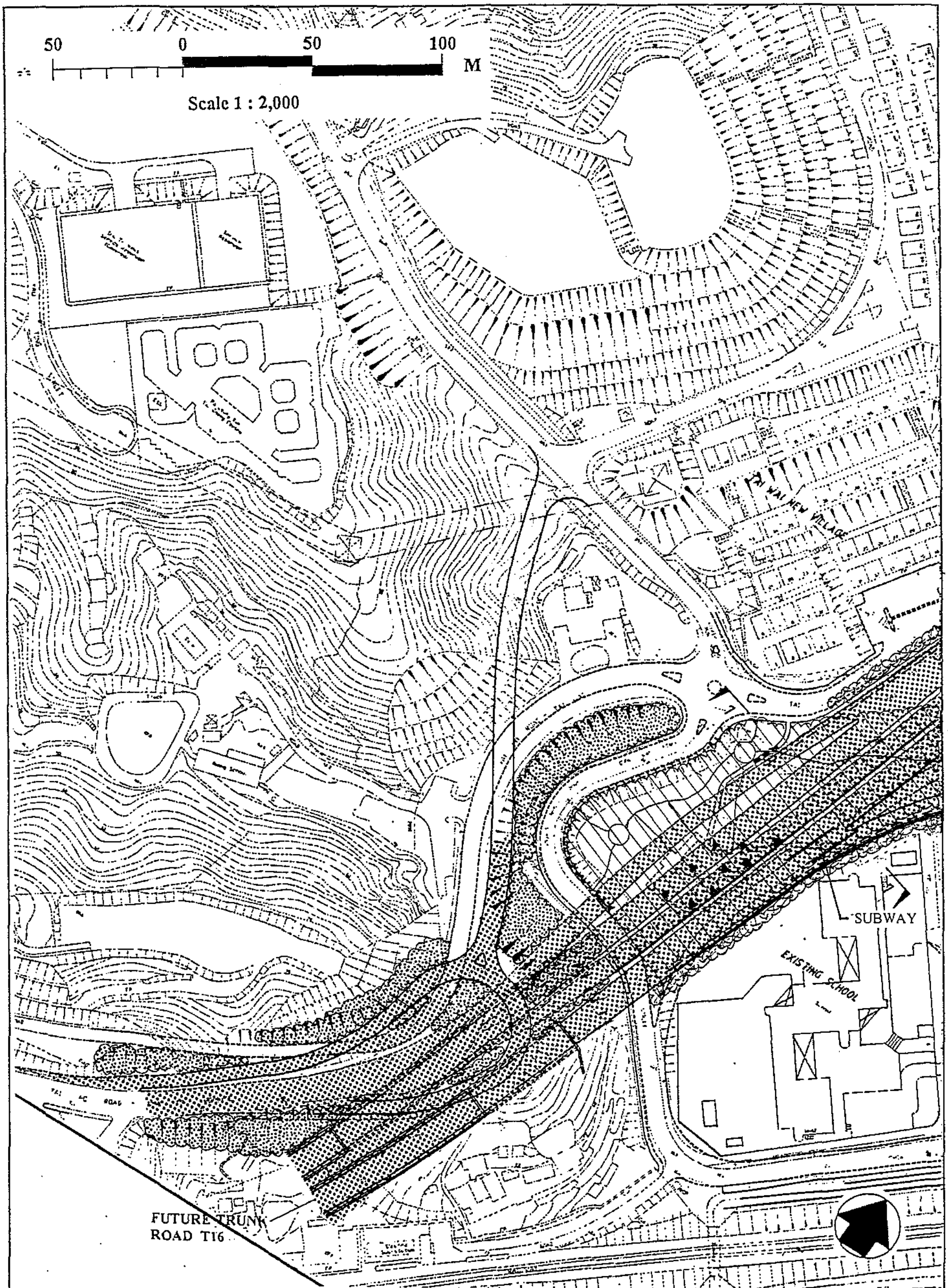


Figure 6.11a Proposed Mitigation for Sensitive Receivers

Maunsell
茂盛(亞洲)工程顧問有限公司 in association with
TEAM 73 HK
地利環境顧問事務所

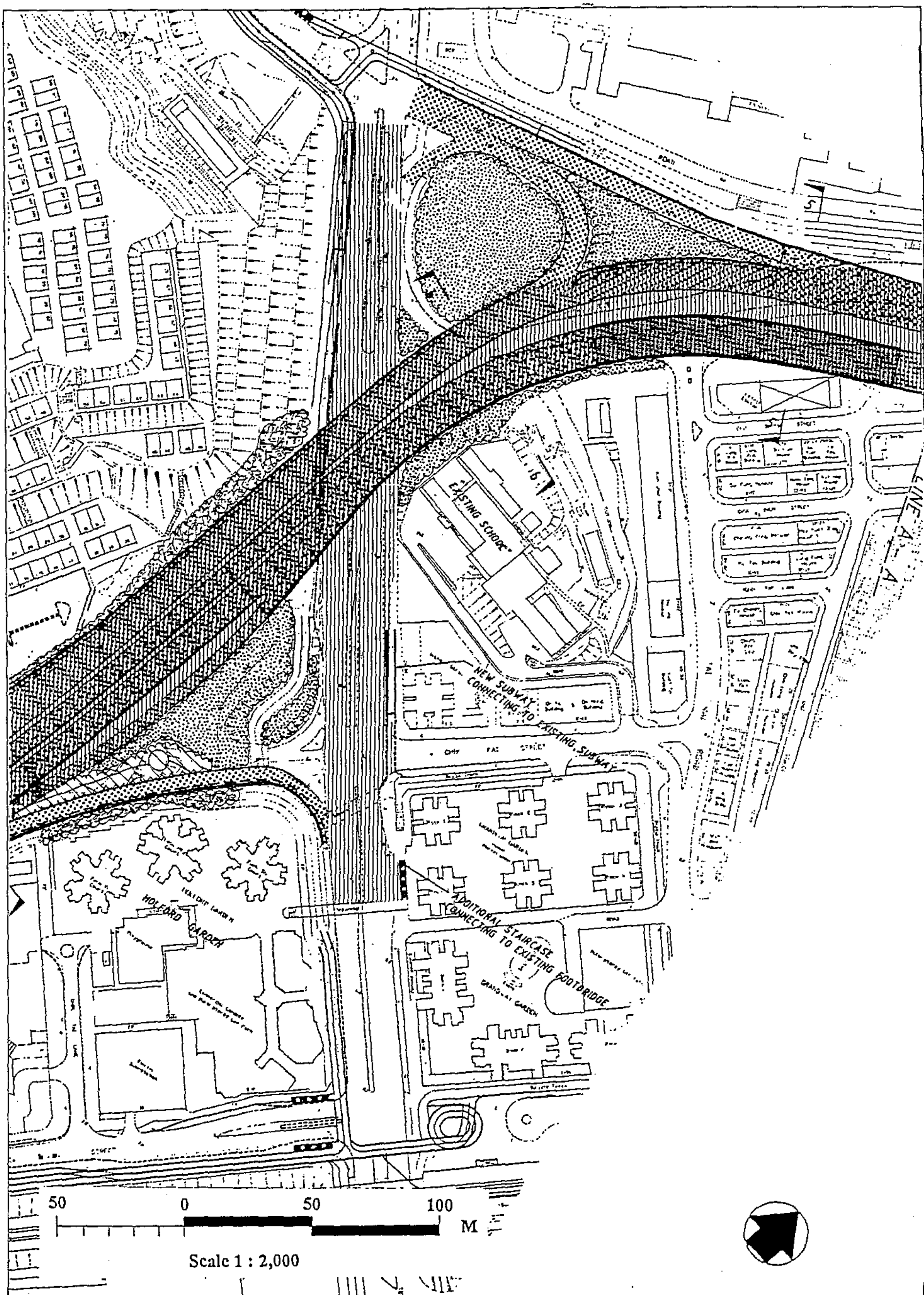


Figure 6.11b Proposed Mitigation for Sensitive Receivers

Maunsell
茂盛(亞洲)工程顧問有限公司 in association with
TEAM 73 HK
地利環境顧問事務所

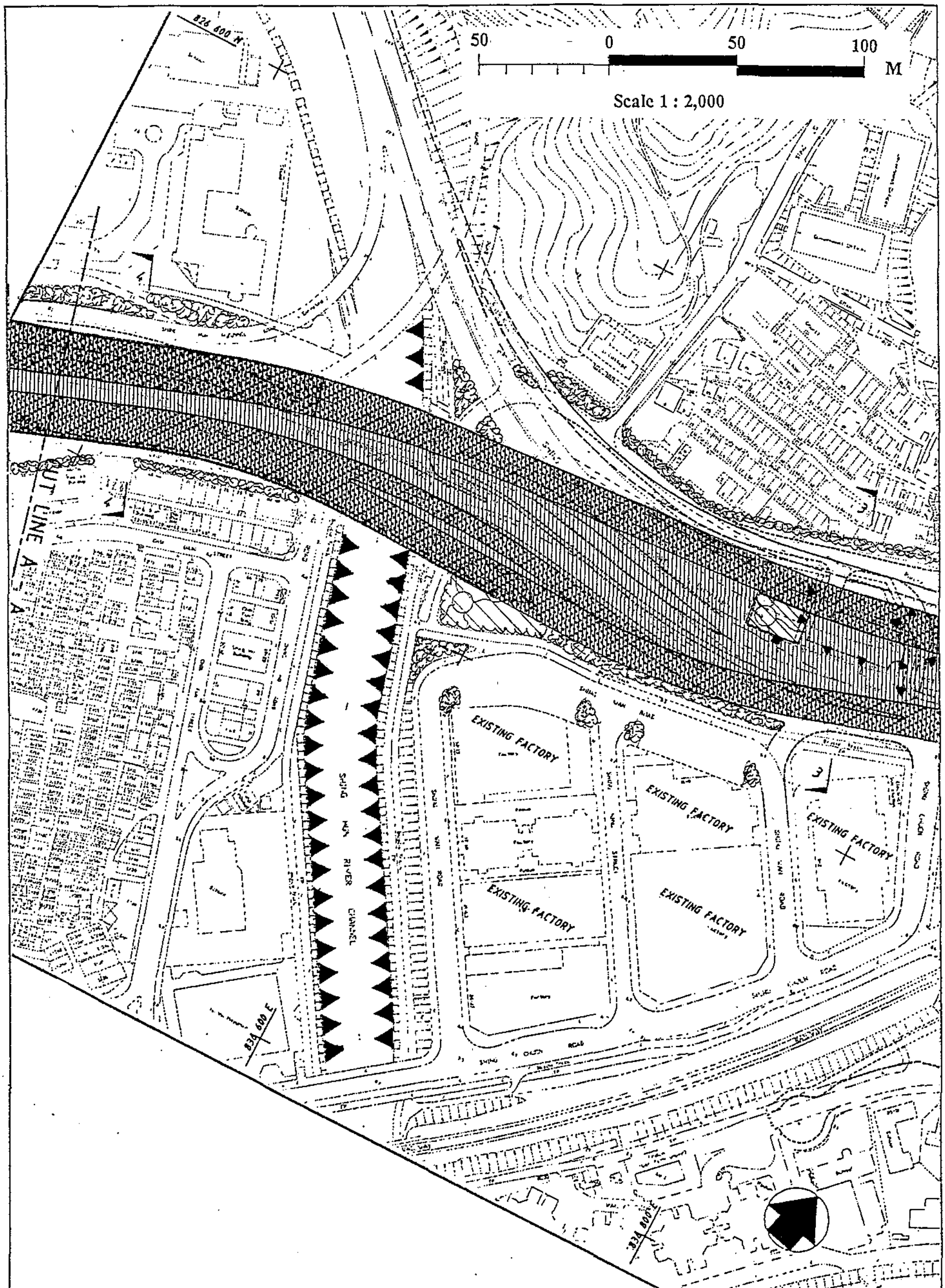


Figure 6.11c Proposed Mitigation for Sensitive Receivers

Maunsell
茂盛(亞洲)工程顧問有限公司 in association with
TEAM 73 HK
地利環境顧問事務所

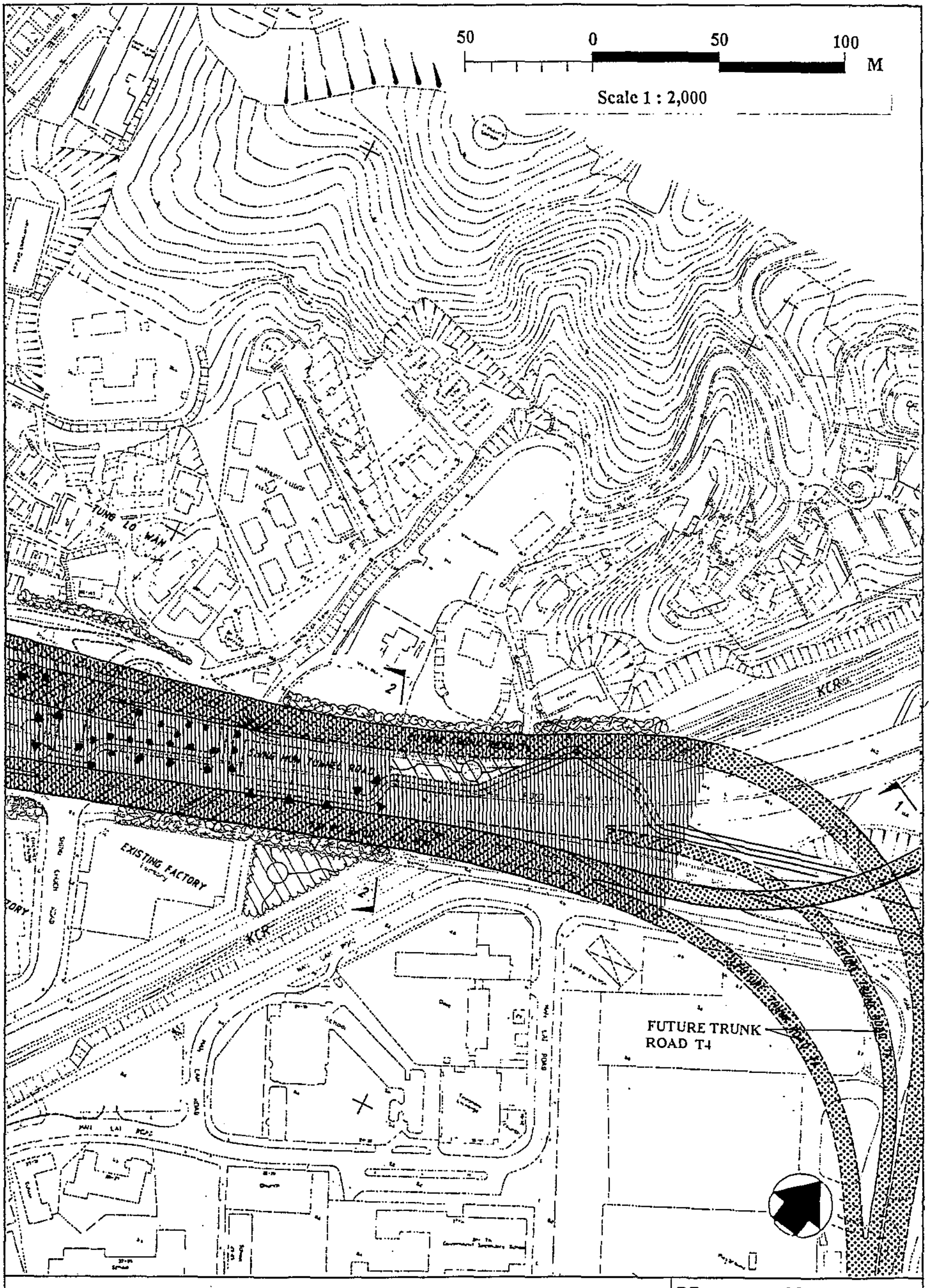


Figure 6.11d Proposed Mitigation for Sensitive Receivers

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地利環境顧問事務所

Legend - Figure 6.11 a-d

Townscape Revitalization

Open Space Revitalization

Open Space Potential

Woodland Planting

Screen Planting

● Existing Amenity Lighting

▲ Proposed Amenity Lighting

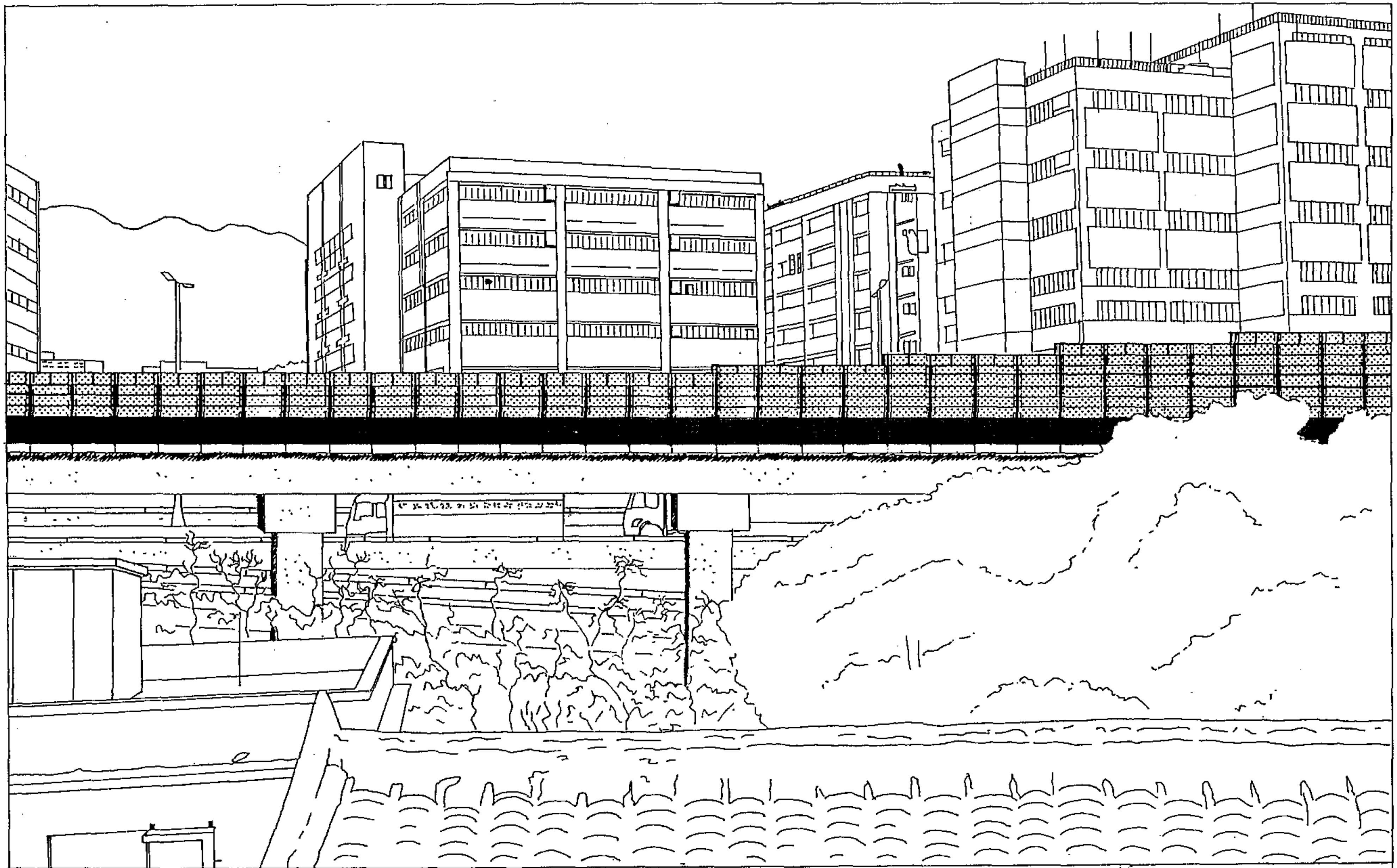

Figure 6.13 Perspective View from Tung Lo Wan Village

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地利環境顧問事務所

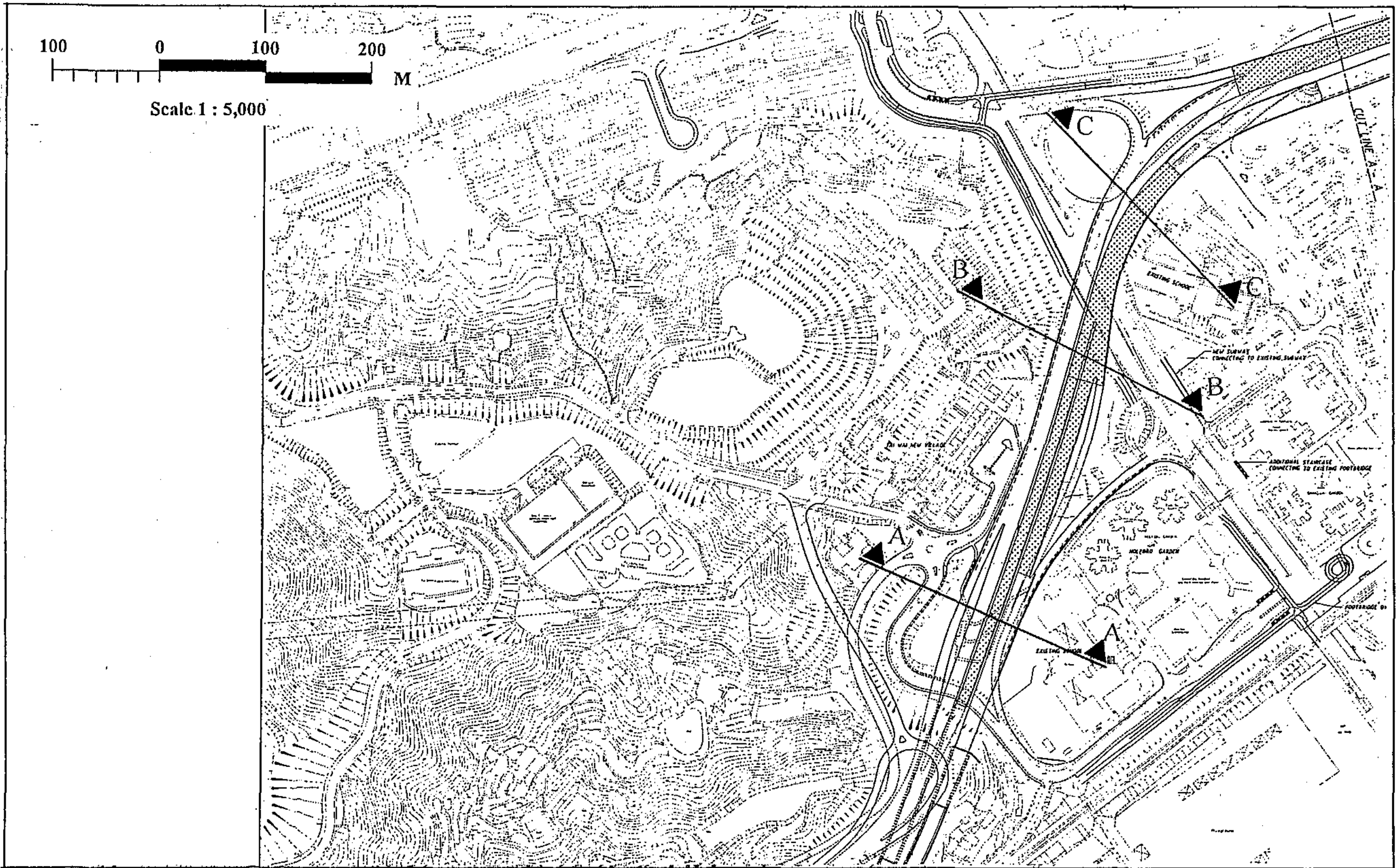


Figure 6.14a Plan - Section Location 1

Maunsell
茂盛亞洲工程顧問有限公司 in association with
TEAM 73 HK
地利環境顧問事務所

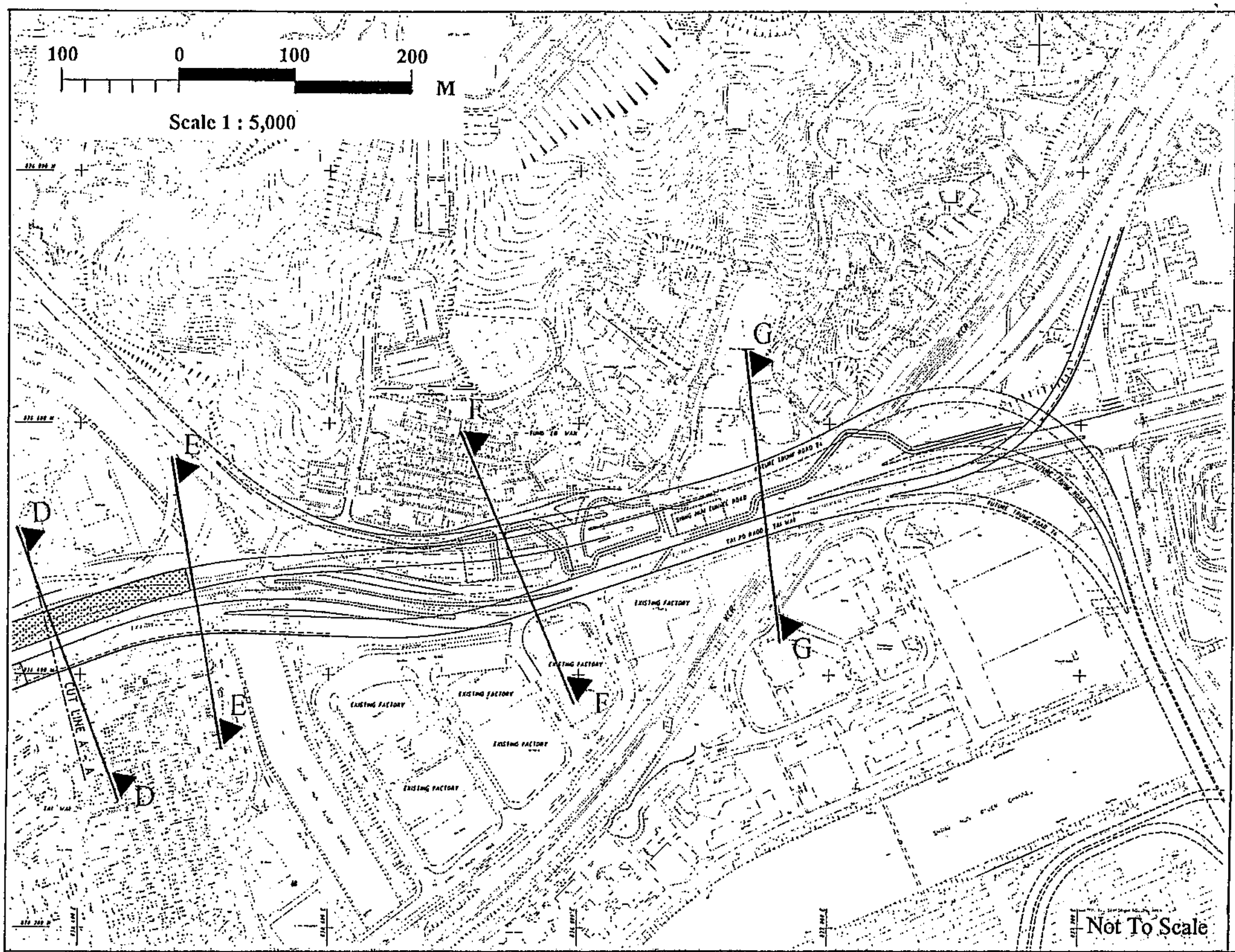
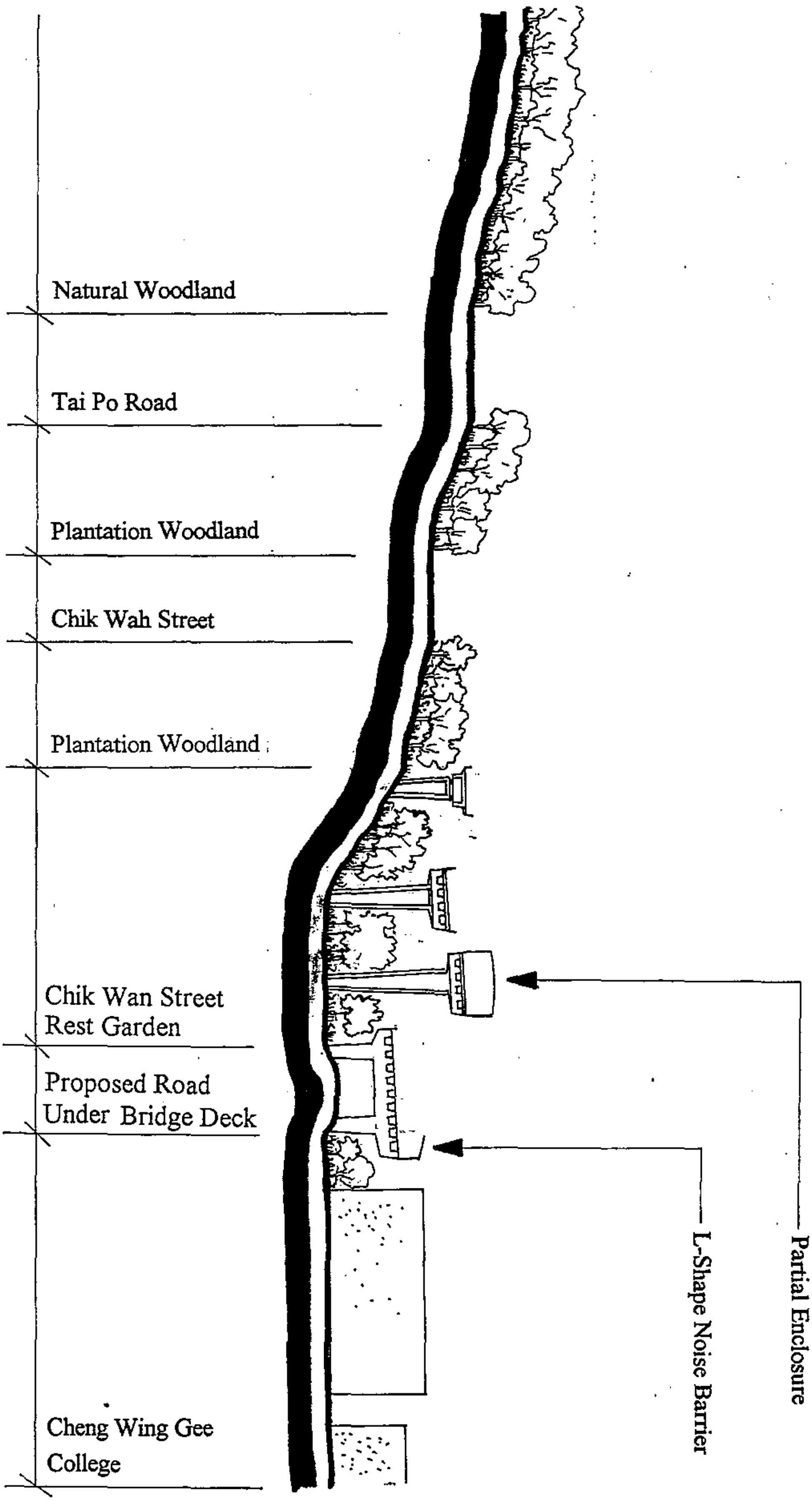


Figure 6.14b Plan - Section Location 2

Maunsell
茂盛(亞洲)工程顧問有限公司 in association with
TEAM 73 HK
地利環境顧問事務所



Scale 1:1000

Figure 6.14c Section A-A'

Maunsell
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TEAM 73 HK
捷利環境顧問事務所

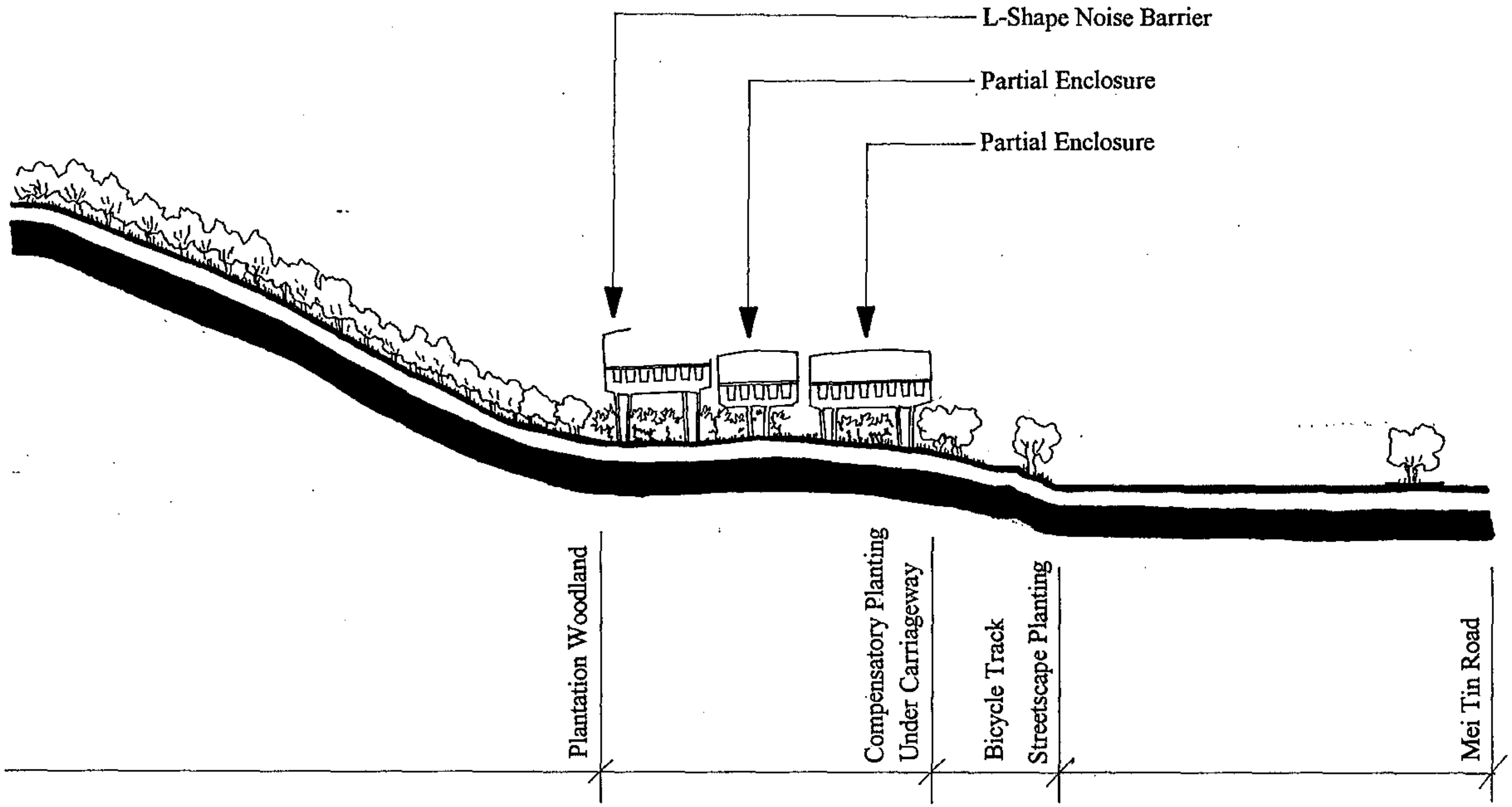

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Figure 6.14d Section B-B'

Maunsell 茂盛(亞洲)工程顧問有限公司 in association with TEAM 73 HK 地利環境顧問事務所

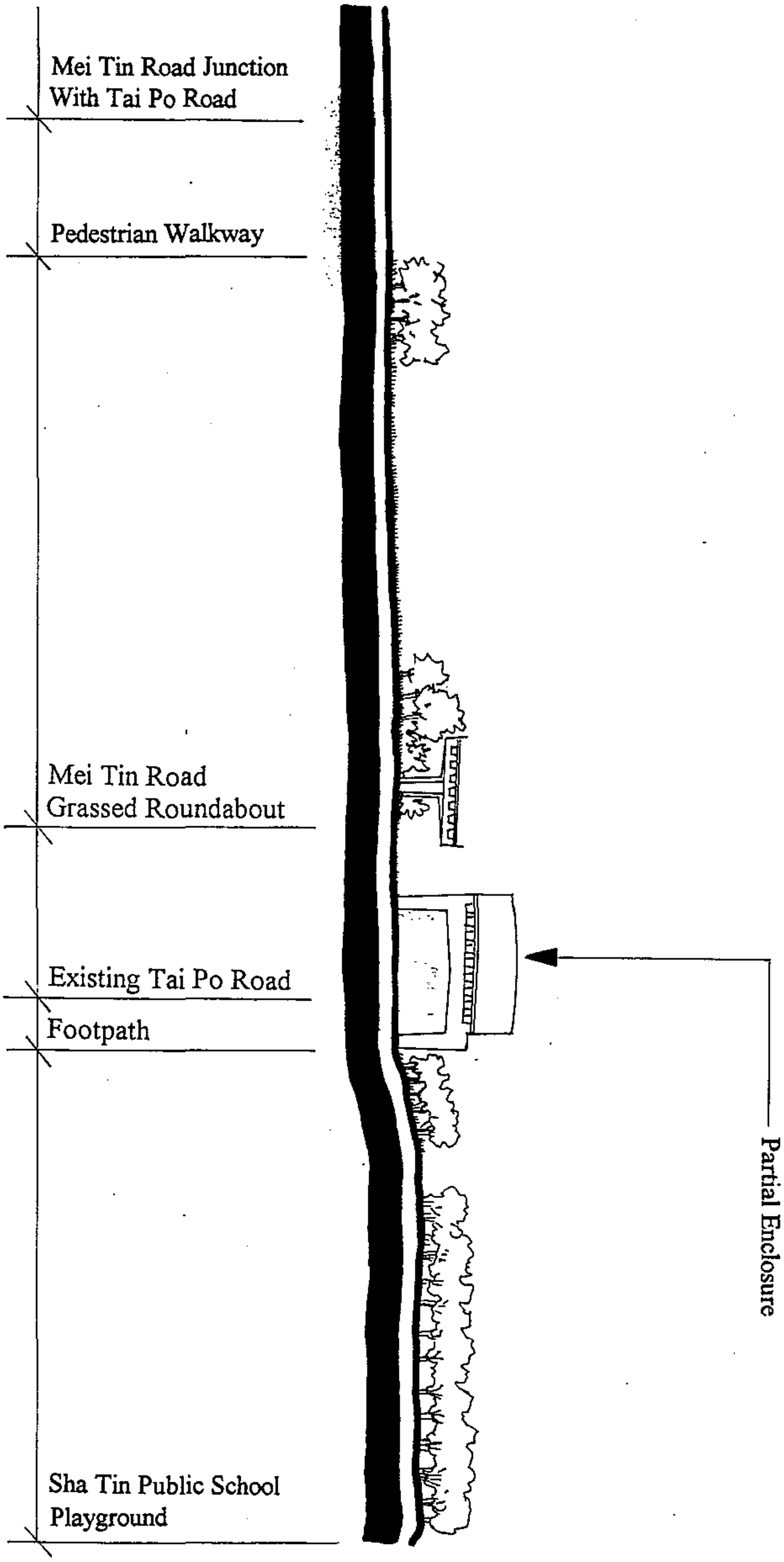

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Figure 6.14e Section C-C'

Maunsell in association with TEAM 73 HK

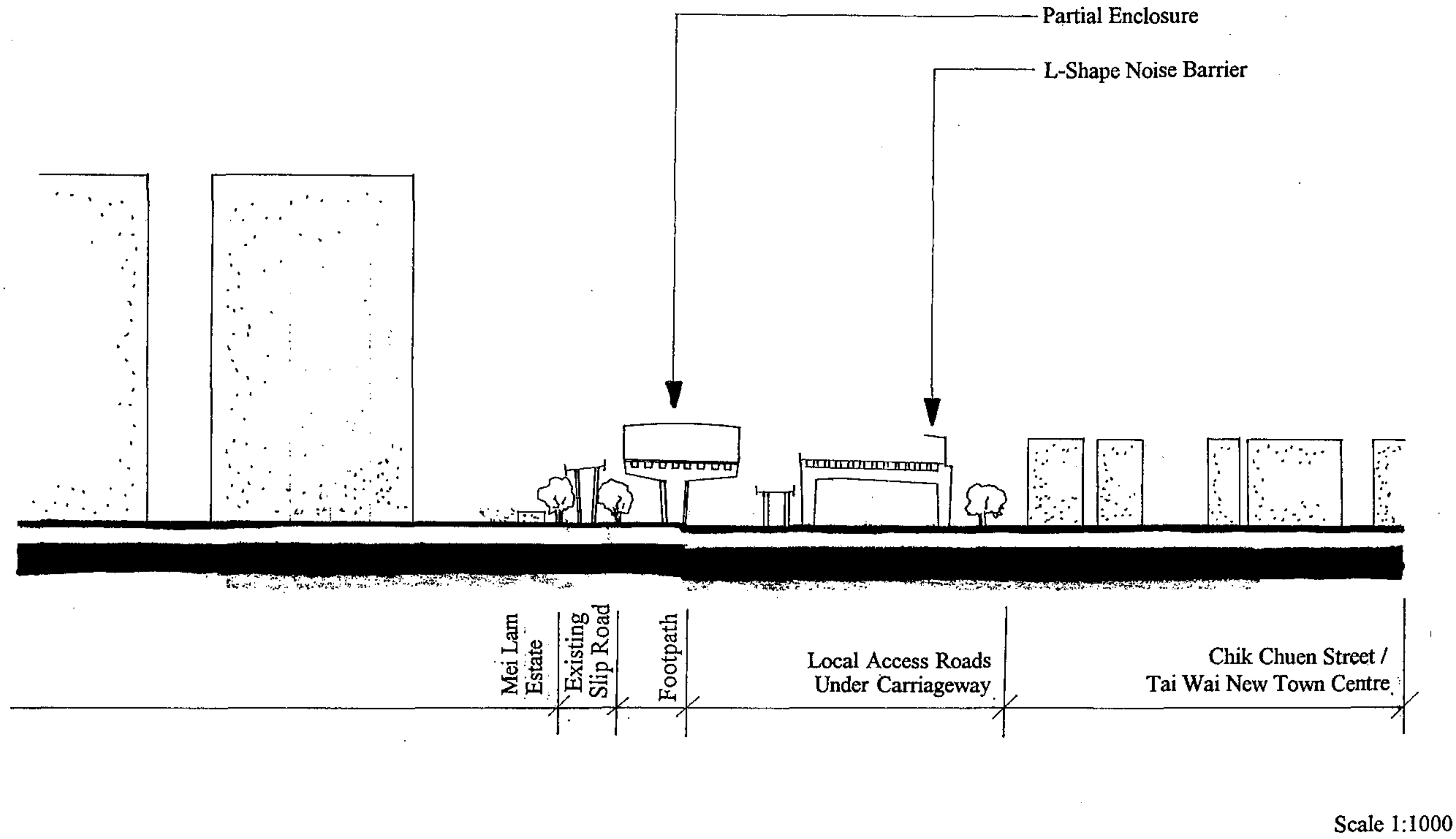
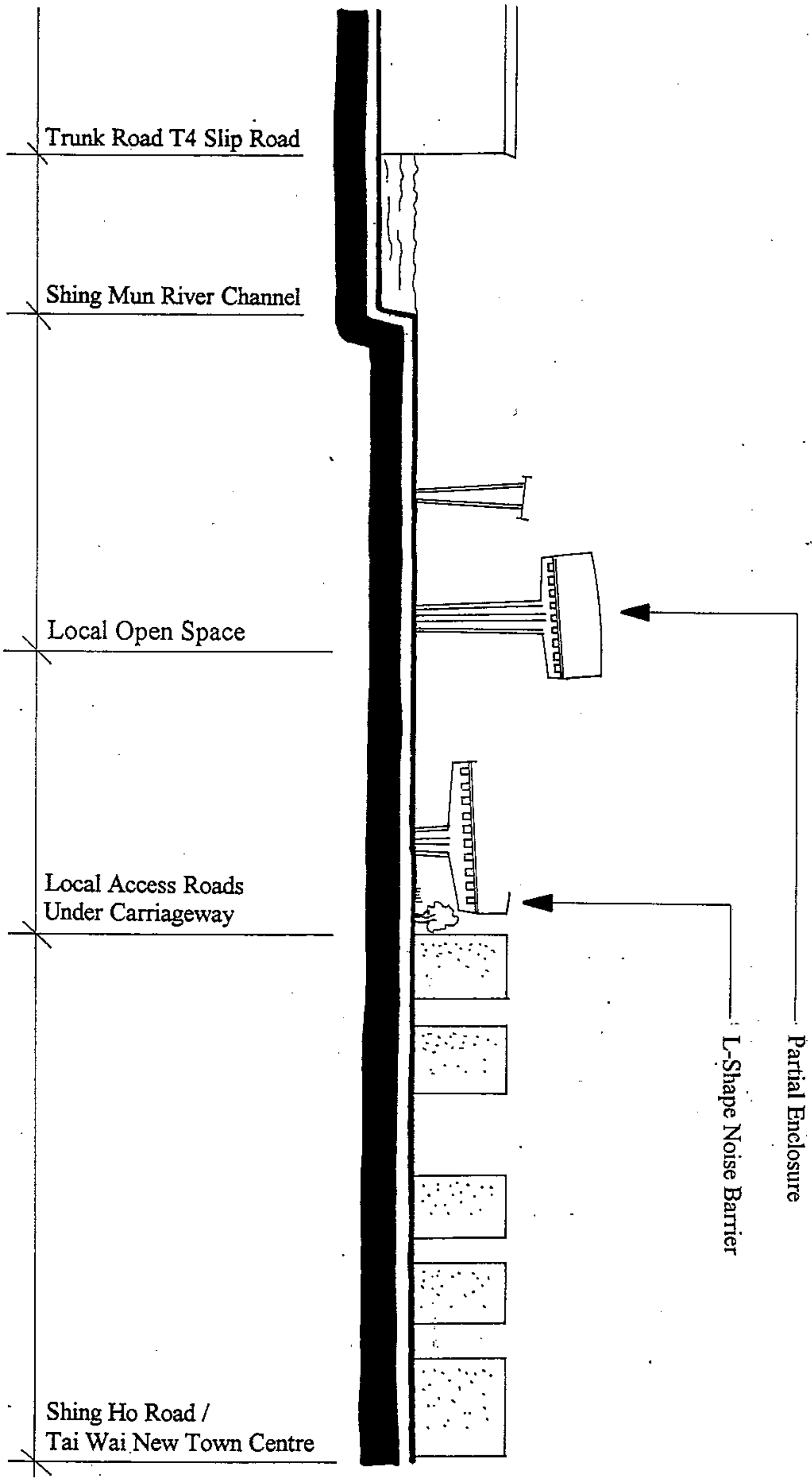


Figure 6.14f Section D-D'

Maunsell 茂盛(亞洲)工程顧問有限公司 in association with TEAM 73 HK 地利環境顧問事務所



Scale 1:1000

Figure 6.14g Section E-E'

Maunsell in association with TEAM 73 HK

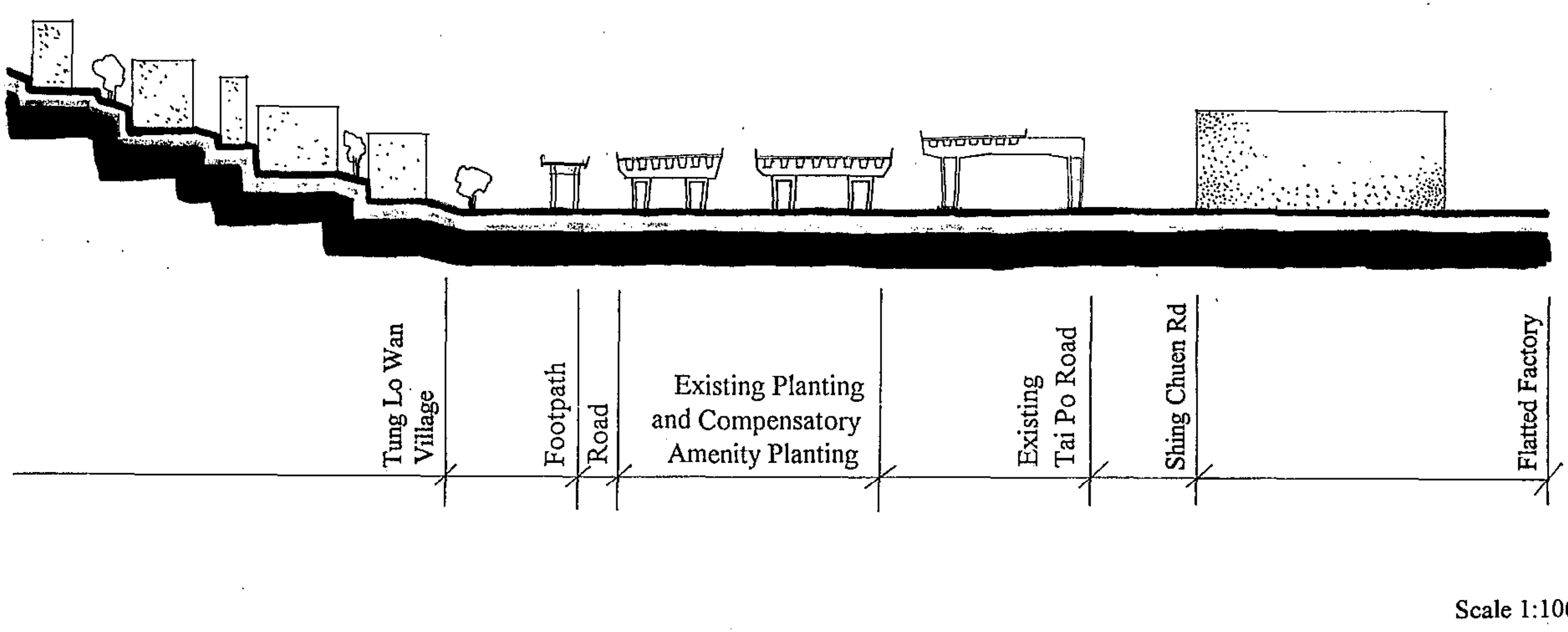


Figure 6.14h Section F-F'

Maunsell 茂盛(亞洲)工程顧問有限公司 in association with TEAM 73 HK 地利環境顧問事務所

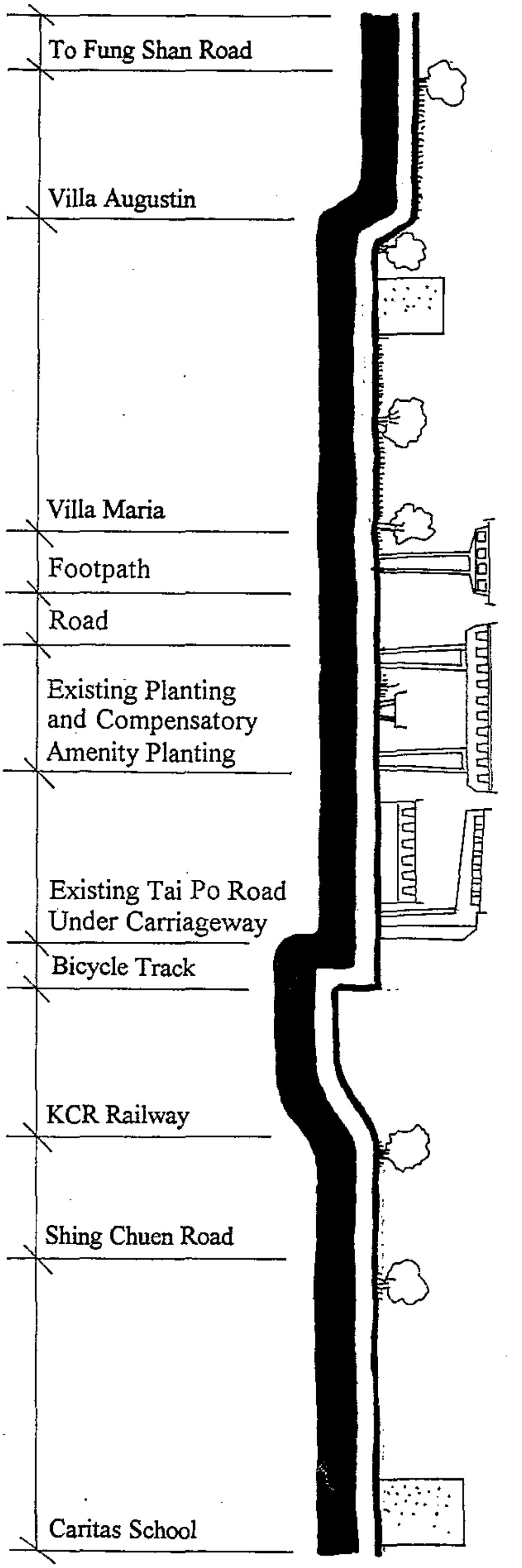


Figure 6.14i Section G-G'

Scale 1:1000

Maunsell 茂盛(亞洲)工程顧問有限公司 in association with TEAM 73 HK 捷利環境顧問事務所

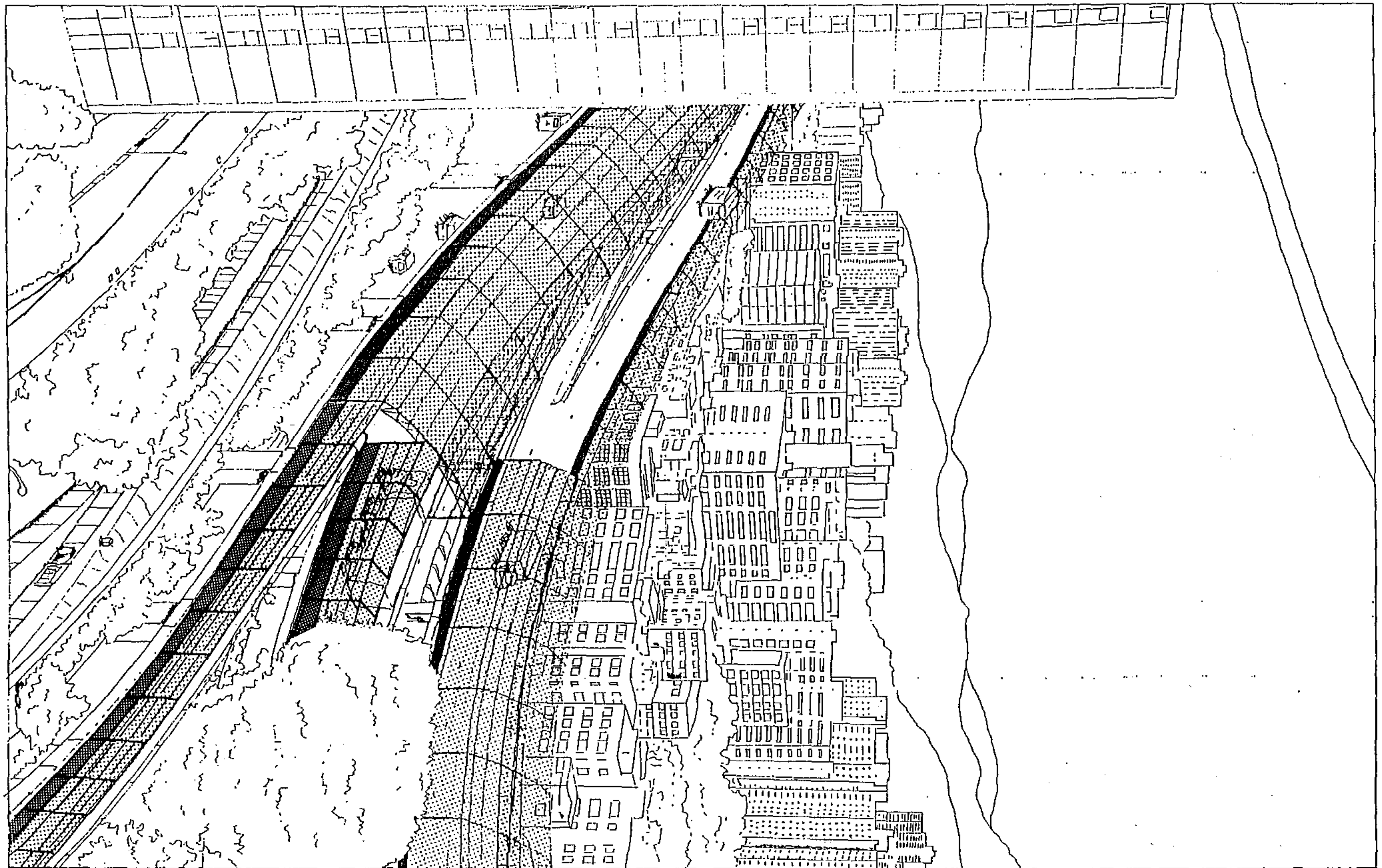


Figure 6.12 Perspective View from Mei Lam Estate

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TEAM 73 HK 地利環境顧問事務所

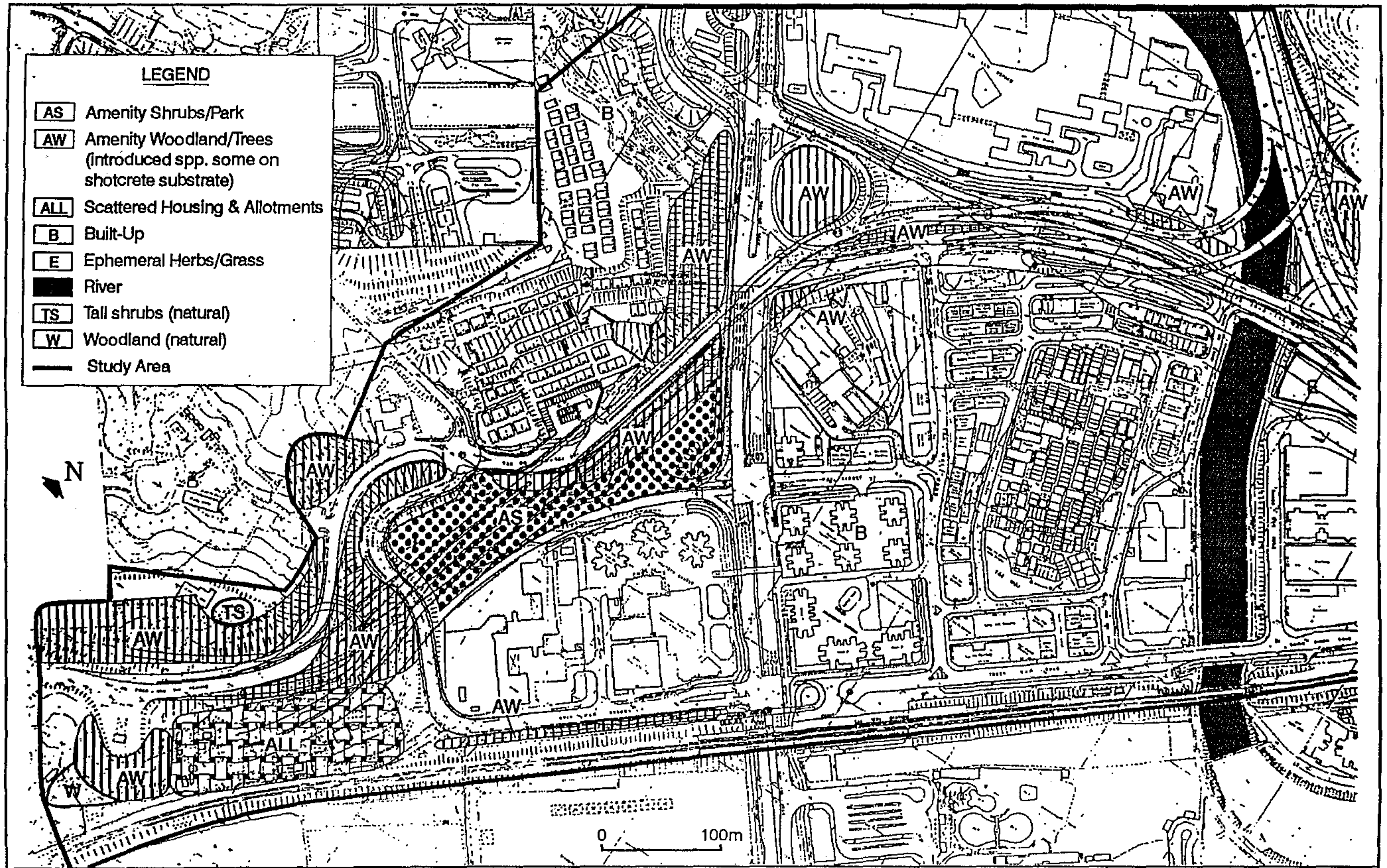

Figure 7.1a Habitat Map

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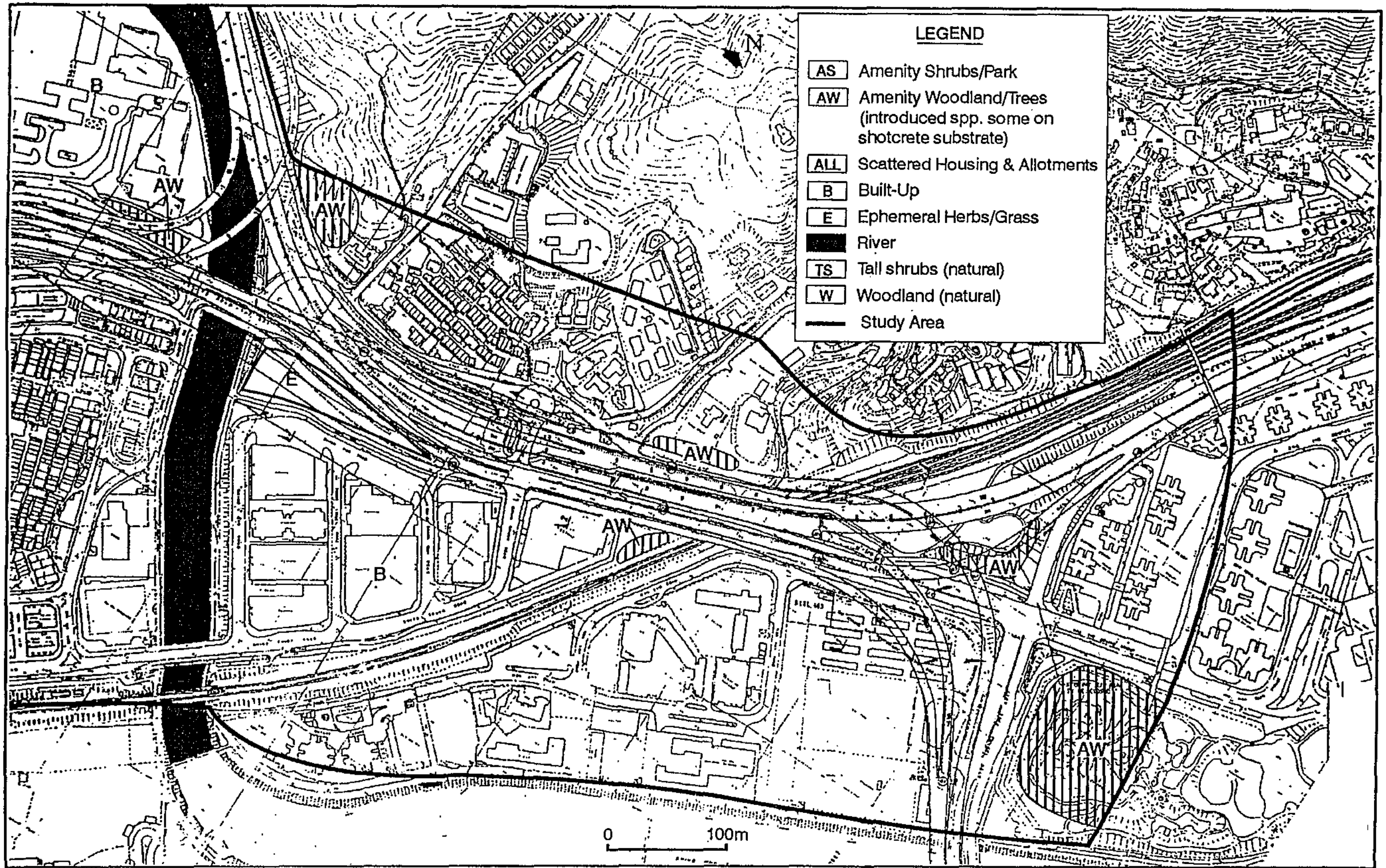

Figure 7.1b Habitat Map

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Appendix 1

Legislation and Guidelines

Contents

A1. LEGISLATION AND GUIDELINES

A1.1 Air

The Air Pollution Control Ordinance (APCO) (Cap. 311, 1983) provides authority for controlling air pollutants from a variety of stationary and mobile sources, including fugitive dust emissions from construction sites. A number of Air Quality Objectives (AQOs) are defined. Currently AQOs stipulate concentrations for sulphur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), and total and respirable suspended particulates (TSP/RSP) in ambient air over the Territory. These are listed in Table A1.1

Table A1.1 Hong Kong Air Quality Objectives (AQOs)

Parameter	Maximum Average Concentration μgm^{-3}			
	1-Hour*	8-Hour	24-Hour**	Annual
SO_2	800	-----	350	80
CO	30000	10000	-----	-----
NO_2	300	-----	150	80
TSP	500***	-----	260	80
RSP	-----	-----	180	55

* Not to be exceeded more than three times per year.

** Not to be exceeded more than once per year.

*** In addition to the above established legislative controls, it is generally accepted that an hourly average TSP concentration of 500 μgm^{-3} should not be exceeded. Such a control limit is particularly relevant to construction work and has been imposed on a number of construction projects in Hong Kong in the form of contract clauses.

The APCO specifies a number of processes which require licensing and are subject to special controls. Amendments to the APCO gave provision to include concrete batching as a Specified Process, hence any batching at this site would require to be licensed. The licensing requirements are for Best Practicable Means (BPM) dust suppression measures to be employed. There are also provisions for on-going monitoring and audit, to be undertaken by the operators, with submission of the results to the Authority (EPD). Compliance with limits imposed under the licence may also be monitored directly by the Authority. Non-compliance with licence conditions may result in fines and denials in licence renewal.

Hong Kong Planning Standards and Guidelines (HKPSG) provide non-statutory guidelines for buffer distances between pollution sources (such as major roads and industrial establishments) and sensitive receivers (in particular residential and active recreational areas) to minimise the potential air quality impacts.

A1.2 Noise

The Noise Control Ordinance (NCO) provides the statutory framework for noise control. This defines statutory limits applicable to fixed noise sources and construction noise. Only the latter is relevant to this study.

Construction Noise

The NCO divides construction noise into activities involving powered mechanical equipment excluding percussive piling, and percussive piling activity. The criteria for the assessment of noise from construction are therefore similarly divided.

Under the Technical Memorandum on 'Noise from Construction Work other than Percussive Piling', noise from activity excluding piling is not restricted during the period 0700-1900 hours (except all day Sunday and Public Holidays). EPD has suggested a daytime general construction noise limit of 75 dB(A) (Table A1.4).

Between 1900 and 0700 hours and all day on Sundays and public holidays, activity is prohibited unless a permit is obtained. A permit will be granted provided that the Acceptable Noise Level (ANL) for the noise sensitive receiver can be complied with. ANLs are assigned depending upon the Area Sensitivity Rating (ASR). For the receivers in the vicinity of T3, NSRs are likely to be assigned an ASR of or B or C. ASR criteria are given in Table A1.2, and the corresponding Basic Noise Levels (BNLs) for evening and night-time periods are given in Table A1.3.

Table A1.2 Area Sensitivity Rating (ASR)

Type of Area		Degree to which NSR is affected by Influencing Factors		
		Not Affected	Indirectly Affected	Directly Affected
1)	Rural area, including country parks or village type developments	A	B	B
2)	Low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
3)	Urban area	B	C	C
4)	Area other than those above	B	B	C

Table A1.3 **Construction Noise Criteria for Activity Other Than Percussive Piling**

Basic Noise Level dB(A)				
$L_{Aeq (30 min)}$ *	$L_{Aeq (5 min)}$			
Daytime (all ASRs)	Evening		Night	
	ASR 'A'	ASR 'B'	ASR 'A'	ASR 'B'
75	60	65	45	50

* Recommended by EPD, but not statutory

Noise from Fixed Sources

Not applicable to this study.

..3 Water

The Water Pollution Control Ordinance (WPCO) Cap. 358 (1980) lays down the framework for designation of Water Control Zones (WCZs) throughout the Territory. Each zone is characterised by specific water quality objectives. Principal features of the WPCO and its subsidiary legislation are as follows:

- o The Ordinance specifies prohibited discharges and deposits.
- o This is reinforced by the Technical Memorandum to the WPCO which further provides standards for effluents discharged into drainage and sewerage systems, inland waters and coastal waters.
- o The Water Pollution Control (Amendment) Ordinance 1990 made various changes to the WPCO including the removal of the `right to discharge' certain pollutants taking place prior to the gazettal of a Water Pollution Control Zone.
- o The Specific legislation pertinent to water quality in the present case includes:

  Water Pollution Control Ordinance : Cap 358 (1980) - Originally 1980 with enactments up to 1994
  Water Pollution Control (General) Regulations : Cap 358 sub leg D - Originally 1986 with enactments up to 1994
  Water Pollution Control (Tolo Harbour and Channel Water Control Zone) Order : Cap 358 sub leg A - Originally 1982 with enactments up to 1993
  Tolo Harbour and Channel Water Control Zone Statement of Water Quality Objectives : Cap 358 sub leg B - Originally 1982 with enactments up to 1991
  Water Pollution Control (Tolo Harbour and Channel Water Control Zone) (Appointed Days) Order : Cap 358 sub leg E - Originally 1987, R.Ed 1988
  Tolo Harbour and Channel WCZ Statement of Water Quality Objectives for Water Courses : Cap 358 sub leg F - Originally 1988, R. Ed 1988
  Technical Memorandum Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters : Caps sub leg AK - Originally Special Gazette Supplement No. 5 1990

APP III Dumping at Sea Act 1974 (Overseas Territory Order (1975))
Marine Fish Culture Ordinance : Cap 353 (1983)
Marine Fish Culture Regulations (1983)
Fish Culture Zone (Designation) Order (1986) and Amendments (1988)

Activities at T3 any discharges, run off, or flows discharging to the marine environr are regulated under the Water Pollution Control (Tolo Harbour and Channel W Control Zone) and the Technical Memorandum on Standards for Effluents Discha: into Drains and Sewerage Systems, Inland and Coastal Waters.

In the case of the former the water quality objectives specified under the legislatior presented in Table A1.4.

Table A1.4 **Selection of Water Quality Objectives for Marine Waters of Tolo Harbour & Channel WCZ**

Water Quality Parameters	Harbour Subzone	Buffer Subzone	Channel Subzone
E. coli (no./100 mL) (annual geometric mean)	not to exceed 610	not to exceed 610	not to exceed 610
Chlorophyll-a (µg/L) (5 days running mean)	not to exceed 20	not exceed 10	not to exceed 6
D.O. within 2 m of bottom (mg/L)	not less than 2	not less than 3	not less than 4
D.O. in rest of water column (mg/L)	not less than 4	not less than 4	not less than 4
Light penetration reduction (%)	not to exceed 20% of normal level	not to exceed 15% of normal level	not to exceed 10% of normal level
pH value	not to exceed 0.5	not to exceed 0.3	not to exceed 0.1
Salinity change (ppt)	not to exceed 3	not to exceed 3	not to exceed 3
Temperature change (°C)	not to exceed 1	not to exceed 1	not to exceed 1
Settleable material adversely influencing bottom living communities or basic Harbour geometry	not to be present	not to be present	not to be present
Toxicants	not to be present at level producing significant toxic effects	not to be present at levels producing significant toxic effects	not to be present at levels producing significant toxic effects

The mechanism that will regulate discharges from the site including run off from storm drains and any liquid effluents is the Technical Memorandum (TM), `Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters'. The Memorandum establishes effluent standards that apply to different receiving water bodies. All such effluents covered by this TM are required to be licensed. Table A1.5 illustrates the standards required for discharge into the coastal waters of Tolo and Port Shelter Water Control Zones. For the purposes of this legislation, inshore waters refer to all waters of less than 6m depth at MLW or within 200 metres of the low water mark.Source : EPD Technical Memorandum on Effluent Standard, Table 10b.

Table A1.5 Standards for effluents discharged into the coastal waters of Tolo and Port Shelter Water Control Zones (All units in mg/l unless otherwise stated; all figures are upper limits unless otherwise indicated)

Determinand / Flow rate (m^3/day)	≤10	>10 and ≤200	>200 and ≤400	>400 and ≤600	>600 and ≤800	>800 and ≤1000	>1000 and ≤1500	>1500 and ≤2000	>2000 and ≤3000	>3000 and ≤4000	>4000 and ≤5000	>5000 and ≤6000
pH (pH units)	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9
Temperature (°C)	45	45	45	45	45	45	45	45	45	45	45	45
Colour (lovibond units) (25 mm cell length)	1	1	1	1	1	1	1	1	1	1	1	1
Suspended solids	30	30	30	30	30	30	15	15	15	15	15	15
BOD	20	20	20	20	20	20	10	10	10	10	10	10
COD	80	80	80	80	80	80	50	50	50	50	50	50
Oil & Grease	20	20	20	20	20	20	10	10	10	10	10	10
Iron	10	10	10	7	5	4	2.7	2	1.3	1	0.8	0.6
Boron	5	4	3	2.5	2	1.6	1.1	0.8	0.5	0.4	0.3	0.2
Barium	5	4	3	2.5	2	1.6	1.1	0.8	0.5	0.4	0.3	0.2
Mercury	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Other toxic metals individually	1	1	0.8	0.5	0.5	0.4	0.1	0.1	0.1	0.1	0.1	0.1
Total toxic metals	2	2	1.6	1	1	0.8	0.2	0.2	0.2	0.2	0.14	0.1
Cyanide	0.1	0.1	0.1	0.1	0.1	0.1	0.05	0.05	0.03	0.02	0.02	0.01
Phenols	0.5	0.5	0.5	0.25	0.25	0.25	0.1	0.1	0.1	0.1	0.1	0.1
Sulphide	5	5	5	5	5	5	2.5	2.5	1.5	1	1	0.5
Total residual chlorine	1	1	1	1	1	1	1	1	1	1	1	1
Total nitrogen	20	20	20	15	15	15	15	15	10	10	10	10
Total phosphorus	8	8	5	5	5	5	5	5	5	5	5	5
Surfactants (total)	15	15	15	15	15	15	10	10	10	10	10	10
E. coli (count/100 ml)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Source : EPD Technical Memorandum on Effluent Standards, Table 7.

A1.4 Ecology

Protection of animals and plants is provided by:

- Forests and Countryside Ordinance,
- Wild Animals Protection Ordinance
- Animals and Plants (Protection of Endangered Species) Ordinance.

protection for habitats is provided by:

- Country Parks Ordinance (covering Country Parks and Special Areas)
- Wild Animals Protection Ordinance (covering Restricted Areas)
- Waterworks Ordinance (covering Water Gathering Grounds)
- Town Planning Ordinance which provides for the designation and protection through the planning process of coastal protection areas, Sites of Special Scientific Interest, green belts and other specified uses which promote conservation or the protection of the environment.

Protection of Animals and Plants

Wild Animals Protection Ordinance (Cap 170) of the Revised Edition 1980

Under the Wild Animals Protection, designated wild animals are protected from hunting, whilst their nests and eggs are protected from injury, destruction and removal. All birds and mammals, except some domestic pests are protected under this Ordinance. Prior approval from the Director of Agriculture and Fisheries is required for permission to destroy any of the protected wild animals listed in the Ordinance.

The Second Schedule of the Ordinance which lists all the animals protected was last revised in June 1992.

The Wild Animals Protection Ordinance restricts access to designation areas of wildlife habitat. The Sixth Schedule lists areas in which entry or presence is restricted. Currently two areas are listed, part of the Deep Bay Marshes at Mai Po, which is restricted at all times of the year and the fung shui wood (an egretry) behind the village of Yim Tso Ha, Starling Inlet, which is restricted by Ist April to 30 September every year.

Forests and Countryside Ordinance (Cap. 96) of the Revised Edition 1984

The Forests and Countryside Ordinance (Cap 96) prohibits felling,m cutting, burning or destroying of trees and growing plants in forests and plantations, 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).

Animals and Plants (Protection of Endangered Species) Ordinance (Cap. 187) of the Revised Edition 1989.

The Animals and Plants (Protection of Endangered Species) Ordinance 1988 is 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.

Tree Felling

The regulations and guidelines concerning Tree Felling in Hong Kong are outlined in Tree Planting and Maintenance in Hong Kong edited by Richard Webb and published by the Hong Kong Government in 1991.

Protection of Habitats

Country Parks Ordinance (Cap 208) of the Revised Edition 1986 (covering Country Parks and Special Areas)

Country Parks and Special Areas are designated under the Country Parks Ordinance and managed by the Agriculture and Fisheries Department on the advice of the Country Parks Board. At present there are 21 Country Parks and 14 Special Areas, 11 of which are in the Country Parks. Country Parks are designation for the purposed of nature conservation, countryside recreation and education; Special Areas are areas of government lands with special interest and importance by reason of their flora, fauna, geological, cultural or archaeological features.

Special Areas within Country Parks receive no additional legal protection but the extra status does serve to highlight areas of particular conservation significance.

Waterworks Ordinance Cap 102

Water Gathering Grounds comprise areas which are conserved for use as water catchment. There are four broad categories which may warrant different controls on use and development:

- Direct Gathering Grounds
- Indirect Gathering Grounds
- Minor Supply Gathering Grounds
- Flood Pumping Gathering Grounds.

The Water Supplies Department (WSD) has specific requirements to control or restrict development and land use in water gathering grounds.

Town Planning Ordinance (Cap 131)

The recently amended Town Planning Ordinance provide for the designation of " ..... coastal protection areas, Sites of Special Scientific Interest (SSSIs), green belts or other specified uses that promote conservation or protection of the environment e.g.Conservation Areas.

Where SSSIs are covered by statutory town plans, the land uses therein are controlled by the provision of the Town Planning Ordinance.

The authority responsible for administering the Town Planning Ordinance is the Town Planning Board (Planning Department).

Hong Kong Planning Standards and Guidelines

The new revised Chapter 10 of the Hong Kong Planning Standards and Guidelines (HKPSG) covers "Landscape and Conservation". This section 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.

Sites of Special Scientific Interest

Sites of Special Scientific Interest are identified by the Agriculture and Fisheries Department as a planning measure to ensure that government departments are aware of the scientific importance of such sites so that consideration are given to conservation when developments in or near such sites are proposed.

SSSIs may be land based or marine sites which are of special interest because of their flora, fauna, geographical, geological or physiographic features. The Planning Department maintains a register of the SSSIs. Once identified, SSSIs are shown on statutory and departmental plans prepared by the Planning Department.

Some 58 SSSIs have been identified and listed in the Register kept by the Planning Department. Approximately half of the SSSIs which fall inside the Country Parks and Special areas, are maintained by AFD.

A1.5 Waste Disposal

The relevant legislation and regulations pertaining to waste management with which the Contractor must comply are as follows:

- Waste Disposal Ordinance (Cap. 354)
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354)

Under the Waste Disposal Ordinance (Cap. 354), construction waste is classified ; waste and contractors are responsible for its disposal. As a result of the large i in the volume of construction waste in recent years, the government is review controls governing its disposal at conventional landfill facilities.

Other 'guideline' documents which detail how the contractor should comply w regulations are as follows:

- Waste Disposal Plan for Hong Kong (December 1989), Planning, Enviro and Lands Branch Government Secretariat.
- Environmental Guidelines for Planning in Hong Kong (1990), Hong Planning and Standards Guidelines, Hong Kong Government.

For the handling and disposal of bentonite slurries, the requirements set out i "Practice Note for Professional Persons ProPECC PN 1/94 - Construction Site Drai: should be followed.

Appendix 2

Pollution Control Clauses

Contents

1. AVOIDANCE OF NUISANCE

(a) All works are to be carried out in such a manner as to cause as little inconvenience as possible to nearby residents, property and to the public in general, and the Contractor shall be held responsible for any claims which may arise from such inconvenience.

(b) The Contractor shall be responsible for the adequate maintenance and clearance of channels, gullies, etc., and shall also provide and maintain such pedestrian and vehicular access as shall be directed within the works site.

(c) Water shall be used to prevent dust rising and the Contractor shall take every precaution to prevent the excavated materials from entering into the public drainage system.

(d) The Contractor shall carry out the Works in such a manner as to minimize adverse impacts on the environment during execution of the Works.

2. NOISE POLLUTION CONTROL

(a) The Contractor shall comply with and observe the Noise Control Ordinance and its subsidiary regulations in force in Hong Kong.

(b) The Contractor shall provide an approved integrating sound level meter to IEC 651:1979 (Type 1) and 804:1985 (Type 1) and THE manufacturer's recommended sound level calibrator for the exclusive use of the Engineer at all times. The Contractor shall maintain the equipment in proper working order and provide a substitute when the equipment are out of order or otherwise not available.

The sound level meter including the sound level calibrator shall be verified by the manufactures every two years to ensure they perform the same levels of accuracy as stated in the manufacturer's specifications. That is to say at the times of measurements, the equipment shall have been verified within the last two years.

(c) In addition to the requirements imposed by the Noise Control Ordinance, to control noise generated from equipment and activities for the purpose of carrying out any construction work other than percussive piling during the time period from 07:00 to 19:00 hours on any day not being a general holiday (including Sundays), the following requirements shall also be complied with:

(i) The noise level measured at 1 m from the most affected external facade of the nearby noise sensitive receivers from the construction work alone during any 30 minute period shall not exceed an equivalent sound level (L_{eq}) of 75 dB(A).

(ii) The noise level measured at 1 m from the most affected external facade of the nearby schools from the construction work alone during any 30 minute period shall not exceed an equivalent sound level (L_{eq}) of 70 dB(A) [65 dB(A) during school examination periods].

The Contractor shall liaise with the schools and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract.

(iii) Should the limits stated in the above sub-clauses (i) and (ii) be exceeded, the construction shall stop and shall not recommence until appropriate measures acceptable to the Engineer that are necessary for compliance have been implemented.

Any stoppage or reduction in output resulting from compliance with this clause shall not entitle the Contractor to any extension of time for completion or to any additional costs whatsoever.

(d) Before the commencement of any work, the Engineer may require the methods of working, equipment and sound-reducing intended to be used on the Site to be made available for inspection and approval to ensure that they are suitable for the project.

(e) The Contractor shall devise, arrange methods of working and carry out the Works in such a manner so as to minimize noise impacts on the surrounding environment, and shall provide experienced personnel with suitable training to ensure that these methods are implemented.

The noise reduction methods shall include, but not be limited to, scheduling of works; siting of facilities; selection of quiet equipment; and use of purpose-built acoustic panels and enclosures.

(f) The Contractor shall ensure that all plant and equipment to be used on site are properly maintained in good operating condition and noisy construction activities shall be effectively sound-reduced by means of silencers, mufflers, acoustic linings or shields, acoustic sheds or screens or other means to avoid disturbance to any nearby noise sensitive receivers.

(g) Notwithstanding the requirements and limitations set out in clause (c) above and subject to compliance with clauses (e) and (f) above, the Engineer may, upon application in writing by the Contractor, allow the use of any equipment and the carrying out of any construction activities for any duration provided that he is satisfied with the application which, in his opinion, to be of absolute necessity and adequate noise insulation has been provided to the educational institutions to be affected, or of emergency nature, and not in contravention with the Noise Control Ordinance in any respect.

(h) No excavator mounted breaker shall be used within 125 m from any nearby noise sensitive receivers. The Contractor shall use hydraulic concrete crusher wherever applicable.

(i) The only equipment that shall be allowed on the Site for rock drilling works will be quiet drilling rigs with a sound power level not exceeding 110 dB(A). Conventional pneumatically driven drilling rigs are specifically prohibited.

(j) Do not operate the percussive piling equipment during the period as prohibited by the Noise Control Ordinance at the elevated structures.

(k) For the purposes of the above clauses, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, or performing arts centre or office building shall be considered a noise sensitive receiver.

(l) The Contractor shall, when necessary, apply as soon as possible for a construction noise permit in accordance with the Noise Control (General) Regulations, display the permit as required and copy to the Engineer.

(m) The Contractor shall, when necessary, apply as soon as possible for a construction noise permit in accordance with the Noise Control (General) Regulations, display the permit as required and copy to the Engineer.

3. DUST SUPPRESSION MEASURES

(a) The Contractor shall undertake at all times to prevent dust nuisance as a result of his activities. The air pollution control system installed shall be operated whenever the plant is in operation.

(b) The Contractor shall at his own cost, and to the satisfaction of the Engineer, install effective dust suppression equipment and take such other measures as may be necessary to ensure that at the Site boundary and any nearby sensitive receiver the concentration of air-borne dust shall not exceed 0.5 milligrams per cubic meter, at standard temperature (25?) and pressure (1.0 bar) averaged over one hour, and 0.26 milligrams per cubic metre, at standard temperature (25?) and pressure (1.0 bar) averaged over 24 hours.

(c) In the process of material handling other than cement and the like, any material which has the potential to create dust shall be treated with water or spraying with wetting agent.

(d) Where dusty materials are being discharged to a vehicle from a conveying system at a fixed transfer point, a three-sided roofed enclosure with a flexible curtain across the entry shall be provided. Exhaust should be provided for this enclosure and vented to a fabric filter system.

(e) Any vehicle with an open load carrying area used for moving materials which have the potential to create dust shall have properly fitting side and tail boards. Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin. The tarpaulin shall be properly secured and shall extend at least 300 mm over the edges of the side and tail boards.

(f) Stockpiles of sand and aggregate greater than 20 m^3 shall be enclosed on three sides, with walls extending above the pile and 2 metres beyond the front of the pile. In addition, water sprays shall be provided and used, both to dampen stored materials and when receiving raw material.

(g) The Contractor shall frequently clean and water the site to minimize the fugitive dust emissions.

(h) The Contractor shall restrict all motorized vehicles to a maximum speed of 8 km per hour and confine haulage and delivery vehicles to designated roadways inside the site. Areas of roadway longer than 100 m where movement of motorized vehicles exceeds 100 vehicular movements per day, or as directed by the Engineer, shall be furnished with a flexible pavement surfacing.

(i) Wheel washing facilities shall be installed and used by all vehicles leaving the site. No earth, mud, debris, dust and the like shall be deposited on public roads. Water in the wheel cleaning facility shall be changed at frequent intervals and sediments shall be removed regularly. The Contractor shall submit details of proposals for the wheel cleaning facilities to the Engineer prior to construction of the facility. Such wheel washing facility shall be usable prior to the commencement of any earthworks excavation activity on the Site. The Contractor shall also provide a hard-surfaced road between the washing facility and the public road.

(j) Conveyor belts shall be fitted with windboards, and conveyor transfer points and hopper discharge areas shall be enclosed to minimize emission of dust. All conveyors carrying materials which have the potential to create dust shall be totally enclosed and fitted with belt cleaners.

4. CONSENT TO EQUIPMENT AND PROCESSES

(a) The Contractor shall not install any furnace, boiler or other plant or equipment or use any fuel that might in any circumstance produce smoke or any other air pollution without the prior consent of the Engineer. Unless specifically instructed by the Engineer, the Contractor shall not light fires on site for the burning of debris or any other matter.

(b) The Contractor's attention is drawn to the Air Pollution Control Ordinance and its subsidiary legislation, particularly the Air Pollution (Furnaces, Ovens and Chimneys) (Installation and Alteration) Regulations and the Air Pollution Control (Smoke) Regulations.

5. REMOVAL OF WASTE MATERIAL

(a) The Contractor shall not permit any sewage, waste water or effluent containing sand, cement, silt or any other suspended or dissolved material to flow from the site onto any adjoining land or allow any waste matter or refuse to be deposited anywhere within the Site or onto any adjoining land and shall have all such matter removed from the Site.

(b) The Contractor shall be liable for any damages caused to adjoining land through his failure to comply with clause 5(a).

(c) The Contractor shall be responsible for temporary training, diverting or conducting of open streams or drains intercepted by any works and for reinstating these to their original courses on completion of the Works.

(d) The Contractor shall be responsible for adequately maintaining any existing site drainage system at all times, including removal of solids in sand traps, manholes and stream beds.

(e) Any proposed stream course and nullah temporary diversions shall be submitted to the Engineer for agreement one month prior to such diversion works being commenced. Diversions shall be constructed to allow the water flow to discharge without overflow, erosion or washout. The area through which the temporary diversion runs is to be reinstated to its original condition or as agreed by the Engineer after the permanent drainage system has been completed.

(f) The Contractor shall furnish, for the Engineer's information, particulars of the Contractor's arrangements for ensuring that material from any earthworks does not wash into the drainage system. If at any time such arrangements prove to be ineffective the Contractor shall take such additional measures as the Engineer shall deem necessary and shall remove all silt which may have accumulated in the drainage system whether within the Site or not.

(g) The Contractor shall segregate all inert construction waste material suitable for reclamation or land formation and shall dispose of such material at such public dumping area(s) as may be specified from time to time by the Director of Civil Engineering Services.

(h) All non-inert construction waste material deemed unsuitable for reclamation or land formation and all other waste material shall be disposed of at a public landfill.

(i) The Contractor's attention is drawn to the Waste Disposal Ordinance, the Public Health and Municipal Services Ordinance, and the Water Pollution Control Ordinance.

6. DISCHARGE INTO SEWERS AND DRAINS

(a) The Contractor shall not discharge directly or indirectly (by runoff) or cause or permit or suffer to be discharged into any public sewer, storm-water drain, channel, stream-course or sea any effluent or foul or contaminated water or cooling or hot water without the prior consent of the Engineer who may require the Contractor to provide, operate and maintain at the Contractor's own expense, within the premises or otherwise, suitable works for the treatment and disposal of such effluent or foul or contaminated or cooling or hot water. The design of such treatment works shall be submitted to the Engineer for approval not less than one month prior to the commencement of construction or as agreed by the Engineer.

(b) If any office, site canteen or toilet facilities are erected, foul water effluent shall be directed to a foul sewer or to a sewage treatment facility either directly or indirectly by means of pumping or other means approved by the Engineer.

(c) The Contractor's attention is drawn to the Buildings Ordinance and to the Water Pollution Control Ordinance.

Appendix 3

Construction Noise Levels

Contents

Table A3.1 Construction Noise Levels at Sensitive Receivers for Single Activity (Unmitigated)

Construction Section	Task Description	dB(A) at NSR Without Mitigation								
		WW C6	HP1	SC2	VLP 1	STG S	STC 2	CS	PRC 1	VM
ELEVATED	Bored piling	69	80	78	70	67	79	72	71	72
	Pile concreting	66	77	75	67	64	76	69	68	69
	Pile cap excavation	73	84	82	74	71	83	76	75	76
	Pile cap backfilling	62	73	71	63	60	72	65	64	65
	Pile cap concreting	71	82	80	72	69	81	74	73	74
	Pile cap reinforcement	65	77	75	67	64	76	69	68	69
	Column concreting	71	82	80	72	69	81	74	73	74
	Column reinforcement	66	77	75	67	64	76	69	68	69
	Precast superstructure construction	67	78	76	68	65	77	70	69	70
	In-situ superstructure construction	72	83	81	73	70	82	75	74	75
	Superstructure reinforcement	71	82	80	72	69	81	74	73	74
	Paving elevated section	65	76	74	66	63	75	68	67	68
AT- GRADE	Drainage excavation	67	68	78	69	69	81	75	75	78
	Placement of drainage pipes	60	61	71	62	62	75	69	69	72
	Laying of road base	68	69	79	70	70	82	76	76	79
	Road kerbing	63	64	74	65	65	77	71	71	74
	Levelling for road construction	66	67	77	68	68	80	74	74	77
	Road surfacing	60	61	71	62	62	74	68	68	71

Construction Section	Task Description	dB(A) at NSR Without Mitigation									
		ML V	OL V	MV	HL2	OT T1	KG	TL W3	TL WK	HA	W WT
ELEVATED	Bored piling	64	66	67	71	72	66	82	71	81	74
	Pile concreting	61	63	64	68	69	63	79	68	78	71
	Pile cap excavation	68	70	71	75	76	70	86	75	85	78
	Pile cap backfilling	57	59	60	64	65	59	75	64	74	67
	Pile cap concreting	66	68	69	73	74	68	84	73	83	76
	Pile cap reinforcement	61	63	64	68	69	63	79	68	78	71
	Column concreting	66	68	69	73	74	68	84	73	83	76
	Column reinforcement	61	63	64	68	69	63	79	68	78	71
	Precast superstructure construction	62	64	65	69	70	64	80	69	79	72
	In-situ superstructure construction	67	69	70	74	75	69	85	74	84	77
	Superstructure reinforcement	66	68	69	73	74	68	84	73	83	76
	Paving elevated section	60	62	64	68	69	63	79	68	78	71
AT- GRADE	Drainage excavation	71	73	76	78	94	92	93	74	92	79
	Placement of drainage pipes	65	67	70	72	88	86	87	68	86	73
	Laying of road base	72	74	77	79	95	93	94	75	93	80
	Road kerbing	67	69	72	74	90	88	89	70	88	75
	Levelling for road construction	70	72	75	77	93	91	92	73	91	78
	Road surfacing	64	66	69	71	87	85	86	67	85	72

Table A3.1 (Cont'd)

Construction Section	Task Description	dB(A) at NSR Without Mitigation									
		MT H5	MF H2	CC S2	SC WP S	KS B1	STP S1	GL G2	GR G	HG 4	LPL 1
ELEVATED	Bored piling	77	79	89	65	85	85	72	74	80	81
	Pile concreting	74	76	86	62	82	82	69	71	77	78
	Pile cap excavation	81	83	93	69	89	89	76	78	84	85
	Pile cap backfilling	70	72	82	58	78	78	65	67	73	74
	Pile cap concreting	79	81	91	67	87	87	74	76	82	83
	Pile cap reinforcement	74	76	86	62	82	82	69	71	77	78
	Column concreting	79	81	91	67	87	87	74	76	82	83
	Column reinforcement	74	76	86	62	82	82	69	71	77	78
	Precast superstructure construction	75	77	87	63	83	83	70	72	78	79
	In-situ superstructure construction	80	82	92	68	88	88	75	77	83	84
	Superstructure reinforcement	79	81	91	67	87	87	74	76	82	83
	Paving elevated section	74	76	86	62	82	82	69	71	77	78
AT- GRADE	Drainage excavation	82	79	82	67	93	83	92	88	81	75
	Placement of drainage pipes	76	73	76	61	87	77	86	82	75	69
	Laying of road base	83	80	83	68	94	84	93	89	82	76
	Road kerbing	78	75	78	63	89	79	88	84	77	71
	Levelling for road construction	81	78	81	66	92	82	91	87	80	74
	Road surfacing	75	72	75	60	86	76	85	81	74	68

Construction Section	Task Description	dB(A) at NSR Without Mitigation								
		CW G	RH	SC H2	TW V4	VD V2	ST H	KS H2	PG2	VH 2
ELEVATED	Bored piling	72	80	70	82	76	65	73	72	76
	Pile concreting	69	77	67	79	73	62	70	69	73
	Pile cap excavation	76	84	74	86	80	69	77	76	80
	Pile cap backfilling	65	73	63	75	69	58	66	65	69
	Pile cap concreting	74	82	72	84	78	67	75	74	78
	Pile cap reinforcement	69	77	67	79	73	62	70	69	73
	Column concreting	74	82	72	84	78	67	75	74	78
	Column reinforcement	69	77	67	79	73	62	70	69	73
	Precast superstructure construction	70	78	68	80	74	63	71	70	74
	In-situ superstructure construction	75	83	73	85	79	68	76	75	79
	Superstructure reinforcement	74	82	72	84	78	67	75	74	78
	Paving elevated section	69	77	67	79	73	62	70	69	73
AT- GRADE	Drainage excavation	77	74	75	86	80	67	78	77	80
	Placement of drainage pipes	71	68	69	80	74	61	72	71	74
	Laying of road base	78	75	76	87	81	68	79	78	81
	Road kerbing	73	70	71	82	76	63	74	73	76
	Levelling for road construction	76	73	74	85	79	66	77	76	79
	Road surfacing	70	67	68	79	73	60	71	70	73

Table A3.2 Highest Unmitigated and Mitigated Construction Noise Levels at Sensitive Receivers for Single and Multiple Activities

NSR	Highest Single Event Noise Level, dB(A) (Unmitigated)		Mitigated Single Event Noise Level, (dB(A) (Temporary Screen + Silenced PME)		Highest Cumulative Noise Level (mitigated) dB(A)
	Elevated	At-grade	Elevated	At-grade	
WWC6	73	68	58	53	60
HP1	84	69	69	49	71
SC2	82	79	67	64	69
VLP1	74	70	59	55	61
STGS (1)	71	70	56	55	58
STC2	83	82	68	67	70
CS (1)	76	76	61	61	63
PRC1	75	76	60	61	63
VM	76	79	61	64	66
MLV	68	72	53	57	59
OLV	70	74	55	59	61
MV	71	77	56	62	64
HL2	75	79	60	64	66
OTT1	76	95	61	80	82
KG (1)	70	93	55	79	81
TLW3	86	94	71	79	81
TLWK (1)	75	75	60	60	62
HA	85	93	70	78	80
WWT (1)	78	80	63	65	67
MTH5	81	83	66	68	70
MFH2	83	80	68	65	70
CCS2	93	83	78	68	80
SCWPS (1)	69	68	54	53	56
KSB1	89	94	74	79	81
STPS1 (1)	89	84	74	69	76
GLG2	76	93	61	78	80
GRG	78	89	63	74	76
HG4	84	82	69	67	71
LPL1 (1)	85	76	70	61	72
CWG (1)	76	78	61	63	65
RH	84	75	69	60	71
SCH2 (1)	74	76	59	61	63
TWV4	86	87	71	72	74
VDV2	80	81	65	66	68
STH	69	68	64	53	66
KSH2	77	79	62	64	66
PG2	76	78	61	63	65
VH2	80	81	65	66	68
Total NSRs exceeding daytime noise limit	28	29	2	6	10
% exceeding daytime noise limit	74	76	5	16	26

Note: (1) Educational Institutions.
(2) Assume the use of temporary screens with 10 dB(A) reduction and the use of silenced equipment with possible sound reduction as indicated in Tables 2.2M-2.9M.
(3) Assume 2 dB(A) increase in the noise level due to multiple activities.
(4) The shaded figures represent exceedance of the construction noise guideline.

Appendix 4

Predicted Noise Levels

Contents

Table A4.1 Current and 2011 Traffic Noise Levels (Unmitigated)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
WWC1	1	70	84.2	61.2	84.1	84.1
WWC1	5	70	83.5	62.3	83.4	83.4
WWC1	10	70	82.8	63.2	82.7	82.7
WWC1	15	70	82.1	64.8	82.0	82.1
WWC1	20	70	81.4	65.4	81.3	81.4
WWC1	25	70	80.8	65.3	80.7	80.8
WWC1	29	70	80.4	66.1	80.3	80.5
WWC2	1	70	82.0	57.5	81.9	81.9
WWC2	5	70	81.4	58.1	81.3	81.3
WWC2	10	70	80.7	58.6	80.7	80.7
WWC2	15	70	80.1	61.1	80.0	80.1
WWC2	20	70	79.5	61.7	79.4	79.5
WWC2	25	70	78.9	61.7	78.8	78.9
WWC2	29	70	78.5	61.8	78.4	78.5
WWC3	1	70	84.9	62.2	84.8	84.8
WWC3	5	70	84.1	63.2	84.0	84.0
WWC3	10	70	83.3	64.0	83.2	83.3
WWC3	15	70	82.5	65.9	82.4	82.5
WWC3	20	70	81.8	66.0	81.7	81.8
WWC3	25	70	81.2	66.8	81.1	81.3
WWC3	29	70	80.8	66.8	80.7	80.9
WWC4	1	70	81.5	56.5	81.4	81.4
WWC4	5	70	81.1	57.1	81.0	81.0
WWC4	10	70	80.5	57.7	80.4	80.4
WWC4	15	70	79.8	60.8	79.7	79.8
WWC4	20	70	79.2	60.6	79.1	79.2
WWC4	25	70	78.6	60.8	78.5	78.6
WWC4	29	70	78.2	60.9	78.1	78.2
WWC5	1	70	85.7	62.1	85.6	85.6
WWC5	5	70	84.8	63.1	84.7	84.7
WWC5	10	70	83.8	64.4	83.7	83.8
WWC5	15	70	82.9	66.0	82.8	82.9
WWC5	20	70	82.2	66.2	82.1	82.2
WWC5	25	70	81.6	67.0	81.4	81.6
WWC5	29	70	81.1	66.9	81.0	81.2
WWC6	1	70	87.2	70.5	87.1	87.2
WWC6	5	70	85.7	70.2	85.6	85.7
WWC6	10	70	84.5	70.3	84.3	84.5
WWC6	15	70	83.5	70.6	83.3	83.5
WWC6	20	70	82.7	70.7	82.5	82.8
WWC6	25	70	82.1	70.8	81.8	82.1
WWC6	29	70	81.6	70.7	81.4	81.8
WWC7	1	70	84.6	71.1	84.4	84.6
WWC7	5	70	83.6	71.1	83.3	83.6
WWC7	10	70	82.6	71.3	82.3	82.6
WWC7	15	70	81.8	71.5	81.5	81.9
WWC7	20	70	81.1	71.8	80.8	81.3
WWC7	25	70	80.5	71.6	80.1	80.7
WWC7	29	70	80.1	71.5	79.7	80.3
HP1	1	70	83.8	73.3	83.4	83.8
HP1	5	70	83.2	72.9	82.8	83.2
HP1	10	70	82.5	72.8	82.0	82.5
HP1	15	70	81.8	72.3	81.4	81.9
HP1	20	70	81.1	71.9	80.7	81.2
HP1	23	70	80.9	71.7	80.5	81.0

Table A4.1 Current and 2011 Traffic Noise Levels (Unmitigated)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
HP2	1	70	83.7	77.0	82.7	83.7
HP2	5	70	83.2	76.7	82.1	83.2
HP2	10	70	82.5	76.4	81.4	82.6
HP2	15	70	81.8	76.2	80.7	82.0
HP2	20	70	81.2	75.7	80.2	81.5
HP2	23	70	80.9	75.5	79.9	81.2
HP3	1	70	78.5	70.6	76.9	77.8
HP3	5	70	78.2	72.5	76.2	77.7
HP3	10	70	78.3	74.2	76.2	78.3
HP3	15	70	77.9	74.3	75.7	78.1
HP3	20	70	77.5	74.2	75.7	78.0
HP3	23	70	77.3	74.1	75.5	77.9
SC1	1	70	83.8	79.9	81.7	83.9
SC1	5	70	83.4	79.3	81.2	83.4
SC1	10	70	83.2	79.1	80.9	83.1
SC1	15	70	82.6	78.5	80.9	82.9
SC1	20	70	82.0	77.9	80.3	82.3
SC1	23	70	81.7	77.7	80.0	82.0
SC2	1	70	84.6	79.8	81.2	83.6
SC2	5	70	83.9	79.7	81.1	83.5
SC2	10	70	83.3	79.7	80.8	83.3
SC2	15	70	82.7	79.2	80.6	83.0
SC2	20	70	82.1	78.6	80.1	82.4
SC2	23	70	81.8	78.4	79.9	82.2
SC3	1	70	81.5	76.2	77.9	80.1
SC3	5	70	81.1	76.4	78.4	80.5
SC3	10	70	80.4	77.1	77.6	80.4
SC3	15	70	79.8	76.9	77.0	80.0
SC3	20	70	79.3	76.4	76.6	79.5
SC3	23	70	79.0	76.2	76.7	79.5
VLP1	2	70	81.3	74.8	80.4	81.5
VLP2	2	70	74.2	67.6	73.1	74.2
VLP3	3	70	80.5	74.8	79.0	80.4
VLP4	3	70	81.5	77.7	80.2	82.1
STGS	1	65	73.5	66.6	72.1	73.2
STGS	3	65	73.8	68.0	72.5	73.8
STGS	5	65	74.0	68.8	71.7	73.5
STC1	1	55	75.2	68.9	73.9	75.1
STC1	3	55	75.3	69.4	74.0	75.3
STC2	1	55	79.6	71.6	78.3	79.1
STC2	2	55	79.6	72.3	78.3	79.3
STC3	1	55	79.6	72.4	78.3	79.3
STC3	2	55	79.7	72.8	78.4	79.5
CS	1	65	74.6	68.0	73.1	74.3
CS	3	65	74.8	69.2	73.5	74.9
CS	5	65	75.0	71.0	74.0	75.8
PRC1	1	65	78.2	73.2	77.1	78.6
PRC1	3	65	79.9	77.3	78.4	80.9
PRC2	1	65	77.4	71.1	76.4	77.5
PRC2	3	65	78.2	72.9	76.9	78.4
VM	2	70	79.0	74.0	77.7	79.2
MLV	1	70	76.1	69.5	74.7	75.8
MLV	3	70	76.8	72.1	76.0	77.5
OLV	1	70	76.9	70.8	75.1	76.5
OLV	3	70	77.6	73.3	76.6	78.3

Table A4.1 Current and 2011 Traffic Noise Levels (Unmitigated)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
OLV	5	70	78.0	73.9	76.8	78.6
MV	2	70	78.9	73.9	77.7	79.2
HL1	2	70	79.0	74.9	77.6	79.5
HL2	2	70	79.2	74.8	78.3	79.9
OTT1	2	70	81.8	77.3	78.9	81.2
OTT2	2	70	81.0	77.2	77.5	80.4
OTT3	2	70	79.5	76.0	75.7	78.9
KG	2	65	77.9	74.2	75.5	77.9
TLW1	1	70	79.3	75.0	75.1	78.1
TLW1	3	70	80.1	76.3	75.9	79.1
TLW2	1	70	78.1	74.7	74.4	77.6
TLW2	3	70	79.9	76.2	75.2	78.7
TLW3	1	70	81.2	75.5	77.0	79.3
TLW3	3	70	82.1	77.0	77.3	80.2
TLW4	1	70	80.0	74.9	75.1	78.0
TLW4	3	70	81.0	76.4	75.8	79.1
TLW5	2	70	78.4	74.8	73.7	77.3
TLW5	3	70	78.5	75.4	73.5	77.6
TLW6	1	70	80.7	76.0	75.8	78.9
TLW6	3	70	82.0	77.3	77.0	80.2
TLW7	1	70	79.0	75.0	74.7	77.9
TLW7	3	70	80.1	75.9	75.3	78.6
TLW8	2	70	78.3	74.4	73.9	77.2
TLW8	3	70	78.6	75.0	74.2	77.6
TLWK	1	65	77.3	73.8	73.3	76.6
TLWK	3	65	77.7	75.0	73.7	77.4
HA	1	55	80.3	74.7	75.6	78.2
HA	3	55	81.7	76.4	76.9	79.7
WWT	1	65	77.0	69.6	72.1	74.0
WWT	3	65	77.4	69.8	72.7	74.5
WWT	5	65	77.5	71.1	72.3	74.8
MTH1	1	70	71.4	70.1	67.1	71.9
MTH1	5	70	73.2	72.9	70.6	74.9
MTH1	10	70	77.6	77.7	75.2	79.6
MTH1	15	70	78.0	78.5	75.7	80.3
MTH1	20	70	77.9	78.1	75.6	80.0
MTH1	25	70	77.7	78.2	75.5	80.1
MTH2	1	70	74.9	73.0	69.5	74.6
MTH2	5	70	75.5	76.3	71.5	77.5
MTH2	10	70	77.3	79.9	73.1	80.7
MTH2	15	70	77.1	80.3	73.0	81.0
MTH2	20	70	77.1	79.8	73.1	80.6
MTH2	25	70	76.8	79.9	73.0	80.7
MTH3	1	70	73.5	72.7	68.9	74.2
MTH3	5	70	75.6	75.2	72.0	76.9
MTH3	10	70	77.0	79.4	73.8	80.5
MTH3	15	70	77.0	79.7	73.8	80.7
MTH3	20	70	77.0	78.8	74.3	80.1
MTH3	25	70	76.8	79.1	74.0	80.3
MTH4	1	70	77.2	74.6	71.3	76.3
MTH4	5	70	78.1	78.4	72.8	79.5
MTH4	10	70	78.4	81.4	72.9	82.0
MTH4	15	70	78.1	81.0	73.2	81.7
MTH4	20	70	77.9	80.9	73.0	81.6
MTH4	25	70	77.4	80.5	73.0	81.2

Table A4.1 Current and 2011 Traffic Noise Levels (Unmitigated)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
MTH5	1	70	80.5	75.6	72.3	77.3
MTH5	5	70	81.1	82.0	73.3	82.5
MTH5	10	70	80.7	83.3	73.7	83.8
MTH5	15	70	80.2	82.7	73.7	83.2
MTH5	20	70	79.6	82.4	74.0	83.0
MTH5	25	70	79.1	81.8	73.8	82.4
MFH1	1	70	75.5	72.8	64.3	73.4
MFH1	5	70	75.3	77.6	64.8	77.8
MFH1	10	70	75.8	78.9	64.9	79.1
MFH1	15	70	75.7	78.7	65.2	78.9
MFH1	20	70	75.2	78.6	67.0	78.9
MFH2	1	70	78.0	74.1	67.1	74.9
MFH2	5	70	78.1	79.0	70.3	79.5
MFH2	10	70	78.2	80.2	70.1	80.6
MFH2	15	70	78.0	80.1	70.2	80.5
MFH2	20	70	77.8	79.7	71.0	80.2
MFH3	1	70	77.6	71.7	68.4	73.4
MFH3	5	70	77.9	75.4	72.9	77.3
MFH3	10	70	77.8	76.5	72.6	78.0
MFH3	15	70	77.5	76.3	72.2	77.7
MFH3	20	70	77.3	76.0	72.1	77.5
MFH4	1	70	77.1	72.1	68.6	73.7
MFH4	5	70	77.0	73.8	71.9	76.0
MFH4	10	70	77.1	76.4	71.7	77.7
MFH4	15	70	76.8	76.5	71.4	77.7
MFH4	20	70	76.6	76.4	71.2	77.5
MFH5	1	70	80.0	70.6	73.9	75.6
MFH5	5	70	79.8	71.1	74.9	76.4
MFH5	10	70	79.5	72.9	74.3	76.7
MFH5	15	70	79.0	73.0	73.7	76.4
MFH5	20	70	78.4	73.3	73.0	76.2
MFH6	1	70	73.3	64.4	69.6	70.7
MFH6	5	70	73.1	64.3	69.5	70.6
MFH6	10	70	72.8	64.2	69.1	70.3
MFH6	15	70	72.4	64.0	68.6	69.9
MFH6	20	70	71.9	63.7	68.0	69.4
KSH1	1	70	80.0	64.3	75.9	76.2
KSH1	5	70	79.1	64.3	75.0	75.4
KSH1	10	70	77.6	64.4	73.5	74.0
KSH1	15	70	76.3	64.4	72.2	72.9
KSH1	20	70	75.3	64.7	71.1	72.0
KSH1	25	70	74.5	65.0	70.2	71.3
KSH2	1	70	81.8	67.7	77.5	77.9
KSH2	5	70	80.7	67.9	76.4	77.0
KSH2	10	70	79.1	69.2	74.8	75.9
KSH2	15	70	77.8	69.6	73.4	74.9
KSH2	20	70	76.8	69.6	72.4	74.2
KSH2	25	70	76.0	69.8	71.5	73.7
PG1	1	70	72.8	68.2	67.9	71.1
PG1	5	70	72.8	69.1	68.1	71.6
PG1	10	70	72.9	71.1	68.4	73.0
PG1	15	70	72.9	71.3	68.6	73.2
PG1	20	70	72.8	71.2	68.4	73.0
PG1	25	70	72.7	71.4	68.3	73.1
PG2	1	70	72.2	68.1	67.1	70.6

Table A4.1 Current and 2011 Traffic Noise Levels (Unmitigated)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
PG2	5	70	72.6	69.0	67.8	71.5
PG2	10	70	72.7	71.2	68.1	72.9
PG2	15	70	72.7	71.2	68.2	73.0
PG2	20	70	72.6	71.2	68.2	73.0
PG2	25	70	72.5	71.3	68.1	73.0
PG3	1	70	70.1	66.9	65.0	69.1
PG3	5	70	70.2	67.7	65.2	69.6
PG3	10	70	70.4	69.8	65.8	71.3
PG3	15	70	70.4	69.9	65.9	71.4
PG3	20	70	70.5	70.1	65.9	71.5
PG3	25	70	70.5	70.2	66.0	71.6
CCS1	1	70	78.8	77.9	74.5	79.5
CCS1	3	70	78.9	79.8	74.1	80.8
CCS1	5	70	78.9	84.8	74.4	85.2
CCS2	1	70	81.2	78.4	76.2	80.4
CCS2	3	70	81.2	78.6	76.0	80.5
CCS2	5	70	81.4	87.4	76.9	87.8
CCS3	1	70	78.7	75.9	74.4	78.2
CCS3	3	70	79.7	78.9	75.4	80.5
CCS3	5	70	79.7	85.8	74.0	86.1
CCS4	1	70	77.8	75.4	74.7	78.1
CCS4	3	70	78.2	77.5	75.1	79.5
CCS4	5	70	79.2	83.6	75.1	84.2
CCS5	1	70	77.8	74.5	75.0	77.8
CCS5	3	70	77.7	76.6	75.2	79.0
CCS5	5	70	78.8	82.2	75.1	83.0
SCWPS	1	65	69.2	66.3	65.5	68.9
SCWPS	3	65	69.3	66.7	65.6	69.2
SCWPS	5	65	69.5	67.5	66.0	69.8
KSB1	1	70	82.3	76.0	80.7	82.0
KSB1	3	70	82.3	78.2	80.4	82.4
KSB1	5	70	82.4	85.7	79.7	86.7
KSB1	7	70	82.3	86.5	78.9	87.2
KSB1	9	70	82.4	86.3	78.6	87.0
KSB2	1	70	79.6	74.9	77.3	79.3
KSB2	3	70	79.4	77.3	77.2	80.3
KSB2	5	70	79.9	83.2	77.0	84.1
KSB2	7	70	80.2	84.5	76.5	85.1
KSB2	9	70	80.2	84.4	76.6	85.1
KSB3	1	70	79.4	72.9	76.4	78.0
KSB3	3	70	80.0	75.1	76.3	78.8
KSB3	5	70	79.8	81.6	76.0	82.7
KSB3	7	70	80.0	82.8	75.8	83.6
KSB3	9	70	80.2	83.0	75.5	83.7
STPS1	1	65	82.8	85.0	77.4	85.7
STPS1	3	65	82.9	86.4	76.5	86.8
STPS1	5	65	82.9	86.3	77.2	86.8
STPS2	1	65	81.5	80.5	78.8	82.7
STPS2	3	65	81.3	82.6	78.2	83.9
STPS2	5	65	81.7	82.6	76.5	83.6
GLG1	1	70	79.4	72.9	77.5	78.8
GLG1	5	70	79.0	76.8	76.7	79.8
GLG1	10	70	79.5	79.6	75.7	81.1
GLG1	15	70	79.0	79.8	75.0	81.0
GLG1	20	70	78.6	79.7	74.2	80.8

Table A4.1 Current and 2011 Traffic Noise Levels (Unmitigated)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
GLG1	24	70	78.3	79.5	73.7	80.5
GLG2	1	70	82.4	72.7	81.4	81.9
GLG2	5	70	80.9	75.7	79.6	81.1
GLG2	10	70	80.2	78.4	78.0	81.2
GLG2	15	70	79.3	78.4	76.7	80.6
GLG2	20	70	78.7	78.3	75.7	80.2
GLG2	24	70	78.3	78.1	75.1	79.9
GRG	1	70	82.4	71.4	81.3	81.7
GRG	5	70	80.9	73.7	79.5	80.5
GRG	10	70	79.9	75.8	78.1	80.1
GRG	15	70	79.0	75.7	76.9	79.4
HG1	1	70	80.0	71.2	78.4	79.2
HG1	5	70	79.6	75.3	77.8	79.7
HG1	10	70	79.4	77.7	76.9	80.3
HG1	15	70	78.9	77.8	76.0	80.0
HG1	20	70	78.4	77.8	75.3	79.7
HG2	1	70	76.8	75.2	73.5	77.4
HG2	5	70	76.8	76.6	73.2	78.2
HG2	10	70	77.5	78.6	72.8	79.6
HG2	15	70	77.3	78.6	72.2	79.5
HG2	20	70	77.1	78.5	71.9	79.4
HG3	1	70	75.7	75.9	72.6	77.6
HG3	5	70	75.9	77.0	72.3	78.3
HG3	10	70	76.8	78.7	72.0	79.5
HG3	15	70	76.8	78.6	71.6	79.4
HG3	20	70	76.5	78.4	71.5	79.2
HG4	1	70	78.1	79.5	70.3	80.0
HG4	5	70	78.3	81.1	69.8	81.4
HG4	10	70	79.0	82.1	69.7	82.3
HG4	15	70	78.9	82.0	69.7	82.2
HG4	20	70	78.7	81.6	69.8	81.9
HG5	1	70	77.6	76.6	66.3	77.0
HG5	5	70	77.8	80.3	65.4	80.4
HG5	10	70	78.4	81.8	65.8	81.9
HG5	15	70	78.3	81.8	65.9	81.9
HG5	20	70	78.2	81.4	66.3	81.5
HG6	1	70	78.1	76.1	65.2	76.4
HG6	5	70	78.3	80.8	65.8	80.9
HG6	10	70	78.7	82.5	66.1	82.6
HG6	15	70	78.6	82.4	66.1	82.5
HG6	20	70	78.5	82.1	66.3	82.2
LPL1	1	65	78.2	74.6	63.6	74.9
LPL1	5	65	78.4	79.4	65.5	79.6
LPL2	1	65	78.1	78.1	62.7	78.2
LPL2	3	65	78.2	77.2	65.0	77.5
LPL2	5	65	78.3	80.1	64.3	80.2
LPL3	1	65	75.9	75.5	60.8	75.6
LPL3	3	65	75.9	76.8	63.5	77.0
LPL3	5	65	75.9	75.1	63.0	75.4
CWG	1	65	75.0	71.2	65.8	72.3
CWG	3	65	75.1	70.3	66.8	71.9
CWG	5	65	75.1	71.5	66.8	72.8
VH1	2	70	71.7	68.0	66.1	70.2
VH2	2	70	74.1	72.8	68.2	74.1
SCH1	1	65	77.0	74.2	71.9	76.2

Table A4.1 Current and 2011 Traffic Noise Levels (Unmitigated)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
SCH1	3	65	77.0	74.8	71.8	76.6
SCH1	5	65	76.9	74.9	71.8	76.6
SCH2	1	65	78.3	75.9	73.9	78.0
SCH2	3	65	78.5	76.6	73.8	78.4
SCH2	5	65	78.4	76.7	73.6	78.4
TWV1	1	70	78.2	78.9	72.7	79.8
TWV1	3	70	78.1	78.9	72.8	79.9
TWV2	1	70	78.0	80.1	70.2	80.5
TWV2	3	70	79.0	81.2	70.4	81.5
TWV3	1	70	80.5	82.0	69.8	82.3
TWV3	3	70	80.5	82.1	69.4	82.3
TWV4	1	70	82.7	81.3	69.3	81.6
TWV4	3	70	82.7	84.1	69.8	84.3
TWV5	1	70	76.1	75.9	66.4	76.4
TWV5	3	70	77.5	77.9	67.0	78.2
TWV6	1	70	74.0	75.6	65.5	76.0
TWV6	3	70	75.6	76.2	66.6	76.7
TWV7	1	70	78.4	76.5	66.0	76.9
TWV7	3	70	79.3	78.4	65.0	78.6
TWV8	1	70	89.8	78.7	66.6	79.0
TWV8	3	70	88.8	80.3	64.6	80.4
VDV1	1	70	79.5	78.2	61.9	78.3
VDV1	3	70	79.3	78.1	62.1	78.2
VDV2	1	70	78.9	76.6	61.4	76.7
VDV2	3	70	78.7	76.5	61.6	76.6
STH	2	70	81.8	60.0	78.6	78.7
STH	5	70	81.1	59.8	77.9	78.0
STH	7	70	80.7	59.8	77.5	77.6

Table A4.2 Current and 2011 Traffic Noise Levels for Mitigation Scenario 1 (With Friction Course Only)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
WWC1	1	70	84.2	58.6	84.1	84.1
WWC1	5	70	83.5	59.8	83.4	83.4
WWC1	10	70	82.8	61.0	82.7	82.7
WWC1	15	70	82.1	62.3	82.0	82.0
WWC1	20	70	81.4	62.9	81.3	81.4
WWC1	25	70	80.8	62.9	80.7	80.8
WWC1	29	70	80.4	63.5	80.3	80.4
WWC2	1	70	82.0	54.7	81.9	81.9
WWC2	5	70	81.4	55.1	81.3	81.3
WWC2	10	70	80.7	55.5	80.7	80.7
WWC2	15	70	80.1	57.8	80.0	80.0
WWC2	20	70	79.5	58.5	79.4	79.4
WWC2	25	70	78.9	58.6	78.8	78.8
WWC2	29	70	78.5	58.7	78.4	78.4
WWC3	1	70	84.9	59.6	84.8	84.8
WWC3	5	70	84.1	60.7	84.0	84.0
WWC3	10	70	83.3	61.9	83.2	83.2
WWC3	15	70	82.5	63.5	82.4	82.5
WWC3	20	70	81.8	63.7	81.7	81.8
WWC3	25	70	81.2	64.3	81.1	81.2
WWC3	29	70	80.8	64.3	80.7	80.8
WWC4	1	70	81.5	53.8	81.4	81.4
WWC4	5	70	81.1	54.2	81.0	81.0
WWC4	10	70	80.5	54.8	80.4	80.4
WWC4	15	70	79.8	57.7	79.7	79.7
WWC4	20	70	79.2	57.6	79.1	79.1
WWC4	25	70	78.6	57.8	78.5	78.5
WWC4	29	70	78.2	57.9	78.1	78.1
WWC5	1	70	85.7	59.6	85.6	85.6
WWC5	5	70	84.8	60.5	84.7	84.7
WWC5	10	70	83.8	62.3	83.7	83.7
WWC5	15	70	82.9	63.7	82.8	82.9
WWC5	20	70	82.2	63.9	82.1	82.2
WWC5	25	70	81.6	64.5	81.4	81.5
WWC5	29	70	81.1	64.4	81.0	81.1
WWC6	1	70	87.2	70.1	87.1	87.2
WWC6	5	70	85.7	69.7	85.6	85.7
WWC6	10	70	84.5	69.7	84.3	84.4
WWC6	15	70	83.5	69.7	83.3	83.5
WWC6	20	70	82.7	69.8	82.5	82.7
WWC6	25	70	82.1	69.7	81.8	82.1
WWC6	29	70	81.6	69.6	81.4	81.7
WWC7	1	70	84.6	70.7	84.4	84.6
WWC7	5	70	83.6	70.6	83.3	83.5
WWC7	10	70	82.6	70.8	82.3	82.6
WWC7	15	70	81.8	70.7	81.5	81.8
WWC7	20	70	81.1	70.9	80.8	81.2
WWC7	25	70	80.5	70.7	80.1	80.6
WWC7	29	70	80.1	70.6	79.7	80.2
HP1	1	70	83.8	73.1	83.4	83.8
HP1	5	70	83.2	72.7	82.8	83.2
HP1	10	70	82.5	72.3	82.0	82.4
HP1	15	70	81.8	71.7	81.4	81.8
HP1	20	70	81.1	71.2	80.7	81.2
HP1	23	70	80.9	70.9	80.5	81.0
HP2	1	70	83.7	76.9	82.7	83.7
HP2	5	70	83.2	76.6	82.1	83.2
HP2	10	70	82.5	76.1	81.4	82.5
HP2	15	70	81.8	75.8	80.7	81.9
HP2	20	70	81.2	75.3	80.2	81.4

Table A4.2 Current and 2011 Traffic Noise Levels for Mitigation Scenario 1 (With Friction Course Only)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
HP2	23	70	80.9	75.1	79.9	81.1
HP3	1	70	78.5	69.9	76.9	77.7
HP3	5	70	78.2	72.3	76.2	77.7
HP3	10	70	78.3	73.8	76.2	78.2
HP3	15	70	77.9	74.0	75.7	77.9
HP3	20	70	77.5	73.8	75.7	77.9
HP3	23	70	77.3	73.8	75.5	77.7
SC1	1	70	83.8	79.8	81.7	83.9
SC1	5	70	83.4	79.2	81.2	83.3
SC1	10	70	83.2	78.8	80.9	83.0
SC1	15	70	82.6	78.3	80.9	82.8
SC1	20	70	82.0	77.6	80.3	82.2
SC1	23	70	81.7	77.4	80.0	81.9
SC2	1	70	84.6	79.7	81.2	83.5
SC2	5	70	83.9	79.6	81.1	83.4
SC2	10	70	83.3	79.5	80.8	83.2
SC2	15	70	82.7	78.9	80.6	82.8
SC2	20	70	82.1	78.3	80.1	82.3
SC2	23	70	81.8	78.0	79.9	82.1
SC3	1	70	81.5	75.8	77.9	80.0
SC3	5	70	81.1	76.1	78.4	80.4
SC3	10	70	80.4	76.7	77.6	80.2
SC3	15	70	79.8	76.5	77.0	79.8
SC3	20	70	79.3	75.9	76.6	79.3
SC3	23	70	79.0	75.7	76.7	79.2
VLP1	2	70	81.3	74.7	80.4	81.4
VLP2	2	70	74.2	67.6	73.1	74.2
VLP3	3	70	80.5	74.8	79.0	80.4
VLP4	3	70	81.5	76.9	80.2	81.9
STGS	1	65	73.5	66.1	72.1	73.1
STGS	3	65	73.8	67.6	72.5	73.7
STGS	5	65	74.0	68.4	71.7	73.4
STC1	1	55	75.2	68.6	73.9	75.0
STC1	3	55	75.3	69.1	74.0	75.2
STC2	1	55	79.6	70.6	78.3	79.0
STC2	2	55	79.6	71.2	78.3	79.1
STC3	1	55	79.6	70.3	78.3	78.9
STC3	2	55	79.7	70.7	78.4	79.1
CS	1	65	74.6	65.4	73.1	73.8
CS	3	65	74.8	66.5	73.5	74.3
CS	5	65	75.0	68.2	74.0	75.0
PRC1	1	65	78.2	72.0	77.1	78.3
PRC1	3	65	79.9	76.6	78.4	80.6
PRC2	1	65	77.4	70.3	76.4	77.4
PRC2	3	65	78.2	72.5	76.9	78.2
VM	2	70	79.0	72.3	77.7	78.8
MLV	1	70	76.1	68.2	74.7	75.6
MLV	3	70	76.8	71.2	76.0	77.2
OLV	1	70	76.9	69.3	75.1	76.1
OLV	3	70	77.6	72.1	76.6	77.9
OLV	5	70	78.0	72.8	76.8	78.3
MV	2	70	78.9	72.9	77.7	78.9
HL1	2	70	79.0	73.6	77.6	79.1
HL2	2	70	79.2	73.8	78.3	79.6
OTT1	2	70	81.8	75.8	78.9	80.6
OTT2	2	70	81.0	74.9	77.5	79.4
OTT3	2	70	79.5	73.4	75.7	77.7
KG	2	65	77.9	71.8	75.5	77.0
TLW1	1	70	79.3	72.5	75.1	77.0
TLW1	3	70	80.1	73.6	75.9	77.9

Table A4.2 Current and 2011 Traffic Noise Levels for Mitigation Scenario 1 (With Friction Course Only)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
TLW2	1	70	78.1	72.0	74.4	76.4
TLW2	3	70	79.9	73.7	75.2	77.5
TLW3	1	70	81.2	73.0	77.0	78.5
TLW3	3	70	82.1	74.4	77.3	79.1
TLW4	1	70	80.0	72.0	75.1	76.8
TLW4	3	70	81.0	73.4	75.8	77.8
TLW5	2	70	78.4	71.8	73.7	75.9
TLW5	3	70	78.5	72.3	73.5	76.0
TLW6	1	70	80.7	73.1	75.8	77.7
TLW6	3	70	82.0	74.3	77.0	78.9
TLW7	1	70	79.0	72.2	74.7	76.6
TLW7	3	70	80.1	73.1	75.3	77.3
TLW8	2	70	78.3	71.5	73.9	75.9
TLW8	3	70	78.6	72.0	74.2	76.2
TLWK	1	65	77.3	70.9	73.3	75.3
TLWK	3	65	77.7	72.0	73.7	75.9
HA	1	55	80.3	72.2	75.6	77.2
HA	3	55	81.7	73.7	76.9	78.6
WWT	1	65	77.0	67.0	72.1	73.3
WWT	3	65	77.4	67.2	72.7	73.8
WWT	5	65	77.5	68.2	72.3	73.7
MTH1	1	70	71.4	66.7	67.1	69.9
MTH1	5	70	73.2	69.6	70.6	73.1
MTH1	10	70	77.6	74.4	75.2	77.8
MTH1	15	70	78.0	75.2	75.7	78.5
MTH1	20	70	77.9	74.9	75.6	78.3
MTH1	25	70	77.7	74.9	75.5	78.2
MTH2	1	70	74.9	69.6	69.5	72.6
MTH2	5	70	75.5	73.0	71.5	75.3
MTH2	10	70	77.3	76.5	73.1	78.1
MTH2	15	70	77.1	77.0	73.0	78.5
MTH2	20	70	77.1	76.4	73.1	78.1
MTH2	25	70	76.8	76.6	73.0	78.2
MTH3	1	70	73.5	69.3	68.9	72.1
MTH3	5	70	75.6	71.8	72.0	74.9
MTH3	10	70	77.0	76.0	73.8	78.0
MTH3	15	70	77.0	76.3	73.8	78.2
MTH3	20	70	77.0	75.4	74.3	77.9
MTH3	25	70	76.8	75.7	74.0	77.9
MTH4	1	70	77.2	71.2	71.3	74.3
MTH4	5	70	78.1	75.0	72.8	77.0
MTH4	10	70	78.4	78.1	72.9	79.2
MTH4	15	70	78.1	77.7	73.2	79.0
MTH4	20	70	77.9	77.6	73.0	78.9
MTH4	25	70	77.4	77.2	73.0	78.6
MTH5	1	70	80.5	72.4	72.3	75.4
MTH5	5	70	81.1	79.1	73.3	80.1
MTH5	10	70	80.7	80.2	73.7	81.1
MTH5	15	70	80.2	79.6	73.7	80.6
MTH5	20	70	79.6	79.3	74.0	80.4
MTH5	25	70	79.1	78.7	73.8	79.9
MFH1	1	70	75.5	69.6	64.3	70.7
MFH1	5	70	75.3	74.6	64.8	75.0
MFH1	10	70	75.8	75.8	64.9	76.1
MFH1	15	70	75.7	75.6	65.2	76.0
MFH1	20	70	75.2	75.4	67.0	76.0
MFH2	1	70	78.0	71.1	67.1	72.6
MFH2	5	70	78.1	76.2	70.3	77.2
MFH2	10	70	78.2	77.3	70.1	78.1
MFH2	15	70	78.0	77.2	70.2	78.0

Table A4.2 Current and 2011 Traffic Noise Levels for Mitigation Scenario 1 (With Friction Course Only)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
MFH2	20	70	77.8	76.7	71.0	77.7
MFH3	1	70	77.6	69.6	68.4	72.1
MFH3	5	70	77.9	73.1	72.9	76.0
MFH3	10	70	77.8	74.1	72.6	76.4
MFH3	15	70	77.5	74.0	72.2	76.2
MFH3	20	70	77.3	73.8	72.1	76.0
MFH4	1	70	77.1	69.8	68.6	72.3
MFH4	5	70	77.0	71.6	71.9	74.8
MFH4	10	70	77.1	73.8	71.7	75.9
MFH4	15	70	76.8	74.0	71.4	75.9
MFH4	20	70	76.6	74.0	71.2	75.8
MFH5	1	70	80.0	69.8	73.9	75.3
MFH5	5	70	79.8	70.2	74.9	76.2
MFH5	10	70	79.5	71.6	74.3	76.2
MFH5	15	70	79.0	71.7	73.7	75.8
MFH5	20	70	78.4	72.1	73.0	75.6
MFH6	1	70	73.3	64.4	69.6	70.7
MFH6	5	70	73.1	64.3	69.5	70.6
MFH6	10	70	72.8	64.2	69.1	70.3
MFH6	15	70	72.4	64.0	68.6	69.9
MFH6	20	70	71.9	63.7	68.0	69.4
KSH1	1	70	80.0	64.3	75.9	76.2
KSH1	5	70	79.1	64.2	75.0	75.3
KSH1	10	70	77.6	64.4	73.5	74.0
KSH1	15	70	76.3	64.4	72.2	72.9
KSH1	20	70	75.3	64.7	71.1	72.0
KSH1	25	70	74.5	65.0	70.2	71.3
KSH2	1	70	81.8	67.1	77.5	77.9
KSH2	5	70	80.7	67.2	76.4	76.9
KSH2	10	70	79.1	68.1	74.8	75.6
KSH2	15	70	77.8	68.4	73.4	74.6
KSH2	20	70	76.8	68.4	72.4	73.9
KSH2	25	70	76.0	68.6	71.5	73.3
PG1	1	70	72.8	66.4	67.9	70.2
PG1	5	70	72.8	67.1	68.1	70.6
PG1	10	70	72.9	68.6	68.4	71.5
PG1	15	70	72.9	68.8	68.6	71.7
PG1	20	70	72.8	68.7	68.4	71.6
PG1	25	70	72.7	68.9	68.3	71.6
PG2	1	70	72.2	66.2	67.1	69.7
PG2	5	70	72.6	67.0	67.8	70.4
PG2	10	70	72.7	68.6	68.1	71.4
PG2	15	70	72.7	68.7	68.2	71.5
PG2	20	70	72.6	68.7	68.2	71.5
PG2	25	70	72.5	68.7	68.1	71.4
PG3	1	70	70.1	64.8	65.0	67.9
PG3	5	70	70.2	65.6	65.2	68.4
PG3	10	70	70.4	67.2	65.8	69.6
PG3	15	70	70.4	67.3	65.9	69.7
PG3	20	70	70.5	67.5	65.9	69.8
PG3	25	70	70.5	67.5	66.0	69.8
CCS1	1	70	78.8	74.9	74.5	77.7
CCS1	3	70	78.9	76.6	74.1	78.5
CCS1	5	70	78.9	81.4	74.4	82.2
CCS2	1	70	81.2	75.2	76.2	78.7
CCS2	3	70	81.2	75.2	76.0	78.6
CCS2	5	70	81.4	84.0	76.9	84.8
CCS3	1	70	78.7	72.6	74.4	76.6
CCS3	3	70	79.7	75.5	75.4	78.5
CCS3	5	70	79.7	82.4	74.0	83.0

Table A4.2 Current and 2011 Traffic Noise Levels for Mitigation Scenario 1 (With Friction Course Only)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
CCS4	1	70	77.8	71.9	74.7	76.5
CCS4	3	70	78.2	74.1	75.1	77.6
CCS4	5	70	79.2	80.2	75.1	81.4
CCS5	1	70	77.8	71.1	75.0	76.5
CCS5	3	70	77.7	73.2	75.2	77.3
CCS5	5	70	78.8	78.8	75.1	80.3
SCWPS	1	65	69.2	63.5	65.5	67.6
SCWPS	3	65	69.3	63.6	65.6	67.7
SCWPS	5	65	69.5	64.5	66.0	68.3
KSB1	1	70	82.3	72.8	80.7	81.4
KSB1	3	70	82.3	74.8	80.4	81.5
KSB1	5	70	82.4	82.2	79.7	84.1
KSB1	7	70	82.3	83.1	78.9	84.5
KSB1	9	70	82.4	82.9	78.6	84.3
KSB2	1	70	79.6	71.6	77.3	78.3
KSB2	3	70	79.4	73.9	77.2	78.9
KSB2	5	70	79.9	79.8	77.0	81.6
KSB2	7	70	80.2	81.1	76.5	82.4
KSB2	9	70	80.2	81.0	76.6	82.3
KSB3	1	70	79.4	69.9	76.4	77.3
KSB3	3	70	80.0	71.8	76.3	77.6
KSB3	5	70	79.8	78.2	76.0	80.2
KSB3	7	70	80.0	79.6	75.8	81.1
KSB3	9	70	80.2	80.0	75.5	81.3
STPS1	1	65	82.8	82.4	77.4	83.6
STPS1	3	65	82.9	83.8	76.5	84.5
STPS1	5	65	82.9	83.6	77.2	84.5
STPS2	1	65	81.5	80.0	78.8	82.5
STPS2	3	65	81.3	81.4	78.2	83.1
STPS2	5	65	81.7	81.3	76.5	82.5
GLG1	1	70	79.4	72.1	77.5	78.6
GLG1	5	70	79.0	76.1	76.7	79.4
GLG1	10	70	79.5	78.1	75.7	80.1
GLG1	15	70	79.0	78.3	75.0	80.0
GLG1	20	70	78.6	78.1	74.2	79.6
GLG1	24	70	78.3	78.0	73.7	79.4
GLG2	1	70	82.4	72.1	81.4	81.9
GLG2	5	70	80.9	75.1	79.6	80.9
GLG2	10	70	80.2	77.4	78.0	80.7
GLG2	15	70	79.3	77.4	76.7	80.1
GLG2	20	70	78.7	77.2	75.7	79.5
GLG2	24	70	78.3	77.1	75.1	79.2
GRG	1	70	82.4	71.0	81.3	81.7
GRG	5	70	80.9	73.2	79.5	80.4
GRG	10	70	79.9	74.8	78.1	79.8
GRG	15	70	79.0	74.8	76.9	79.0
HG1	1	70	80.0	70.6	78.4	79.1
HG1	5	70	79.6	74.8	77.8	79.6
HG1	10	70	79.4	76.7	76.9	79.8
HG1	15	70	78.9	76.7	76.0	79.4
HG1	20	70	78.4	76.6	75.3	79.0
HG2	1	70	76.8	74.9	73.5	77.3
HG2	5	70	76.8	76.2	73.2	78.0
HG2	10	70	77.5	77.8	72.8	79.0
HG2	15	70	77.3	77.6	72.2	78.7
HG2	20	70	77.1	77.4	71.9	78.5
HG3	1	70	75.7	75.6	72.6	77.4
HG3	5	70	75.9	76.6	72.3	78.0
HG3	10	70	76.8	77.8	72.0	78.8
HG3	15	70	76.8	77.6	71.6	78.6

Table A4.2 Current and 2011 Traffic Noise Levels for Mitigation Scenario 1 (With Friction Course Only)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
HG3	20	70	76.5	77.3	71.5	78.3
HG4	1	70	78.1	79.4	70.3	79.9
HG4	5	70	78.3	80.9	69.8	81.2
HG4	10	70	79.0	81.7	69.7	82.0
HG4	15	70	78.9	81.5	69.7	81.8
HG4	20	70	78.7	81.0	69.8	81.3
HG5	1	70	77.6	76.3	66.3	76.7
HG5	5	70	77.8	80.0	65.4	80.1
HG5	10	70	78.4	81.3	65.8	81.4
HG5	15	70	78.3	81.3	65.9	81.4
HG5	20	70	78.2	80.9	66.3	81.0
HG6	1	70	78.1	75.7	65.2	76.1
HG6	5	70	78.3	80.5	65.8	80.6
HG6	10	70	78.7	82.2	66.1	82.3
HG6	15	70	78.6	82.1	66.1	82.2
HG6	20	70	78.5	81.7	66.3	81.8
LPL1	1	65	78.2	74.2	63.6	74.6
LPL1	5	65	78.4	79.2	65.5	79.4
LPL2	1	65	78.1	78.1	62.7	78.2
LPL2	3	65	78.2	77.0	65.0	77.3
LPL2	5	65	78.3	80.0	64.3	80.1
LPL3	1	65	75.9	75.4	60.8	75.5
LPL3	3	65	75.9	76.5	63.5	76.7
LPL3	5	65	75.9	74.6	63.0	74.9
CWG	1	65	75.0	71.0	65.8	72.1
CWG	3	65	75.1	69.9	66.8	71.6
CWG	5	65	75.1	71.0	66.8	72.4
VH1	2	70	71.7	67.5	66.1	69.9
VH2	2	70	74.1	71.8	68.2	73.4
SCH1	1	65	77.0	72.4	71.9	75.2
SCH1	3	65	77.0	72.7	71.8	75.3
SCH1	5	65	76.9	72.8	71.8	75.3
SCH2	1	65	78.3	73.1	73.9	76.5
SCH2	3	65	78.5	73.9	73.8	76.9
SCH2	5	65	78.4	74.0	73.6	76.8
TWV1	1	70	78.2	76.4	72.7	77.9
TWV1	3	70	78.1	76.5	72.8	78.0
TWV2	1	70	78.0	78.0	70.2	78.7
TWV2	3	70	79.0	79.1	70.4	79.6
TWV3	1	70	80.5	80.0	69.8	80.4
TWV3	3	70	80.5	80.2	69.4	80.5
TWV4	1	70	82.7	79.7	69.3	80.1
TWV4	3	70	82.7	81.7	69.8	82.0
TWV5	1	70	76.1	73.6	66.4	74.4
TWV5	3	70	77.5	76.6	67.0	77.1
TWV6	1	70	74.0	73.8	65.5	74.4
TWV6	3	70	75.6	74.7	66.6	75.3
TWV7	1	70	78.4	76.0	66.0	76.4
TWV7	3	70	79.3	77.0	65.0	77.3
TWV8	1	70	89.8	78.1	66.6	78.4
TWV8	3	70	88.8	80.0	64.6	80.1
VDV1	1	70	79.5	77.9	61.9	78.0
VDV1	3	70	79.3	77.8	62.1	77.9
VDV2	1	70	78.9	76.4	61.4	76.5
VDV2	3	70	78.7	76.2	61.6	76.3
STH	2	70	81.8	60.0	78.6	78.7
STH	5	70	81.1	59.8	77.9	78.0
STH	7	70	80.7	59.8	77.5	77.6

Table A4.3 Current and 2011 Traffic Noise Levels for Mitigation Scenario 2 (With Barriers and Friction Course)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
WWC1	1	70	84.2	57.9	84.1	84.1
WWC1	5	70	83.5	59.0	83.4	83.4
WWC1	10	70	82.8	59.0	82.7	82.7
WWC1	15	70	82.1	60.8	81.9	81.9
WWC1	20	70	81.4	61.7	81.3	81.3
WWC1	25	70	80.8	61.7	80.7	80.8
WWC1	29	70	80.4	62.5	80.3	80.4
WWC2	1	70	82.0	54.4	81.9	81.9
WWC2	5	70	81.4	54.8	81.3	81.3
WWC2	10	70	80.7	55.2	80.7	80.7
WWC2	15	70	80.1	57.5	80.0	80.0
WWC2	20	70	79.5	58.2	79.4	79.4
WWC2	25	70	78.9	58.2	78.8	78.8
WWC2	29	70	78.5	58.3	78.4	78.4
WWC3	1	70	84.9	59.0	84.8	84.8
WWC3	5	70	84.1	59.9	84.0	84.0
WWC3	10	70	83.3	60.0	83.2	83.2
WWC3	15	70	82.5	62.2	82.4	82.4
WWC3	20	70	81.8	62.5	81.7	81.8
WWC3	25	70	81.2	63.3	81.1	81.2
WWC3	29	70	80.8	63.3	80.7	80.8
WWC4	1	70	81.5	53.4	81.4	81.4
WWC4	5	70	81.1	53.8	81.0	81.0
WWC4	10	70	80.5	54.3	80.4	80.4
WWC4	15	70	79.8	57.2	79.7	79.7
WWC4	20	70	79.2	57.2	79.1	79.1
WWC4	25	70	78.6	57.3	78.5	78.5
WWC4	29	70	78.2	57.4	78.1	78.1
WWC5	1	70	85.7	58.9	85.6	85.6
WWC5	5	70	84.8	59.5	84.7	84.7
WWC5	10	70	83.8	60.2	83.7	83.7
WWC5	15	70	82.9	62.3	82.8	82.8
WWC5	20	70	82.2	62.6	82.1	82.1
WWC5	25	70	81.6	63.4	81.4	81.5
WWC5	29	70	81.1	63.3	81.0	81.1
WWC6	1	70	87.2	66.3	87.1	87.1
WWC6	5	70	85.7	66.2	85.6	85.6
WWC6	10	70	84.5	66.7	84.3	84.4
WWC6	15	70	83.5	67.0	83.3	83.4
WWC6	20	70	82.7	67.5	82.5	82.6
WWC6	25	70	82.1	67.8	81.8	82.0
WWC6	29	70	81.6	67.8	81.4	81.6
WWC7	1	70	84.6	66.5	84.4	84.5
WWC7	5	70	83.6	66.6	83.3	83.4
WWC7	10	70	82.6	67.4	82.3	82.4
WWC7	15	70	81.8	67.8	81.5	81.7
WWC7	20	70	81.1	68.5	80.7	81.0
WWC7	25	70	80.5	68.4	80.1	80.4
WWC7	29	70	80.1	68.6	79.7	80.0
HP1	1	70	83.8	65.3	83.1	83.2
HP1	5	70	83.2	65.0	82.5	82.6
HP1	10	70	82.5	66.2	82.0	82.1
HP1	15	70	81.8	66.1	81.4	81.5
HP1	20	70	81.1	66.3	80.7	80.9
HP1	23	70	80.9	66.3	80.5	80.7
HP2	1	70	83.7	67.3	81.8	82.0
HP2	5	70	83.2	68.5	81.7	81.9
HP2	10	70	82.5	69.8	81.4	81.7
HP2	15	70	81.8	70.8	80.7	81.1
HP2	20	70	81.2	70.9	80.2	80.7

Table A4.3 Current and 2011 Traffic Noise Levels for Mitigation Scenario 2 (With Barriers and Friction Course)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
HP2	23	70	80.9	71.1	79.9	80.4
HP3	1	70	78.5	67.1	76.0	76.5
HP3	5	70	78.2	68.4	76.2	76.9
HP3	10	70	78.3	71.9	76.3	77.6
HP3	15	70	77.9	72.0	75.7	77.2
HP3	20	70	77.5	71.9	75.7	77.2
HP3	23	70	77.3	71.9	75.4	77.0
SC1	1	70	83.8	68.0	79.7	80.0
SC1	5	70	83.4	70.2	80.9	81.3
SC1	10	70	83.2	72.9	80.5	81.2
SC1	15	70	82.6	73.4	80.7	81.4
SC1	20	70	82.0	73.1	80.1	80.9
SC1	23	70	81.7	73.1	79.9	80.7
SC2	1	70	84.6	68.6	79.4	79.7
SC2	5	70	83.9	72.5	80.9	81.5
SC2	10	70	83.3	74.7	80.6	81.6
SC2	15	70	82.7	74.9	80.5	81.6
SC2	20	70	82.1	74.7	80.0	81.1
SC2	23	70	81.8	74.7	79.8	81.0
SC3	1	70	81.5	68.4	77.2	77.7
SC3	5	70	81.1	72.5	78.3	79.3
SC3	10	70	80.4	74.4	77.9	79.5
SC3	15	70	79.8	74.4	77.0	78.9
SC3	20	70	79.3	74.1	76.6	78.5
SC3	23	70	79.0	73.9	76.6	78.5
VLP1	2	70	81.3	74.2	80.3	81.3
VLP2	2	70	74.2	67.6	73.1	74.2
VLP3	3	70	80.5	74.6	78.7	80.1
VLP4	3	70	81.5	75.8	80.1	81.5
STGS	1	65	73.5	66.0	72.1	73.1
STGS	3	65	73.8	67.5	72.4	73.6
STGS	5	65	74.0	68.0	71.7	73.2
STC1	1	55	75.2	67.6	73.8	74.7
STC1	3	55	75.3	67.8	74.0	74.9
STC2	1	55	79.6	70.6	78.3	79.0
STC2	2	55	79.6	71.2	78.3	79.1
STC3	1	55	79.6	70.2	78.3	78.9
STC3	2	55	79.7	70.5	78.4	79.1
CS	1	65	74.6	65.4	73.1	73.8
CS	3	65	74.8	66.5	73.5	74.3
CS	5	65	75.0	67.7	74.0	74.9
PRC1	1	65	78.2	68.7	76.9	77.5
PRC1	3	65	79.9	70.4	76.3	77.3
PRC2	1	65	77.4	68.7	76.4	77.1
PRC2	3	65	78.2	68.3	76.9	77.5
VM	2	70	79.0	70.9	77.6	78.4
MLV	1	70	76.1	66.4	74.4	75.0
MLV	3	70	76.8	68.8	75.2	76.1
OLV	1	70	76.9	67.3	74.8	75.5
OLV	3	70	77.6	69.6	75.6	76.6
OLV	5	70	78.0	70.3	76.4	77.4
MV	2	70	78.9	68.8	76.4	77.1
HL1	2	70	79.0	70.1	75.9	76.9
HL2	2	70	79.2	69.9	78.1	78.7
OTT1	2	70	81.8	70.6	76.7	77.7
OTT2	2	70	81.0	72.6	76.4	77.9
OTT3	2	70	79.5	72.2	74.7	76.6
KG	2	65	77.9	70.7	75.2	76.5
TLW1	1	70	79.3	72.1	74.8	76.7
TLW1	3	70	80.1	73.0	75.2	77.2

Table A4.3 Current and 2011 Traffic Noise Levels for Mitigation Scenario 2 (With Barriers and Friction Course)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
TLW2	1	70	78.1	71.4	74.0	75.9
TLW2	3	70	79.9	72.6	74.8	76.8
TLW3	1	70	81.2	72.7	77.0	78.4
TLW3	3	70	82.1	74.0	77.3	79.0
TLW4	1	70	80.0	71.8	75.1	76.8
TLW4	3	70	81.0	73.1	75.8	77.7
TLW5	2	70	78.4	71.5	73.7	75.7
TLW5	3	70	78.5	72.2	73.5	75.9
TLW6	1	70	80.7	73.0	75.8	77.6
TLW6	3	70	82.0	74.3	77.0	78.9
TLW7	1	70	79.0	72.2	74.7	76.6
TLW7	3	70	80.1	73.0	75.3	77.3
TLW8	2	70	78.3	71.3	73.8	75.7
TLW8	3	70	78.6	71.8	74.1	76.1
TLWK	1	65	77.3	70.6	73.1	75.0
TLWK	3	65	77.7	71.6	73.7	75.8
HA	1	55	80.3	72.1	75.6	77.2
HA	3	55	81.7	73.7	76.9	78.6
WWT	1	65	77.0	66.9	71.9	73.1
WWT	3	65	77.4	66.9	72.6	73.6
WWT	5	65	77.5	68.0	72.3	73.7
MTH1	1	70	71.4	64.0	67.1	68.8
MTH1	5	70	73.2	67.4	70.6	72.3
MTH1	10	70	77.6	70.2	75.1	76.3
MTH1	15	70	78.0	69.9	75.7	76.7
MTH1	20	70	77.9	71.0	75.5	76.8
MTH1	25	70	77.7	71.2	75.4	76.8
MTH2	1	70	74.9	66.1	69.5	71.1
MTH2	5	70	75.5	67.9	71.5	73.1
MTH2	10	70	77.3	69.2	73.1	74.6
MTH2	15	70	77.1	68.7	72.6	74.1
MTH2	20	70	77.1	70.0	72.6	74.5
MTH2	25	70	76.8	70.0	72.8	74.6
MTH3	1	70	73.5	66.5	68.9	70.9
MTH3	5	70	75.6	68.5	72.0	73.6
MTH3	10	70	77.0	68.2	73.7	74.8
MTH3	15	70	77.0	69.9	73.6	75.1
MTH3	20	70	77.0	69.5	74.0	75.3
MTH3	25	70	76.8	70.1	73.5	75.1
MTH4	1	70	77.2	67.7	71.3	72.9
MTH4	5	70	78.1	68.3	72.8	74.1
MTH4	10	70	78.4	67.2	72.8	73.9
MTH4	15	70	78.1	68.5	72.5	74.0
MTH4	20	70	77.9	69.0	72.5	74.1
MTH4	25	70	77.4	69.9	72.2	74.2
MTH5	1	70	80.5	66.0	72.3	73.2
MTH5	5	70	81.1	68.2	73.1	74.3
MTH5	10	70	80.7	71.3	72.7	75.1
MTH5	15	70	80.2	72.7	73.0	75.9
MTH5	20	70	79.6	74.4	73.4	76.9
MTH5	25	70	79.1	74.2	73.4	76.8
MFH1	1	70	75.5	57.9	64.2	65.1
MFH1	5	70	75.3	56.7	64.6	65.3
MFH1	10	70	75.8	62.6	64.0	66.4
MFH1	15	70	75.7	63.2	63.7	66.5
MFH1	20	70	75.2	67.0	66.1	69.6
MFH2	1	70	78.0	62.5	67.1	68.4
MFH2	5	70	78.1	70.0	70.3	73.2
MFH2	10	70	78.2	71.9	69.8	74.0
MFH2	15	70	78.0	72.4	69.6	74.2

Table A4.3 Current and 2011 Traffic Noise Levels for Mitigation Scenario 2 (With Barriers and Friction Course)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
MFH2	20	70	77.8	72.8	70.6	74.8
MFH3	1	70	77.6	68.4	68.4	71.4
MFH3	5	70	77.9	70.8	72.9	75.0
MFH3	10	70	77.8	72.6	72.6	75.6
MFH3	15	70	77.5	73.4	72.2	75.9
MFH3	20	70	77.3	73.3	72.0	75.7
MFH4	1	70	77.1	68.5	68.6	71.6
MFH4	5	70	77.0	68.9	71.9	73.7
MFH4	10	70	77.1	70.5	71.7	74.2
MFH4	15	70	76.8	71.7	71.2	74.5
MFH4	20	70	76.6	72.3	71.1	74.8
MFH5	1	70	80.0	69.3	73.9	75.2
MFH5	5	70	79.8	69.0	74.9	75.9
MFH5	10	70	79.5	69.0	74.3	75.4
MFH5	15	70	79.0	69.7	73.6	75.1
MFH5	20	70	78.4	70.8	73.0	75.0
MFH6	1	70	73.3	64.4	69.6	70.7
MFH6	5	70	73.1	64.3	69.5	70.6
MFH6	10	70	72.8	64.2	69.1	70.3
MFH6	15	70	72.4	64.0	68.6	69.9
MFH6	20	70	71.9	63.7	68.0	69.4
KSH1	1	70	80.0	64.3	75.9	76.2
KSH1	5	70	79.1	64.2	75.0	75.3
KSH1	10	70	77.6	64.4	73.5	74.0
KSH1	15	70	76.3	64.4	72.2	72.9
KSH1	20	70	75.3	64.6	71.1	72.0
KSH1	25	70	74.5	64.6	70.2	71.3
KSH2	1	70	81.8	66.7	77.5	77.8
KSH2	5	70	80.7	66.7	76.4	76.8
KSH2	10	70	79.1	66.9	74.8	75.5
KSH2	15	70	77.8	67.1	73.4	74.3
KSH2	20	70	76.8	67.0	72.4	73.5
KSH2	25	70	76.0	67.0	71.5	72.8
PG1	1	70	72.8	65.0	67.9	69.7
PG1	5	70	72.8	65.2	68.1	69.9
PG1	10	70	72.9	66.0	68.4	70.4
PG1	15	70	72.9	65.9	68.6	70.5
PG1	20	70	72.8	65.9	68.4	70.3
PG1	25	70	72.7	66.0	68.3	70.3
PG2	1	70	72.2	64.9	67.1	69.1
PG2	5	70	72.6	65.1	67.8	69.7
PG2	10	70	72.7	66.1	68.1	70.2
PG2	15	70	72.7	65.9	68.2	70.2
PG2	20	70	72.6	65.9	68.2	70.2
PG2	25	70	72.5	66.0	68.1	70.2
PG3	1	70	70.1	63.3	65.0	67.2
PG3	5	70	70.2	63.5	65.2	67.4
PG3	10	70	70.4	64.7	65.8	68.3
PG3	15	70	70.4	64.6	65.9	68.3
PG3	20	70	70.5	64.7	65.9	68.4
PG3	25	70	70.5	64.6	65.9	68.3
CCS1	1	70	78.8	73.9	74.5	77.2
CCS1	3	70	78.9	73.8	73.1	76.5
CCS1	5	70	78.9	74.0	67.3	74.8
CCS2	1	70	81.2	73.1	76.2	77.9
CCS2	3	70	81.2	65.3	75.7	76.1
CCS2	5	70	81.4	67.5	65.4	69.6
CCS3	1	70	78.7	67.9	74.4	75.3
CCS3	3	70	79.7	63.9	75.2	75.5
CCS3	5	70	79.7	68.8	69.6	72.2

Table A4.3 Current and 2011 Traffic Noise Levels for Mitigation Scenario 2 (With Barriers and Friction Course)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
CCS4	1	70	77.8	67.4	74.7	75.4
CCS4	3	70	78.2	64.7	75.0	75.4
CCS4	5	70	79.2	67.1	74.7	75.4
CCS5	1	70	77.8	65.8	75.0	75.5
CCS5	3	70	77.7	66.1	75.0	75.5
CCS5	5	70	78.8	65.7	74.9	75.4
SCWPS	1	65	69.2	61.0	63.5	65.4
SCWPS	3	65	69.3	60.4	64.2	65.7
SCWPS	5	65	69.5	60.9	65.4	66.7
KSB1	1	70	82.3	69.2	80.7	81.0
KSB1	3	70	82.3	69.0	80.4	80.7
KSB1	5	70	82.4	65.3	79.6	79.8
KSB1	7	70	82.3	69.2	78.5	79.0
KSB1	9	70	82.4	71.0	77.9	78.7
KSB2	1	70	79.6	67.1	77.3	77.7
KSB2	3	70	79.4	67.7	77.2	77.7
KSB2	5	70	79.9	65.4	76.9	77.2
KSB2	7	70	80.2	69.2	76.0	76.8
KSB2	9	70	80.2	70.9	75.7	76.9
KSB3	1	70	79.4	66.1	76.4	76.8
KSB3	3	70	80.0	67.1	76.3	76.8
KSB3	5	70	79.8	61.1	75.8	75.9
KSB3	7	70	80.0	64.0	75.4	75.7
KSB3	9	70	80.2	66.5	75.3	75.8
STPS1	1	65	82.8	61.8	77.3	77.4
STPS1	3	65	82.9	65.7	72.4	73.2
STPS1	5	65	82.9	68.7	72.4	73.9
STPS2	1	65	81.5	64.2	78.8	78.9
STPS2	3	65	81.3	66.4	77.9	78.2
STPS2	5	65	81.7	68.3	76.1	76.8
GLG1	1	70	79.4	66.9	77.5	77.9
GLG1	5	70	79.0	67.2	76.7	77.2
GLG1	10	70	79.5	68.1	75.6	76.3
GLG1	15	70	79.0	68.8	74.8	75.8
GLG1	20	70	78.6	69.4	74.0	75.3
GLG1	24	70	78.3	70.4	73.5	75.2
GLG2	1	70	82.4	67.0	81.4	81.6
GLG2	5	70	80.9	67.4	79.6	79.9
GLG2	10	70	80.2	67.9	78.0	78.4
GLG2	15	70	79.3	68.5	76.6	77.2
GLG2	20	70	78.7	69.0	75.6	76.5
GLG2	24	70	78.3	70.0	75.0	76.2
GRG	1	70	82.4	61.5	81.3	81.3
GRG	5	70	80.9	64.9	79.5	79.6
GRG	10	70	79.9	65.3	78.1	78.3
GRG	15	70	79.0	65.6	76.9	77.2
HG1	1	70	80.0	56.3	76.1	76.1
HG1	5	70	79.6	59.3	76.5	76.6
HG1	10	70	79.4	60.3	76.0	76.1
HG1	15	70	78.9	62.1	76.0	76.2
HG1	20	70	78.4	64.2	75.3	75.6
HG2	1	70	76.8	57.4	64.7	65.4
HG2	5	70	76.8	60.3	71.2	71.5
HG2	10	70	77.5	61.1	70.9	71.3
HG2	15	70	77.3	62.9	70.8	71.5
HG2	20	70	77.1	65.1	71.9	72.7
HG3	1	70	75.7	57.5	64.1	65.0
HG3	5	70	75.9	59.5	69.9	70.3
HG3	10	70	76.8	60.3	70.4	70.8
HG3	15	70	76.8	62.4	70.0	70.7

Table A4.3 Current and 2011 Traffic Noise Levels for Mitigation Scenario 2 (With Barriers and Friction Course)

NSR	Floor	L_{10} (1-hr), dB(A)				
		Assessment Criterion	Current Noise Level	Predicted Noise Level		
				New Roads	Existing Roads	Overall
HG3	20	70	76.5	65.9	71.2	72.3
HG4	1	70	78.1	62.9	58.0	64.1
HG4	5	70	78.3	66.9	68.4	70.7
HG4	10	70	79.0	69.7	68.5	72.2
HG4	15	70	78.9	71.5	69.0	73.4
HG4	20	70	78.7	72.1	69.6	74.0
HG5	1	70	77.6	63.8	57.4	64.7
HG5	5	70	77.8	67.0	64.8	69.0
HG5	10	70	78.4	70.2	64.4	71.2
HG5	15	70	78.3	71.8	65.0	72.6
HG5	20	70	78.2	72.2	65.7	73.1
HG6	1	70	78.1	63.6	62.8	66.2
HG6	5	70	78.3	67.8	64.5	69.5
HG6	10	70	78.7	71.8	64.4	72.5
HG6	15	70	78.6	73.4	65.2	74.0
HG6	20	70	78.5	73.6	66.0	74.3
LPL1	1	65	78.2	70.0	63.6	70.9
LPL1	5	65	78.4	67.1	55.9	67.4
LPL2	1	65	78.1	77.2	62.4	77.3
LPL2	3	65	78.2	73.5	64.4	74.0
LPL2	5	65	78.3	67.0	59.4	67.7
LPL3	1	65	75.9	74.4	60.8	74.6
LPL3	3	65	75.9	74.4	63.5	74.7
LPL3	5	65	75.9	65.9	62.8	67.6
CWG	1	65	75.0	66.6	65.8	69.2
CWG	3	65	75.1	66.8	66.8	69.8
CWG	5	65	75.1	67.7	66.7	70.2
VH1	2	70	71.7	67.7	66.7	70.2
VH2	2	70	74.1	71.0	68.2	72.8
SCH1	1	65	77.0	71.4	71.8	74.6
SCH1	3	65	77.0	71.6	71.8	74.7
SCH1	5	65	76.9	71.6	71.7	74.7
SCH2	1	65	78.3	70.1	73.8	75.3
SCH2	3	65	78.5	70.3	73.7	75.3
SCH2	5	65	78.4	70.2	73.5	75.2
TWV1	1	70	78.2	71.7	72.3	75.0
TWV1	3	70	78.1	72.8	72.4	75.6
TWV2	1	70	78.0	74.2	68.9	75.3
TWV2	3	70	79.0	76.0	69.2	76.8
TWV3	1	70	80.5	70.7	66.9	72.2
TWV3	3	70	80.5	75.3	64.4	75.6
TWV4	1	70	82.7	77.1	69.0	77.7
TWV4	3	70	82.7	69.4	64.0	70.5
TWV5	1	70	76.1	67.8	66.2	70.1
TWV5	3	70	77.5	69.7	65.1	71.0
TWV6	1	70	74.0	69.1	65.4	70.6
TWV6	3	70	75.6	70.9	66.5	72.2
TWV7	1	70	78.4	75.5	65.1	75.9
TWV7	3	70	79.3	74.4	62.8	74.7
TWV8	1	70	89.8	77.2	65.3	77.5
TWV8	3	70	88.8	74.6	63.8	74.9
VDV1	1	70	79.5	77.8	61.6	77.9
VDV1	3	70	79.3	77.7	61.8	77.8
VDV2	1	70	78.9	76.4	61.4	76.5
VDV2	3	70	78.7	76.2	61.6	76.3
STH	2	70	81.8	60.0	78.6	78.7
STH	5	70	81.1	59.8	77.9	78.0
STH	7	70	80.7	59.8	77.5	77.6

Table A4.4 Summary of Unmitigated and Mitigated Traffic Noise Levels in 2011

NSR	Floor	L10 (1-hr), dB(A)				
		Unmitigated	Mitigation Scenario 1		Mitigation Scenario 2	
		Noise Level	Noise Level	Reduction	Noise Level	Reduction
WWC1	1	84.1	84.1	0.0	84.1	0.0
WWC1	5	83.4	83.4	0.0	83.4	0.0
WWC1	10	82.7	82.7	0.0	82.7	0.0
WWC1	15	82.1	82.0	0.1	81.9	0.2
WWC1	20	81.4	81.4	0.0	81.3	0.1
WWC1	25	80.8	80.8	0.0	80.8	0.0
WWC1	29	80.5	80.4	0.1	80.4	0.1
WWC2	1	81.9	81.9	0.0	81.9	0.0
WWC2	5	81.3	81.3	0.0	81.3	0.0
WWC2	10	80.7	80.7	0.0	80.7	0.0
WWC2	15	80.1	80.0	0.1	80.0	0.1
WWC2	20	79.5	79.4	0.1	79.4	0.1
WWC2	25	78.9	78.8	0.1	78.8	0.1
WWC2	29	78.5	78.4	0.1	78.4	0.1
WWC3	1	84.8	84.8	0.0	84.8	0.0
WWC3	5	84.0	84.0	0.0	84.0	0.0
WWC3	10	83.3	83.2	0.1	83.2	0.1
WWC3	15	82.5	82.5	0.0	82.4	0.1
WWC3	20	81.8	81.8	0.0	81.8	0.0
WWC3	25	81.3	81.2	0.1	81.2	0.1
WWC3	29	80.9	80.8	0.1	80.8	0.1
WWC4	1	81.4	81.4	0.0	81.4	0.0
WWC4	5	81.0	81.0	0.0	81.0	0.0
WWC4	10	80.4	80.4	0.0	80.4	0.0
WWC4	15	79.8	79.7	0.1	79.7	0.1
WWC4	20	79.2	79.1	0.1	79.1	0.1
WWC4	25	78.6	78.5	0.1	78.5	0.1
WWC4	29	78.2	78.1	0.1	78.1	0.1
WWC5	1	85.6	85.6	0.0	85.6	0.0
WWC5	5	84.7	84.7	0.0	84.7	0.0
WWC5	10	83.8	83.7	0.1	83.7	0.1
WWC5	15	82.9	82.9	0.0	82.8	0.1
WWC5	20	82.2	82.2	0.0	82.1	0.1
WWC5	25	81.6	81.5	0.1	81.5	0.1
WWC5	29	81.2	81.1	0.1	81.1	0.1
WWC6	1	87.2	87.2	0.0	87.1	0.1
WWC6	5	85.7	85.7	0.0	85.6	0.1
WWC6	10	84.5	84.4	0.1	84.4	0.1
WWC6	15	83.5	83.5	0.0	83.4	0.1
WWC6	20	82.8	82.7	0.1	82.6	0.2
WWC6	25	82.1	82.1	0.0	82.0	0.1
WWC6	29	81.8	81.7	0.1	81.6	0.2
WWC7	1	84.6	84.6	0.0	84.5	0.1
WWC7	5	83.6	83.5	0.1	83.4	0.2
WWC7	10	82.6	82.6	0.0	82.4	0.2
WWC7	15	81.9	81.8	0.1	81.7	0.2
WWC7	20	81.3	81.2	0.1	81.0	0.3
WWC7	25	80.7	80.6	0.1	80.4	0.3
WWC7	29	80.3	80.2	0.1	80.0	0.3
HP1	1	83.8	83.8	0.0	83.2	0.6
HP1	5	83.2	83.2	0.0	82.6	0.6
HP1	10	82.5	82.4	0.1	82.1	0.4
HP1	15	81.9	81.8	0.1	81.5	0.4
HP1	20	81.2	81.2	0.0	80.9	0.3
HP1	23	81.0	81.0	0.0	80.7	0.3
HP2	1	83.7	83.7	0.0	82.0	1.7

Table A4.4 Summary of Unmitigated and Mitigated Traffic Noise Levels in 2011

NSR	Floor	L10 (1-hr), dB(A)				
		Unmitigated	Mitigation Scenario 1		Mitigation Scenario 2	
		Noise Level	Noise Level	Reduction	Noise Level	Reduction
HP2	5	83.2	83.2	0.0	81.9	1.3
HP2	10	82.6	82.5	0.1	81.7	0.9
HP2	15	82.0	81.9	0.1	81.1	0.9
HP2	20	81.5	81.4	0.1	80.7	0.8
HP2	23	81.2	81.1	0.1	80.4	0.8
HP3	1	77.8	77.7	0.1	76.5	1.3
HP3	5	77.7	77.7	0.0	76.9	0.8
HP3	10	78.3	78.2	0.1	77.6	0.7
HP3	15	78.1	77.9	0.2	77.2	0.9
HP3	20	78.0	77.9	0.1	77.2	0.8
HP3	23	77.9	77.7	0.2	77.0	0.9
SC1	1	83.9	83.9	0.0	80.0	3.9
SC1	5	83.4	83.3	0.1	81.3	2.1
SC1	10	83.1	83.0	0.1	81.2	1.9
SC1	15	82.9	82.8	0.1	81.4	1.5
SC1	20	82.3	82.2	0.1	80.9	1.4
SC1	23	82.0	81.9	0.1	80.7	1.3
SC2	1	83.6	83.5	0.1	79.7	3.9
SC2	5	83.5	83.4	0.1	81.5	2.0
SC2	10	83.3	83.2	0.1	81.6	1.7
SC2	15	83.0	82.8	0.2	81.6	1.4
SC2	20	82.4	82.3	0.1	81.1	1.3
SC2	23	82.2	82.1	0.1	81.0	1.2
SC3	1	80.1	80.0	0.1	77.7	2.4
SC3	5	80.5	80.4	0.1	79.3	1.2
SC3	10	80.4	80.2	0.2	79.5	0.9
SC3	15	80.0	79.8	0.2	78.9	1.1
SC3	20	79.5	79.3	0.2	78.5	1.0
SC3	23	79.5	79.2	0.3	78.5	1.0
VLP1	2	81.5	81.4	0.1	81.3	0.2
VLP2	2	74.2	74.2	0.0	74.2	0.0
VLP3	3	80.4	80.4	0.0	80.1	0.3
VLP4	3	82.1	81.9	0.2	81.5	0.6
STGS	1	73.2	73.1	0.1	73.1	0.1
STGS	3	73.8	73.7	0.1	73.6	0.2
STGS	5	73.5	73.4	0.1	73.2	0.3
STC1	1	75.1	75.0	0.1	74.7	0.4
STC1	3	75.3	75.2	0.1	74.9	0.4
STC2	1	79.1	79.0	0.1	79.0	0.1
STC2	2	79.3	79.1	0.2	79.1	0.2
STC3	1	79.3	78.9	0.4	78.9	0.4
STC3	2	79.5	79.1	0.4	79.1	0.4
CS	1	74.3	73.8	0.5	73.8	0.5
CS	3	74.9	74.3	0.6	74.3	0.6
CS	5	75.8	75.0	0.8	74.9	0.9
PRC1	1	78.6	78.3	0.3	77.5	1.1
PRC1	3	80.9	80.6	0.3	77.3	3.6
PRC2	1	77.5	77.4	0.1	77.1	0.4
PRC2	3	78.4	78.2	0.2	77.5	0.9
VM	2	79.2	78.8	0.4	78.4	0.8
MLV	1	75.8	75.6	0.2	75.0	0.8
MLV	3	77.5	77.2	0.3	76.1	1.4
OLV	1	76.5	76.1	0.4	75.5	1.0
OLV	3	78.3	77.9	0.4	76.6	1.7
OLV	5	78.6	78.3	0.3	77.4	1.2
MV	2	79.2	78.9	0.3	77.1	2.1

Table A4.4 Summary of Unmitigated and Mitigated Traffic Noise Levels in 2011

NSR	Floor	L10 (1-hr), dB(A)				
		Unmitigated	Mitigation Scenario 1		Mitigation Scenario 2	
		Noise Level	Noise Level	Reduction	Noise Level	Reduction
HL1	2	79.5	79.1	0.4	76.9	2.6
HL2	2	79.9	79.6	0.3	78.7	1.2
OTT1	2	81.2	80.6	0.6	77.7	3.5
OTT2	2	80.4	79.4	1.0	77.9	2.5
OTT3	2	78.9	77.7	1.2	76.6	2.3
KG	2	77.9	77.0	0.9	76.5	1.4
TLW1	1	78.1	77.0	1.1	76.7	1.4
TLW1	3	79.1	77.9	1.2	77.2	1.9
TLW2	1	77.6	76.4	1.2	75.9	1.7
TLW2	3	78.7	77.5	1.2	76.8	1.9
TLW3	1	79.3	78.5	0.8	78.4	0.9
TLW3	3	80.2	79.1	1.1	79.0	1.2
TLW4	1	78.0	76.8	1.2	76.8	1.2
TLW4	3	79.1	77.8	1.3	77.7	1.4
TLW5	2	77.3	75.9	1.4	75.7	1.6
TLW5	3	77.6	76.0	1.6	75.9	1.7
TLW6	1	78.9	77.7	1.2	77.6	1.3
TLW6	3	80.2	78.9	1.3	78.9	1.3
TLW7	1	77.9	76.6	1.3	76.6	1.3
TLW7	3	78.6	77.3	1.3	77.3	1.3
TLW8	2	77.2	75.9	1.3	75.7	1.5
TLW8	3	77.6	76.2	1.4	76.1	1.5
TLWK	1	76.6	75.3	1.3	75.0	1.6
TLWK	3	77.4	75.9	1.5	75.8	1.6
HA	1	78.2	77.2	1.0	77.2	1.0
HA	3	79.7	78.6	1.1	78.6	1.1
WWT	1	74.0	73.3	0.7	73.1	0.9
WWT	3	74.5	73.8	0.7	73.6	0.9
WWT	5	74.8	73.7	1.1	73.7	1.1
MTH1	1	71.9	69.9	2.0	68.8	3.1
MTH1	5	74.9	73.1	1.8	72.3	2.6
MTH1	10	79.6	77.8	1.8	76.3	3.3
MTH1	15	80.3	78.5	1.8	76.7	3.6
MTH1	20	80.0	78.3	1.7	76.8	3.2
MTH1	25	80.1	78.2	1.9	76.8	3.3
MTH2	1	74.6	72.6	2.0	71.1	3.5
MTH2	5	77.5	75.3	2.2	73.1	4.4
MTH2	10	80.7	78.1	2.6	74.6	6.1
MTH2	15	81.0	78.5	2.5	74.1	6.9
MTH2	20	80.6	78.1	2.5	74.5	6.1
MTH2	25	80.7	78.2	2.5	74.6	6.1
MTH3	1	74.2	72.1	2.1	70.9	3.3
MTH3	5	76.9	74.9	2.0	73.6	3.3
MTH3	10	80.5	78.0	2.5	74.8	5.7
MTH3	15	80.7	78.2	2.5	75.1	5.6
MTH3	20	80.1	77.9	2.2	75.3	4.8
MTH3	25	80.3	77.9	2.4	75.1	5.2
MTH4	1	76.3	74.3	2.0	72.9	3.4
MTH4	5	79.5	77.0	2.5	74.1	5.4
MTH4	10	82.0	79.2	2.8	73.9	8.1
MTH4	15	81.7	79.0	2.7	74.0	7.7
MTH4	20	81.6	78.9	2.7	74.1	7.5
MTH4	25	81.2	78.6	2.6	74.2	7.0
MTH5	1	77.3	75.4	1.9	73.2	4.1
MTH5	5	82.5	80.1	2.4	74.3	8.2
MTH5	10	83.8	81.1	2.7	75.1	8.7

Table A4.4 Summary of Unmitigated and Mitigated Traffic Noise Levels in 2011

NSR	Floor	L10 (1-hr), dB(A)				
		Unmitigated	Mitigation Scenario 1		Mitigation Scenario 2	
		Noise Level	Noise Level	Reduction	Noise Level	Reduction
MTH5	15	83.2	80.6	2.6	75.9	7.3
MTH5	20	83.0	80.4	2.6	76.9	6.1
MTH5	25	82.4	79.9	2.5	76.8	5.6
MFH1	1	73.4	70.7	2.7	65.1	8.3
MFH1	5	77.8	75.0	2.8	65.3	12.5
MFH1	10	79.1	76.1	3.0	66.4	12.7
MFH1	15	78.9	76.0	2.9	66.5	12.4
MFH1	20	78.9	76.0	2.9	69.6	9.3
MFH2	1	74.9	72.6	2.3	68.4	6.5
MFH2	5	79.5	77.2	2.3	73.2	6.3
MFH2	10	80.6	78.1	2.5	74.0	6.6
MFH2	15	80.5	78.0	2.5	74.2	6.3
MFH2	20	80.2	77.7	2.5	74.8	5.4
MFH3	1	73.4	72.1	1.3	71.4	2.0
MFH3	5	77.3	76.0	1.3	75.0	2.3
MFH3	10	78.0	76.4	1.6	75.6	2.4
MFH3	15	77.7	76.2	1.5	75.9	1.8
MFH3	20	77.5	76.0	1.5	75.7	1.8
MFH4	1	73.7	72.3	1.4	71.6	2.1
MFH4	5	76.0	74.8	1.2	73.7	2.3
MFH4	10	77.7	75.9	1.8	74.2	3.5
MFH4	15	77.7	75.9	1.8	74.5	3.2
MFH4	20	77.5	75.8	1.7	74.8	2.7
MFH5	1	75.6	75.3	0.3	75.2	0.4
MFH5	5	76.4	76.2	0.2	75.9	0.5
MFH5	10	76.7	76.2	0.5	75.4	1.3
MFH5	15	76.4	75.8	0.6	75.1	1.3
MFH5	20	76.2	75.6	0.6	75.0	1.2
MFH6	1	70.7	70.7	0.0	70.7	0.0
MFH6	5	70.6	70.6	0.0	70.6	0.0
MFH6	10	70.3	70.3	0.0	70.3	0.0
MFH6	15	69.9	69.9	0.0	69.9	0.0
MFH6	20	69.4	69.4	0.0	69.4	0.0
KSH1	1	76.2	76.2	0.0	76.2	0.0
KSH1	5	75.4	75.3	0.1	75.3	0.1
KSH1	10	74.0	74.0	0.0	74.0	0.0
KSH1	15	72.9	72.9	0.0	72.9	0.0
KSH1	20	72.0	72.0	0.0	72.0	0.0
KSH1	25	71.3	71.3	0.0	71.3	0.0
KSH2	1	77.9	77.9	0.0	77.8	0.1
KSH2	5	77.0	76.9	0.1	76.8	0.2
KSH2	10	75.9	75.6	0.3	75.5	0.4
KSH2	15	74.9	74.6	0.3	74.3	0.6
KSH2	20	74.2	73.9	0.3	73.5	0.7
KSH2	25	73.7	73.3	0.4	72.8	0.9
PG1	1	71.1	70.2	0.9	69.7	1.4
PG1	5	71.6	70.6	1.0	69.9	1.7
PG1	10	73.0	71.5	1.5	70.4	2.6
PG1	15	73.2	71.7	1.5	70.5	2.7
PG1	20	73.0	71.6	1.4	70.3	2.7
PG1	25	73.1	71.6	1.5	70.3	2.8
PG2	1	70.6	69.7	0.9	69.1	1.5
PG2	5	71.5	70.4	1.1	69.7	1.8
PG2	10	72.9	71.4	1.5	70.2	2.7
PG2	15	73.0	71.5	1.5	70.2	2.8
PG2	20	73.0	71.5	1.5	70.2	2.8

Table A4.4 Summary of Unmitigated and Mitigated Traffic Noise Levels in 2011

NSR	Floor	L10 (1-hr), dB(A)				
		Unmitigated Noise Level	Mitigation Scenario 1		Mitigation Scenario 2	
			Noise Level	Reduction	Noise Level	Reduction
PG2	25	73.0	71.4	1.6	70.2	2.8
PG3	1	69.1	67.9	1.2	67.2	1.9
PG3	5	69.6	68.4	1.2	67.4	2.2
PG3	10	71.3	69.6	1.7	68.3	3.0
PG3	15	71.4	69.7	1.7	68.3	3.1
PG3	20	71.5	69.8	1.7	68.4	3.1
PG3	25	71.6	69.8	1.8	68.3	3.3
CCS1	1	79.5	77.7	1.8	77.2	2.3
CCS1	3	80.8	78.5	2.3	76.5	4.3
CCS1	5	85.2	82.2	3.0	74.8	10.4
CCS2	1	80.4	78.7	1.7	77.9	2.5
CCS2	3	80.5	78.6	1.9	76.1	4.4
CCS2	5	87.8	84.8	3.0	69.6	18.2
CCS3	1	78.2	76.6	1.6	75.3	2.9
CCS3	3	80.5	78.5	2.0	75.5	5.0
CCS3	5	86.1	83.0	3.1	72.2	13.9
CCS4	1	78.1	76.5	1.6	75.4	2.7
CCS4	3	79.5	77.6	1.9	75.4	4.1
CCS4	5	84.2	81.4	2.8	75.4	8.8
CCS5	1	77.8	76.5	1.3	75.5	2.3
CCS5	3	79.0	77.3	1.7	75.5	3.5
CCS5	5	83.0	80.3	2.7	75.4	7.6
SCWPS	1	68.9	67.6	1.3	65.4	3.5
SCWPS	3	69.2	67.7	1.5	65.7	3.5
SCWPS	5	69.8	68.3	1.5	66.7	3.1
KSB1	1	82.0	81.4	0.6	81.0	1.0
KSB1	3	82.4	81.5	0.9	80.7	1.7
KSB1	5	86.7	84.1	2.6	79.8	6.9
KSB1	7	87.2	84.5	2.7	79.0	8.2
KSB1	9	87.0	84.3	2.7	78.7	8.3
KSB2	1	79.3	78.3	1.0	77.7	1.6
KSB2	3	80.3	78.9	1.4	77.7	2.6
KSB2	5	84.1	81.6	2.5	77.2	6.9
KSB2	7	85.1	82.4	2.7	76.8	8.3
KSB2	9	85.1	82.3	2.8	76.9	8.2
KSB3	1	78.0	77.3	0.7	76.8	1.2
KSB3	3	78.8	77.6	1.2	76.8	2.0
KSB3	5	82.7	80.2	2.5	75.9	6.8
KSB3	7	83.6	81.1	2.5	75.7	7.9
KSB3	9	83.7	81.3	2.4	75.8	7.9
STPS1	1	85.7	83.6	2.1	77.4	8.3
STPS1	3	86.8	84.5	2.3	73.2	13.6
STPS1	5	86.8	84.5	2.3	73.9	12.9
STPS2	1	82.7	82.5	0.2	78.9	3.8
STPS2	3	83.9	83.1	0.8	78.2	5.7
STPS2	5	83.6	82.5	1.1	76.8	6.8
GLG1	1	78.8	78.6	0.2	77.9	0.9
GLG1	5	79.8	79.4	0.4	77.2	2.6
GLG1	10	81.1	80.1	1.0	76.3	4.8
GLG1	15	81.0	80.0	1.0	75.8	5.2
GLG1	20	80.8	79.6	1.2	75.3	5.5
GLG1	24	80.5	79.4	1.1	75.2	5.3
GLG2	1	81.9	81.9	0.0	81.6	0.3
GLG2	5	81.1	80.9	0.2	79.9	1.2
GLG2	10	81.2	80.7	0.5	78.4	2.8
GLG2	15	80.6	80.1	0.5	77.2	3.4

Table A4.4 Summary of Unmitigated and Mitigated Traffic Noise Levels in 2011

NSR	Floor	L10 (1-hr), dB(A)				
		Unmitigated	Mitigation Scenario 1		Mitigation Scenario 2	
		Noise Level	Noise Level	Reduction	Noise Level	Reduction
GLG2	20	80.2	79.5	0.7	76.5	3.7
GLG2	24	79.9	79.2	0.7	76.2	3.7
GRG	1	81.7	81.7	0.0	81.3	0.4
GRG	5	80.5	80.4	0.1	79.6	0.9
GRG	10	80.1	79.8	0.3	78.3	1.8
GRG	15	79.4	79.0	0.4	77.2	2.2
HG1	1	79.2	79.1	0.1	76.1	3.1
HG1	5	79.7	79.6	0.1	76.6	3.1
HG1	10	80.3	79.8	0.5	76.1	4.2
HG1	15	80.0	79.4	0.6	76.2	3.8
HG1	20	79.7	79.0	0.7	75.6	4.1
HG2	1	77.4	77.3	0.1	65.4	12.0
HG2	5	78.2	78.0	0.2	71.5	6.7
HG2	10	79.6	79.0	0.6	71.3	8.3
HG2	15	79.5	78.7	0.8	71.5	8.0
HG2	20	79.4	78.5	0.9	72.7	6.7
HG3	1	77.6	77.4	0.2	65.0	12.6
HG3	5	78.3	78.0	0.3	70.3	8.0
HG3	10	79.5	78.8	0.7	70.8	8.7
HG3	15	79.4	78.6	0.8	70.7	8.7
HG3	20	79.2	78.3	0.9	72.3	6.9
HG4	1	80.0	79.9	0.1	64.1	15.9
HG4	5	81.4	81.2	0.2	70.7	10.7
HG4	10	82.3	82.0	0.3	72.2	10.1
HG4	15	82.2	81.8	0.4	73.4	8.8
HG4	20	81.9	81.3	0.6	74.0	7.9
HG5	1	77.0	76.7	0.3	64.7	12.3
HG5	5	80.4	80.1	0.3	69.0	11.4
HG5	10	81.9	81.4	0.5	71.2	10.7
HG5	15	81.9	81.4	0.5	72.6	9.3
HG5	20	81.5	81.0	0.5	73.1	8.4
HG6	1	76.4	76.1	0.3	66.2	10.2
HG6	5	80.9	80.6	0.3	69.5	11.4
HG6	10	82.6	82.3	0.3	72.5	10.1
HG6	15	82.5	82.2	0.3	74.0	8.5
HG6	20	82.2	81.8	0.4	74.3	7.9
LPL1	1	74.9	74.6	0.3	70.9	4.0
LPL1	5	79.6	79.4	0.2	67.4	12.2
LPL2	1	78.2	78.2	0.0	77.3	0.9
LPL2	3	77.5	77.3	0.2	74.0	3.5
LPL2	5	80.2	80.1	0.1	67.7	12.5
LPL3	1	75.6	75.5	0.1	74.6	1.0
LPL3	3	77.0	76.7	0.3	74.7	2.3
LPL3	5	75.4	74.9	0.5	67.6	7.8
CWG	1	72.3	72.1	0.2	69.2	3.1
CWG	3	71.9	71.6	0.3	69.8	2.1
CWG	5	72.8	72.4	0.4	70.2	2.6
VH1	2	70.2	69.9	0.3	69.6	0.6
VH2	2	74.1	73.4	0.7	72.8	1.3
SCH1	1	76.2	75.2	1.0	74.6	1.6
SCH1	3	76.6	75.3	1.3	74.7	1.9
SCH1	5	76.6	75.3	1.3	74.7	1.9
SCH2	1	78.0	76.5	1.5	75.3	2.7
SCH2	3	78.4	76.9	1.5	75.3	3.1
SCH2	5	78.4	76.8	1.6	75.2	3.2
TWV1	1	79.8	77.9	1.9	75.0	4.8

Table A4.4 Summary of Unmitigated and Mitigated Traffic Noise Levels in 2011

NSR	Floor	L10 (1-hr), dB(A)				
		Unmitigated	Mitigation Scenario 1		Mitigation Scenario 2	
		Noise Level	Noise Level	Reduction	Noise Level	Reduction
TWV1	3	79.9	78.0	1.9	75.6	4.3
TWV2	1	80.5	78.7	1.8	75.3	5.2
TWV2	3	81.5	79.6	1.9	76.8	4.7
TWV3	1	82.3	80.4	1.9	72.2	10.1
TWV3	3	82.3	80.5	1.8	75.6	6.7
TWV4	1	81.6	80.1	1.5	77.7	3.9
TWV4	3	84.3	82.0	2.3	70.5	13.8
TWV5	1	76.4	74.4	2.0	70.1	6.3
TWV5	3	78.2	77.1	1.1	71.0	7.2
TWV6	1	76.0	74.4	1.6	70.6	5.4
TWV6	3	76.7	75.3	1.4	72.2	4.5
TWV7	1	76.9	76.4	0.5	75.9	1.0
TWV7	3	78.6	77.3	1.3	74.7	3.9
TWV8	1	79.0	78.4	0.6	77.5	1.5
TWV8	3	80.4	80.1	0.3	74.9	5.5
VDV1	1	78.3	78.0	0.3	77.9	0.4
VDV1	3	78.2	77.9	0.3	77.8	0.4
VDV2	1	76.7	76.5	0.2	76.5	0.2
VDV2	3	76.6	76.3	0.3	76.3	0.3
STH	2	78.7	78.7	0.0	78.7	0.0
STH	5	78.0	78.0	0.0	78.0	0.0
STH	7	77.6	77.6	0.0	77.6	0.0

Table A4.5 Eligibility Assessment for Indirect Technical Remedies

NSR	Floor	L_{10} (1-hr), dB(A)					Eligibility Test			Eligible
		Assessment Criterion (a)	Current Noise Level (b)	Predicted Noise Level			(d) > (a)	(d) - (b) ≥ 1.0 dB(A)	(d) - (c) ≥ 1.0 dB(A)	Yes/No
				New Roads	Existing Roads (c)	Overall (d)				
WWC1	1	70	84.2	57.9	84.1	84.1	Yes	No	No	No
WWC1	5	70	83.5	59.0	83.4	83.4	Yes	No	No	No
WWC1	10	70	82.8	59.0	82.7	82.7	Yes	No	No	No
WWC1	15	70	82.1	60.8	81.9	81.9	Yes	No	No	No
WWC1	20	70	81.4	61.7	81.3	81.3	Yes	No	No	No
WWC1	25	70	80.8	61.7	80.7	80.8	Yes	No	No	No
WWC1	29	70	80.4	62.5	80.3	80.4	Yes	No	No	No
WWC2	1	70	82.0	54.4	81.9	81.9	Yes	No	No	No
WWC2	5	70	81.4	54.8	81.3	81.3	Yes	No	No	No
WWC2	10	70	80.7	55.2	80.7	80.7	Yes	No	No	No
WWC2	15	70	80.1	57.5	80.0	80.0	Yes	No	No	No
WWC2	20	70	79.5	58.2	79.4	79.4	Yes	No	No	No
WWC2	25	70	78.9	58.2	78.8	78.8	Yes	No	No	No
WWC2	29	70	78.5	58.3	78.4	78.4	Yes	No	No	No
WWC3	1	70	84.9	59.0	84.8	84.8	Yes	No	No	No
WWC3	5	70	84.1	59.9	84.0	84.0	Yes	No	No	No
WWC3	10	70	83.3	60.0	83.2	83.2	Yes	No	No	No
WWC3	15	70	82.5	62.2	82.4	82.4	Yes	No	No	No
WWC3	20	70	81.8	62.5	81.7	81.8	Yes	No	No	No
WWC3	25	70	81.2	63.3	81.1	81.2	Yes	No	No	No
WWC3	29	70	80.8	63.3	80.7	80.8	Yes	No	No	No
WWC4	1	70	81.5	53.4	81.4	81.4	Yes	No	No	No
WWC4	5	70	81.1	53.8	81.0	81.0	Yes	No	No	No
WWC4	10	70	80.5	54.3	80.4	80.4	Yes	No	No	No
WWC4	15	70	79.8	57.2	79.7	79.7	Yes	No	No	No
WWC4	20	70	79.2	57.2	79.1	79.1	Yes	No	No	No
WWC4	25	70	78.6	57.3	78.5	78.5	Yes	No	No	No
WWC4	29	70	78.2	57.4	78.1	78.1	Yes	No	No	No
WWC5	1	70	85.7	58.9	85.6	85.6	Yes	No	No	No
WWC5	5	70	84.8	59.5	84.7	84.7	Yes	No	No	No
WWC5	10	70	83.8	60.2	83.7	83.7	Yes	No	No	No
WWC5	15	70	82.9	62.3	82.8	82.8	Yes	No	No	No
WWC5	20	70	82.2	62.6	82.1	82.1	Yes	No	No	No
WWC5	25	70	81.6	63.4	81.4	81.5	Yes	No	No	No
WWC5	29	70	81.1	63.3	81.0	81.1	Yes	No	No	No
WWC6	1	70	87.2	66.3	87.1	87.1	Yes	No	No	No
WWC6	5	70	85.7	66.2	85.6	85.6	Yes	No	No	No
WWC6	10	70	84.5	66.7	84.3	84.4	Yes	No	No	No
WWC6	15	70	83.5	67.0	83.3	83.4	Yes	No	No	No
WWC6	20	70	82.7	67.5	82.5	82.6	Yes	No	No	No
WWC6	25	70	82.1	67.8	81.8	82.0	Yes	No	No	No
WWC6	29	70	81.6	67.8	81.4	81.6	Yes	No	No	No
WWC7	1	70	84.6	66.5	84.4	84.5	Yes	No	No	No
WWC7	5	70	83.6	66.6	83.3	83.4	Yes	No	No	No
WWC7	10	70	82.6	67.4	82.3	82.4	Yes	No	No	No
WWC7	15	70	81.8	67.8	81.5	81.7	Yes	No	No	No
WWC7	20	70	81.1	68.5	80.7	81.0	Yes	No	No	No
WWC7	25	70	80.5	68.4	80.1	80.4	Yes	No	No	No
WWC7	29	70	80.1	68.6	79.7	80.0	Yes	No	No	No
HP1	1	70	83.8	65.3	83.1	83.2	Yes	No	No	No
HP1	5	70	83.2	65.0	82.5	82.6	Yes	No	No	No
HP1	10	70	82.5	66.2	82.0	82.1	Yes	No	No	No
HP1	15	70	81.8	66.1	81.4	81.5	Yes	No	No	No
HP1	20	70	81.1	66.3	80.7	80.9	Yes	No	No	No
HP1	23	70	80.9	66.3	80.5	80.7	Yes	No	No	No
HP2	1	70	83.7	67.3	81.8	82.0	Yes	No	No	No
HP2	5	70	83.2	68.5	81.7	81.9	Yes	No	No	No
HP2	10	70	82.5	69.8	81.4	81.7	Yes	No	No	No
HP2	15	70	81.8	70.8	80.7	81.1	Yes	No	No	No
HP2	20	70	81.2	70.9	80.2	80.7	Yes	No	No	No
HP2	23	70	80.9	71.1	79.9	80.4	Yes	No	No	No
HP3	1	70	78.5	67.1	76.0	76.5	Yes	No	No	No
HP3	5	70	78.2	68.4	76.2	76.9	Yes	No	No	No
HP3	10	70	78.3	71.9	76.3	77.6	Yes	No	Yes	No
HP3	15	70	77.9	72.0	75.7	77.2	Yes	No	Yes	No
HP3	20	70	77.5	71.9	75.7	77.2	Yes	No	Yes	No
HP3	23	70	77.3	71.9	75.4	77.0	Yes	No	Yes	No
SC1	1	70	83.8	68.0	79.7	80.0	Yes	No	No	No
SC1	5	70	83.4	70.2	80.9	81.3	Yes	No	No	No
SC1	10	70	83.2	72.9	80.5	81.2	Yes	No	No	No
SC1	15	70	82.6	73.4	80.7	81.4	Yes	No	No	No
SC1	20	70	82.0	73.1	80.1	80.9	Yes	No	No	No
SC1	23	70	81.7	73.1	79.9	80.7	Yes	No	No	No
SC2	1	70	84.6	68.6	79.4	79.7	Yes	No	No	No
SC2	5	70	83.9	72.5	80.9	81.5	Yes	No	No	No
SC2	10	70	83.3	74.7	80.6	81.6	Yes	No	Yes	No
SC2	15	70	82.7	74.9	80.5	81.6	Yes	No	Yes	No
SC2	20	70	82.1	74.7	80.0	81.1	Yes	No	Yes	No
SC2	23	70	81.8	74.7	79.8	81.0	Yes	No	Yes	No
SC3	1	70	81.5	68.4	77.2	77.7	Yes	No	No	No
SC3	5	70	81.1	72.5	78.3	79.3	Yes	No	Yes	No
SC3	10	70	80.4	74.4	77.9	79.5	Yes	No	Yes	No
SC3	15	70	79.8	74.4	77.0	78.9	Yes	No	Yes	No

Table A4.5 Eligibility Assessment for Indirect Technical Remedies

NSR	Floor	L_{10} (1-hr), dB(A)					Eligibility Test			Eligible
		Assessment Criterion (a)	Current Noise Level (b)	Predicted Noise Level			(d) > (a)	(d) - (b)	(d) - (c)	
				New Roads	Existing Roads (c)	Overall (d)		≥ 1.0 dB(A)	≥ 1.0 dB(A)	Yes/No
SC3	20	70	79.3	74.1	76.6	78.5	Yes	No	Yes	No
SC3	23	70	79.0	73.9	76.6	78.5	Yes	No	Yes	No
VLP1	2	70	81.3	74.2	80.3	81.3	Yes	No	Yes	No
VLP2	2	70	74.2	67.6	73.1	74.2	Yes	No	Yes	No
VLP3	3	70	80.5	74.6	78.7	80.1	Yes	No	Yes	No
VLP4	3	70	81.5	75.8	80.1	81.5	Yes	No	Yes	No
STGS	1	65	73.5	66.0	72.1	73.1	Yes	No	Yes	No
STGS	3	65	73.8	67.5	72.4	73.6	Yes	No	Yes	No
STGS	5	65	74.0	68.0	71.7	73.2	Yes	No	Yes	No
STC1	1	55	75.2	67.6	73.8	74.7	Yes	No	No	No
STC1	3	55	75.3	67.8	74.0	74.9	Yes	No	No	No
STC2	1	55	79.6	70.6	78.3	79.0	Yes	No	No	No
STC2	2	55	79.6	71.2	78.3	79.1	Yes	No	No	No
STC3	1	55	79.6	70.2	78.3	78.9	Yes	No	No	No
STC3	2	55	79.7	70.5	78.4	79.1	Yes	No	No	No
CS	1	65	74.6	65.4	73.1	73.8	Yes	No	No	No
CS	3	65	74.8	66.5	73.5	74.3	Yes	No	No	No
CS	5	65	75.0	67.7	74.0	74.9	Yes	No	No	No
PRC1	1	65	78.2	68.7	76.9	77.5	Yes	No	No	No
PRC1	3	65	79.9	70.4	76.3	77.3	Yes	No	Yes	No
PRC2	1	65	77.4	68.7	76.4	77.1	Yes	No	No	No
PRC2	3	65	78.2	68.3	76.9	77.5	Yes	No	No	No
VM	2	70	79.0	70.9	77.6	78.4	Yes	No	No	No
MLV	1	70	76.1	66.4	74.4	75.0	Yes	No	No	No
MLV	3	70	76.8	68.8	75.2	76.1	Yes	No	No	No
OLV	1	70	76.9	67.3	74.8	75.5	Yes	No	No	No
OLV	3	70	77.6	69.6	75.6	76.6	Yes	No	Yes	No
OLV	5	70	78.0	70.3	76.4	77.4	Yes	No	Yes	No
MV	2	70	78.9	68.8	76.4	77.1	Yes	No	No	No
HL1	2	70	79.0	70.1	75.9	76.9	Yes	No	Yes	No
HL2	2	70	79.2	69.9	78.1	78.7	Yes	No	No	No
OTT1	2	70	81.8	70.6	76.7	77.7	Yes	No	Yes	No
OTT2	2	70	81.0	72.6	76.4	77.9	Yes	No	Yes	No
OTT3	2	70	79.5	72.2	74.7	76.6	Yes	No	Yes	No
KG	2	65	77.9	70.7	75.2	76.5	Yes	No	Yes	No
TLW1	1	70	79.3	72.1	74.8	76.7	Yes	No	Yes	No
TLW1	3	70	80.1	73.0	75.2	77.2	Yes	No	Yes	No
TLW2	1	70	78.1	71.4	74.0	75.9	Yes	No	Yes	No
TLW2	3	70	79.9	72.6	74.8	76.8	Yes	No	Yes	No
TLW3	1	70	81.2	72.7	77.0	78.4	Yes	No	Yes	No
TLW3	3	70	82.1	74.0	77.3	79.0	Yes	No	Yes	No
TLW4	1	70	80.0	71.8	75.1	76.8	Yes	No	Yes	No
TLW4	3	70	81.0	73.1	75.8	77.7	Yes	No	Yes	No
TLW5	2	70	78.4	71.5	73.7	75.7	Yes	No	Yes	No
TLW5	3	70	78.5	72.2	73.5	75.9	Yes	No	Yes	No
TLW6	1	70	80.7	73.0	75.8	77.6	Yes	No	Yes	No
TLW6	3	70	82.0	74.3	77.0	78.9	Yes	No	Yes	No
TLW7	1	70	79.0	72.2	74.7	76.6	Yes	No	Yes	No
TLW7	3	70	80.1	73.0	75.3	77.3	Yes	No	Yes	No
TLW8	2	70	78.3	71.3	73.8	75.7	Yes	No	Yes	No
TLW8	3	70	78.6	71.8	74.1	76.1	Yes	No	Yes	No
TLWK	1	65	77.3	70.6	73.1	75.0	Yes	No	Yes	No
TLWK	3	65	77.7	71.6	73.7	75.8	Yes	No	Yes	No
HA	1	55	80.3	72.1	75.6	77.2	Yes	No	Yes	No
HA	3	55	81.7	73.7	76.9	78.6	Yes	No	Yes	No
WWT	1	65	77.0	66.9	71.9	73.1	Yes	No	Yes	No
WWT	3	65	77.4	66.9	72.6	73.6	Yes	No	Yes	No
WWT	5	65	77.5	68.0	72.3	73.7	Yes	No	Yes	No
MTH1	1	70	71.4	64.0	67.1	68.8	No	No	Yes	No
MTH1	5	70	73.2	67.4	70.6	72.3	Yes	No	Yes	No
MTH1	10	70	77.6	70.2	75.1	76.3	Yes	No	Yes	No
MTH1	15	70	78.0	69.9	75.7	76.7	Yes	No	Yes	No
MTH1	20	70	77.9	71.0	75.5	76.8	Yes	No	Yes	No
MTH1	25	70	77.7	71.2	75.4	76.8	Yes	No	Yes	No
MTH2	1	70	74.9	66.1	69.5	71.1	Yes	No	Yes	No
MTH2	5	70	75.5	67.9	71.5	73.1	Yes	No	Yes	No
MTH2	10	70	77.3	69.2	73.1	74.6	Yes	No	Yes	No
MTH2	15	70	77.1	68.7	72.6	74.1	Yes	No	Yes	No
MTH2	20	70	77.1	70.0	72.6	74.5	Yes	No	Yes	No
MTH2	25	70	76.8	70.0	72.8	74.6	Yes	No	Yes	No
MTH3	1	70	73.5	66.5	68.9	70.9	Yes	No	Yes	No
MTH3	5	70	75.6	68.5	72.0	73.6	Yes	No	Yes	No
MTH3	10	70	77.0	68.2	73.7	74.8	Yes	No	Yes	No
MTH3	15	70	77.0	69.9	73.6	75.1	Yes	No	Yes	No
MTH3	20	70	77.0	69.5	74.0	75.3	Yes	No	Yes	No
MTH3	25	70	76.8	70.1	73.5	75.1	Yes	No	Yes	No
MTH4	1	70	77.2	67.7	71.3	72.9	Yes	No	Yes	No
MTH4	5	70	78.1	68.3	72.8	74.1	Yes	No	Yes	No
MTH4	10	70	78.4	67.2	72.8	73.9	Yes	No	Yes	No
MTH4	15	70	78.1	68.5	72.5	74.0	Yes	No	Yes	No
MTH4	20	70	77.9	69.0	72.5	74.1	Yes	No	Yes	No
MTH4	25	70	77.4	69.9	72.2	74.2	Yes	No	Yes	No
MTH5	1	70	80.5	66.0	72.3	73.2	Yes	No	No	No

Table A4.5 Eligibility Assessment for Indirect Technical Remedies

NSR	Floor	L_{10} (1-hr), dB(A) Assessment Criterion (a)	Current Noise Level (b)	Predicted Noise Level: New Roads	Predicted Noise Level: Existing Roads (c)	Predicted Noise Level: Overall (d)	Eligibility Test: (d) > (a)	Eligibility Test: (d) - (b) ≥ 1.0 dB(A)	Eligibility Test: (d) - (c) ≥ 1.0 dB(A)	Eligible Yes/No
MTH5	5	70	81.1	68.2	73.1	74.3	Yes	No	Yes	No
MTH5	10	70	80.7	71.3	72.7	75.1	Yes	No	Yes	No
MTH5	15	70	80.2	72.7	73.0	75.9	Yes	No	Yes	No
MTH5	20	70	79.6	74.4	73.4	76.9	Yes	No	Yes	No
MTH5	25	70	79.1	74.2	73.4	76.8	Yes	No	Yes	No
MFH1	1	70	75.5	57.9	64.2	65.1	No	No	No	No
MFH1	5	70	75.3	56.7	64.6	65.3	No	No	No	No
MFH1	10	70	75.8	62.6	64.0	66.4	No	No	Yes	No
MFH1	15	70	75.7	63.2	63.7	66.5	No	No	Yes	No
MFH1	20	70	75.2	67.0	66.1	69.6	No	No	Yes	No
MFH2	1	70	78.0	62.5	67.1	68.4	No	No	Yes	No
MFH2	5	70	78.1	70.0	70.3	73.2	Yes	No	Yes	No
MFH2	10	70	78.2	71.9	69.8	74.0	Yes	No	Yes	No
MFH2	15	70	78.0	72.4	69.6	74.2	Yes	No	Yes	No
MFH2	20	70	77.8	72.8	70.6	74.8	Yes	No	Yes	No
MFH3	1	70	77.6	68.4	68.4	71.4	Yes	No	Yes	No
MFH3	5	70	77.9	70.8	72.9	75.0	Yes	No	Yes	No
MFH3	10	70	77.8	72.6	72.6	75.6	Yes	No	Yes	No
MFH3	15	70	77.5	73.4	72.2	75.9	Yes	No	Yes	No
MFH3	20	70	77.3	73.3	72.0	75.7	Yes	No	Yes	No
MFH4	1	70	77.1	68.5	68.6	71.6	Yes	No	Yes	No
MFH4	5	70	77.0	68.9	71.9	73.7	Yes	No	Yes	No
MFH4	10	70	77.1	70.5	71.7	74.2	Yes	No	Yes	No
MFH4	15	70	76.8	71.7	71.2	74.5	Yes	No	Yes	No
MFH4	20	70	76.6	72.3	71.1	74.8	Yes	No	Yes	No
MFH5	1	70	80.0	69.3	73.9	75.2	Yes	No	Yes	No
MFH5	5	70	79.8	69.0	74.9	75.9	Yes	No	Yes	No
MFH5	10	70	79.5	69.0	74.3	75.4	Yes	No	Yes	No
MFH5	15	70	79.0	69.7	73.6	75.1	Yes	No	Yes	No
MFH5	20	70	78.4	70.8	73.0	75.0	Yes	No	Yes	No
MFH6	1	70	73.3	64.4	69.6	70.7	Yes	No	Yes	No
MFH6	5	70	73.1	64.3	69.5	70.6	Yes	No	Yes	No
MFH6	10	70	72.8	64.2	69.1	70.3	No	No	Yes	No
MFH6	15	70	72.4	64.0	68.6	69.9	No	No	Yes	No
MFH6	20	70	71.9	63.7	68.0	69.4	No	No	Yes	No
KSH1	1	70	80.0	64.3	75.9	76.2	Yes	No	No	No
KSH1	5	70	79.1	64.2	75.0	75.3	Yes	No	No	No
KSH1	10	70	77.6	64.4	73.5	74.0	Yes	No	No	No
KSH1	15	70	76.3	64.4	72.2	72.9	Yes	No	No	No
KSH1	20	70	75.3	64.6	71.1	72.0	Yes	No	No	No
KSH1	25	70	74.5	64.6	70.2	71.3	Yes	No	Yes	No
KSH2	1	70	81.8	66.7	77.5	77.8	Yes	No	No	No
KSH2	5	70	80.7	66.7	76.4	76.8	Yes	No	No	No
KSH2	10	70	79.1	66.9	74.8	75.5	Yes	No	No	No
KSH2	15	70	77.8	67.1	73.4	74.3	Yes	No	No	No
KSH2	20	70	76.8	67.0	72.4	73.5	Yes	No	Yes	No
KSH2	25	70	76.0	67.0	71.5	72.8	Yes	No	Yes	No
PG1	1	70	72.8	65.0	67.9	69.7	No	No	Yes	No
PG1	5	70	72.8	65.2	68.1	69.9	No	No	Yes	No
PG1	10	70	72.9	66.0	68.4	70.4	No	No	Yes	No
PG1	15	70	72.9	65.9	68.6	70.5	Yes	No	Yes	No
PG1	20	70	72.8	65.9	68.4	70.3	No	No	Yes	No
PG1	25	70	72.7	66.0	68.3	70.3	No	No	Yes	No
PG2	1	70	72.2	64.9	67.1	69.1	No	No	Yes	No
PG2	5	70	72.6	65.1	67.8	69.7	No	No	Yes	No
PG2	10	70	72.7	66.1	68.1	70.2	No	No	Yes	No
PG2	15	70	72.7	65.9	68.2	70.2	No	No	Yes	No
PG2	20	70	72.6	65.9	68.2	70.2	No	No	Yes	No
PG2	25	70	72.5	66.0	68.1	70.2	No	No	Yes	No
PG3	1	70	70.1	63.3	65.0	67.2	No	No	Yes	No
PG3	5	70	70.2	63.5	65.2	67.4	No	No	Yes	No
PG3	10	70	70.4	64.7	65.8	68.3	No	No	Yes	No
PG3	15	70	70.4	64.6	65.9	68.3	No	No	Yes	No
PG3	20	70	70.5	64.7	65.9	68.4	No	No	Yes	No
PG3	25	70	70.5	64.6	65.9	68.3	No	No	Yes	No
CCS1	1	70	78.8	73.9	74.5	77.2	Yes	No	Yes	No
CCS1	3	70	78.9	73.8	73.1	76.5	Yes	No	Yes	No
CCS1	5	70	78.9	74.0	67.3	74.8	Yes	No	Yes	No
CCS2	1	70	81.2	73.1	76.2	77.9	Yes	No	Yes	No
CCS2	3	70	81.2	65.3	75.7	76.1	Yes	No	No	No
CCS2	5	70	81.4	67.5	65.4	69.6	No	No	Yes	No
CCS3	1	70	78.7	67.9	74.4	75.3	Yes	No	No	No
CCS3	3	70	79.7	63.9	75.2	75.5	Yes	No	No	No
CCS3	5	70	79.7	68.8	69.6	72.2	Yes	No	Yes	No
CCS4	1	70	77.8	67.4	74.7	75.4	Yes	No	No	No
CCS4	3	70	78.2	64.7	75.0	75.4	Yes	No	No	No
CCS4	5	70	79.2	67.1	74.7	75.4	Yes	No	No	No
CCS5	1	70	77.8	65.8	75.0	75.5	Yes	No	No	No
CCS5	3	70	77.7	66.1	75.0	75.5	Yes	No	No	No
CCS5	5	70	78.8	65.7	74.9	75.4	Yes	No	No	No
SCWPS	1	65	69.2	61.0	63.5	65.4	No	No	Yes	No
SCWPS	3	65	69.3	60.4	64.2	65.7	Yes	No	Yes	No
SCWPS	5	65	69.5	60.9	65.4	66.7	Yes	No	Yes	No

Table A4.5 Eligibility Assessment for Indirect Technical Remedies

NSR	Floor	L_{10} (1-hr), dB(A)					Eligibility Test			Eligible
		Assessment Criterion (a)	Current Noise Level (b)	Predicted Noise Level			(d) > (a)	(d) - (b) ≥ 1.0 dB(A)	(d) - (c) ≥ 1.0 dB(A)	Yes/No
				New Roads	Existing Roads (c)	Overall (d)				
KSB1	1	70	82.3	69.2	80.7	81.0	Yes	No	No	No
KSB1	3	70	82.3	69.0	80.4	80.7	Yes	No	No	No
KSB1	5	70	82.4	65.3	79.6	79.8	Yes	No	No	No
KSB1	7	70	82.3	69.2	78.5	79.0	Yes	No	No	No
KSB1	9	70	82.4	71.0	77.9	78.7	Yes	No	No	No
KSB2	1	70	79.6	67.1	77.3	77.7	Yes	No	No	No
KSB2	3	70	79.4	67.7	77.2	77.7	Yes	No	No	No
KSB2	5	70	79.9	65.4	76.9	77.2	Yes	No	No	No
KSB2	7	70	80.2	69.2	76.0	76.8	Yes	No	No	No
KSB2	9	70	80.2	70.9	75.7	76.9	Yes	No	Yes	No
KSB3	1	70	79.4	66.1	76.4	76.8	Yes	No	No	No
KSB3	3	70	80.0	67.1	76.3	76.8	Yes	No	No	No
KSB3	5	70	79.8	61.1	75.8	75.9	Yes	No	No	No
KSB3	7	70	80.0	64.0	75.4	75.7	Yes	No	No	No
KSB3	9	70	80.2	66.5	75.3	75.8	Yes	No	No	No
STPS1	1	65	82.8	61.8	77.3	77.4	Yes	No	No	No
STPS1	3	65	82.9	65.7	72.4	73.2	Yes	No	No	No
STPS1	5	65	82.9	68.7	72.4	73.9	Yes	No	Yes	No
STPS2	1	65	81.5	64.2	78.8	78.9	Yes	No	No	No
STPS2	3	65	81.3	66.4	77.9	78.2	Yes	No	No	No
STPS2	5	65	81.7	68.3	76.1	76.8	Yes	No	No	No
GLG1	1	70	79.4	66.9	77.5	77.9	Yes	No	No	No
GLG1	5	70	79.0	67.2	76.7	77.2	Yes	No	No	No
GLG1	10	70	79.5	68.1	75.6	76.3	Yes	No	No	No
GLG1	15	70	79.0	68.8	74.8	75.8	Yes	No	Yes	No
GLG1	20	70	78.6	69.4	74.0	75.3	Yes	No	Yes	No
GLG1	24	70	78.3	70.4	73.5	75.2	Yes	No	Yes	No
GLG2	1	70	82.4	67.0	81.4	81.6	Yes	No	No	No
GLG2	5	70	80.9	67.4	79.6	79.9	Yes	No	No	No
GLG2	10	70	80.2	67.9	78.0	78.4	Yes	No	No	No
GLG2	15	70	79.3	68.5	76.6	77.2	Yes	No	No	No
GLG2	20	70	78.7	69.0	75.6	76.5	Yes	No	No	No
GLG2	24	70	78.3	70.0	75.0	76.2	Yes	No	Yes	No
GRG	1	70	82.4	61.5	81.3	81.3	Yes	No	No	No
GRG	5	70	80.9	64.9	79.5	79.6	Yes	No	No	No
GRG	10	70	79.9	65.3	78.1	78.3	Yes	No	No	No
GRG	15	70	79.0	65.6	76.9	77.2	Yes	No	No	No
HG1	1	70	80.0	56.3	76.1	76.1	Yes	No	No	No
HG1	5	70	79.6	59.3	76.5	76.6	Yes	No	No	No
HG1	10	70	79.4	60.3	76.0	76.1	Yes	No	No	No
HG1	15	70	78.9	62.1	76.0	76.2	Yes	No	No	No
HG1	20	70	78.4	64.2	75.3	75.6	Yes	No	No	No
HG2	1	70	76.8	57.4	64.7	65.4	No	No	No	No
HG2	5	70	76.8	60.3	71.2	71.5	Yes	No	No	No
HG2	10	70	77.5	61.1	70.9	71.3	Yes	No	No	No
HG2	15	70	77.3	62.9	70.8	71.5	Yes	No	No	No
HG2	20	70	77.1	65.1	71.9	72.7	Yes	No	No	No
HG3	1	70	75.7	57.5	64.1	65.0	No	No	No	No
HG3	5	70	75.9	59.5	69.9	70.3	No	No	No	No
HG3	10	70	76.8	60.3	70.4	70.8	Yes	No	No	No
HG3	15	70	76.8	62.4	70.0	70.7	Yes	No	No	No
HG3	20	70	76.5	65.9	71.2	72.3	Yes	No	Yes	No
HG4	1	70	78.1	62.9	58.0	64.1	No	No	Yes	No
HG4	5	70	78.3	66.9	68.4	70.7	Yes	No	Yes	No
HG4	10	70	79.0	69.7	68.5	72.2	Yes	No	Yes	No
HG4	15	70	78.9	71.5	69.0	73.4	Yes	No	Yes	No
HG4	20	70	78.7	72.1	69.6	74.0	Yes	No	Yes	No
HG5	1	70	77.6	63.8	57.4	64.7	No	No	Yes	No
HG5	5	70	77.8	67.0	64.8	69.0	No	No	Yes	No
HG5	10	70	78.4	70.2	64.4	71.2	Yes	No	Yes	No
HG5	15	70	78.3	71.8	65.0	72.6	Yes	No	Yes	No
HG5	20	70	78.2	72.2	65.7	73.1	Yes	No	Yes	No
HG6	1	70	78.1	63.6	62.8	66.2	No	No	Yes	No
HG6	5	70	78.3	67.8	64.5	69.5	No	No	Yes	No
HG6	10	70	78.7	71.8	64.4	72.5	Yes	No	Yes	No
HG6	15	70	78.6	73.4	65.2	74.0	Yes	No	Yes	No
HG6	20	70	78.5	73.6	66.0	74.3	Yes	No	Yes	No
LPL1	1	65	78.2	70.0	63.6	70.9	Yes	No	Yes	No
LPL1	5	65	78.4	67.1	55.9	67.4	Yes	No	Yes	No
LPL2	1	65	78.1	77.2	62.4	77.3	Yes	No	Yes	No
LPL2	3	65	78.2	73.5	64.4	74.0	Yes	No	Yes	No
LPL2	5	65	78.3	67.0	59.4	67.7	Yes	No	Yes	No
LPL3	1	65	75.9	74.4	60.8	74.6	Yes	No	Yes	No
LPL3	3	65	75.9	74.4	63.5	74.7	Yes	No	Yes	No
LPL3	5	65	75.9	65.9	62.8	67.6	Yes	No	Yes	No
CWG	1	65	75.0	66.6	65.8	69.2	Yes	No	Yes	No
CWG	3	65	75.1	66.8	66.8	69.8	Yes	No	Yes	No
CWG	5	65	75.1	67.7	66.7	70.2	Yes	No	Yes	No
VH1	2	70	71.7	67.1	66.0	69.6	No	No	Yes	No
VH2	2	70	74.1	71.0	68.2	72.8	Yes	No	Yes	No
SCH1	1	65	77.0	71.4	71.8	74.6	Yes	No	Yes	No
SCH1	3	65	77.0	71.6	71.8	74.7	Yes	No	Yes	No
SCH1	5	65	76.9	71.6	71.7	74.7	Yes	No	Yes	No

Table A4.5 Eligibility Assessment for Indirect Technical Remedies

NSR	Floor	L_{10} (1-hr), dB(A)					Eligibility Test			Eligible
		Assessment Criterion (a)	Current Noise Level (b)	Predicted Noise Level			(d) > (a)	(d) - (b) ≥ 1.0 dB(A)	(d) - (c) ≥ 1.0 dB(A)	Yes/No
				New Roads	Existing Roads (c)	Overall (d)				
SCH2	1	65	78.3	70.1	73.8	75.3	Yes	No	Yes	No
SCH2	3	65	78.5	70.3	73.7	75.3	Yes	No	Yes	No
SCH2	5	65	78.4	70.2	73.5	75.2	Yes	No	Yes	No
TWV1	1	70	78.2	71.7	72.3	75.0	Yes	No	Yes	No
TWV1	3	70	78.1	72.8	72.4	75.6	Yes	No	Yes	No
TWV2	1	70	78.0	74.2	68.9	75.3	Yes	No	Yes	No
TWV2	3	70	79.0	76.0	69.2	76.8	Yes	No	Yes	No
TWV3	1	70	80.5	70.7	66.9	72.2	Yes	No	Yes	No
TWV3	3	70	80.5	75.3	64.4	75.6	Yes	No	Yes	No
TWV4	1	70	82.7	77.1	69.0	77.7	Yes	No	Yes	No
TWV4	3	70	82.7	69.4	64.0	70.5	Yes	No	Yes	No
TWV5	1	70	76.1	67.8	66.2	70.1	No	No	Yes	No
TWV5	3	70	77.5	69.7	65.1	71.0	Yes	No	Yes	No
TWV6	1	70	74.0	69.1	65.4	70.6	Yes	No	Yes	No
TWV6	3	70	75.6	70.9	66.5	72.2	Yes	No	Yes	No
TWV7	1	70	78.4	75.5	65.1	75.9	Yes	No	Yes	No
TWV7	3	70	79.3	74.4	62.8	74.7	Yes	No	Yes	No
TWV8	1	70	89.8	77.2	65.3	77.5	Yes	No	Yes	No
TWV8	3	70	88.8	74.6	63.8	74.9	Yes	No	Yes	No
VDV1	1	70	79.5	77.8	61.6	77.9	Yes	No	Yes	No
VDV1	3	70	79.3	77.7	61.8	77.8	Yes	No	Yes	No
VDV2	1	70	78.9	76.4	61.4	76.5	Yes	No	Yes	No
VDV2	3	70	78.7	76.2	61.6	76.3	Yes	No	Yes	No
STH	2	70	81.8	60.0	78.6	78.7	Yes	No	No	No
STH	5	70	81.1	59.8	77.9	78.0	Yes	No	No	No
STH	7	70	80.7	59.8	77.5	77.6	Yes	No	No	No

Appendix 5

FDM Sample Output File (Phase III)

APPENDIX 5

FDM sample output file (Phase III)

1 FDM - (DATED 91109)

IBM-PC VERSION (1.01)
(C) COPYRIGHT 1991, TRINITY CONSULTANTS, INC.
SERIAL NUMBER 8354 SOLD TO ENPAC LIMITED
RUN BEGAN ON 1/08/98 AT 19:18:19

RUN TITLE:
T3 - Construction Dust Impact

INPUT FILE NAME: Ph_3.DAT
OUTPUT FILE NAME: Ph_3.LST

CONVERGENCE OPTION 1=OFF, 2=ON	1
MET OPTION SWITCH, 1=CARDS, 2=PREPROCESSED	1
PLOT FILE OUTPUT, 1=NO, 2=YES	1
MET DATA PRINT SWITCH, 1=NO, 2=YES	1
POST-PROCESSOR OUTPUT, 1=NO, 2=YES	1
DEP. VEL./GRAV. SETL. VEL., 1=DEFAULT, 2=USER	1
PRINT 1-HOUR AVERAGE CONCEN, 1=NO, 2=YES	3
PRINT 3-HOUR AVERAGE CONCEN, 1=NO, 2=YES	1
PRINT 8-HOUR AVERAGE CONCEN, 1=NO, 2=YES	1
PRINT 24-HOUR AVERAGE CONCEN, 1=NO, 2=YES	3
PRINT LONG-TERM AVERAGE CONCEN, 1=NO, 2=YES	3
BYPASS RAMMET CALMS RECOGNITION, 1=NO, 2=YES	1
NUMBER OF SOURCES PROCESSED	2
NUMBER OF RECEPTORS PROCESSED	81
NUMBER OF PARTICLE SIZE CLASSES	5
NUMBER OF HOURS OF MET DATA PROCESSED	8760
LENGTH IN MINUTES OF 1-HOUR OF MET DATA	60.
ROUGHNESS LENGTH IN CM	20.00
SCALING FACTOR FOR SOURCE AND RECPTORS	1.0000
PARTICLE DENSITY IN G/CM**3	2.50
ANEMOMETER HEIGHT IN M	10.00

GENERAL PARTICLE SIZE CLASS INFORMATION

PARTICLE SIZE CLASS	CHAR. DIA. (UM)	GRAV. SETTLING VELOCITY (M/SEC)	DEPOSITION VELOCITY (M/SEC)	FRACTION IN EACH SIZE CLASS
1	1.2500000	**	**	.0262
2	3.7500000	**	**	.0678
3	7.5000000	**	**	.1704
4	12.5000000	**	**	.1536
5	20.0000000	**	**	.5820

** COMPUTED BY FDM

APPENDIX 5

1

RECEPTOR COORDINATES (X,Y,Z)

(7354., 6907., 2.) (7329., 6879., 2.) (7307., 6853., 2.)
(7283., 6825., 2.) (7256., 6743., 2.) (7288., 6640., 2.)
(7236., 6689., 2.) (7226., 6655., 2.) (7237., 6642., 2.)
(7118., 6751., 2.) (7084., 6732., 2.) (7061., 6691., 2.)
(6947., 6605., 2.) (6913., 6585., 2.) (6900., 6703., 2.)
(6893., 6681., 2.) (6886., 6643., 2.) (6868., 6633., 2.)
(6853., 6592., 2.) (6852., 6563., 2.) (7035., 6458., 2.)
(7023., 6489., 2.) (7057., 6428., 2.) (6954., 6429., 2.)
(6814., 6559., 2.) (6800., 6565., 2.) (6794., 6606., 2.)
(6749., 6551., 2.) (6729., 6585., 2.) (6724., 6525., 2.)
(6702., 6526., 2.) (6669., 6517., 2.) (6668., 6584., 2.)
(6635., 6519., 2.) (6858., 6464., 2.) (6779., 6423., 2.)
(6719., 6394., 2.) (6637., 6388., 2.) (6431., 6508., 2.)
(6416., 6488., 2.) (6340., 6523., 2.) (6300., 6480., 2.)
(6277., 6453., 2.) (6215., 6450., 2.) (6165., 6432., 2.)
(6490., 6428., 2.) (6450., 6416., 2.) (6383., 6386., 2.)
(6273., 6318., 2.) (6257., 6324., 2.) (6256., 6310., 2.)
(6561., 6264., 2.) (6301., 6325., 2.) (6401., 6547., 2.)
(6197., 6254., 2.) (6195., 6225., 2.) (6239., 6138., 2.)
(6272., 6095., 2.) (6038., 6310., 2.) (6065., 6224., 2.)
(6092., 6186., 2.) (6092., 6135., 2.) (6042., 6139., 2.)
(6026., 6166., 2.) (6049., 6077., 2.) (6227., 6053., 2.)
(6176., 6036., 2.) (6151., 5995., 2.) (6112., 5955., 2.)
(6133., 5869., 2.) (6042., 6031., 2.) (6052., 5755., 2.)
(5791., 5587., 2.) (5903., 5793., 2.) (5893., 5778., 2.)
(6750., 6520., 2.) (7170., 6500., 2.) (5992., 6582., 2.)
(5965., 6355., 2.) (5860., 6564., 2.) (5795., 6525., 2.)

1

SOURCE INFORMATION

TYPE	ENTERED EMIS. RATE (G/SEC, G/SEC/M OR G/SEC/M**2)	TOTAL EMISSION RATE (G/SEC)	WIND SPEED FAC.	X1 (M)	Y1 (M)	X2 (M)	Y2 (M)	HEIGHT (M)	WIDTH (M)
PHASE III :									
2	.000522816	.08923	.000	6462.	6434.	6301.	6379.	.50	15.00
2	.000662226	.14065	.000	6291.	6403.	6492.	6471.	.50	19.00
TOTAL EMISSIONS		.22988							

Remaining phases' source information shown in other output files:

TYPE	ENTERED EMIS. RATE	TOTAL EMISSION RATE	WIND SPEED FAC.	X1	Y1	X2	Y2	HEIGHT	WIDTH
PHASE I :									
2	.000278832	.04778	.000	7240.	6788.	7183.	6626.	.50	8.00
2	.000278832	.02449	.000	7183.	6626.	7121.	6565.	.50	8.00
2	.000278832	.03422	.000	7121.	6565.	7004.	6526.	.50	8.00
2	.000278832	.03697	.000	7004.	6526.	6876.	6492.	.50	8.00
2	.000522816	.09799	.000	6876.	6492.	6696.	6438.	.50	15.00
2	.000662226	.10328	.000	6714.	6495.	6868.	6523.	.50	19.00
TOTAL EMISSIONS		.34472							

APPENDIX 5

PHASE II :

2	.000522816	.12188	.000	6695.	6438.	6462.	6434.	.50	15.00
2	.000662226	.14783	.000	6492.	6471.	6714.	6495.	.50	19.00

TOTAL EMISSIONS .26971

PHASE IV :

2	.000662226	.10072	.000	6301.	6379.	6188.	6277.	.50	19.00
2	.000522816	.07418	.000	6181.	6313.	6291.	6403.	.50	15.00
2	.000278832	.05307	.000	6098.	6390.	6287.	6417	.50	8.00

TOTAL EMISSIONS .22797

PHASE V :

2	.000662226	.07220	.000	6188.	6277.	6142.	6178	.50	19.00
2	.000522816	.14285	.000	6101.	6052.	6181.	6313	.50	15.00

PHASE VI :

2	.000662226	.08893	.000	6142.	6178.	6117.	6046.	.50	19.00
2	.000522816	.07070	.000	6138.	6182.	6101.	6052.	.50	15.00

TOTAL EMISSIONS .15963

PHASE VII :

2	.000662226	.18448	.000	6117.	6046.	6025.	5783.	.50	19.00
2	.000278832	.01048	.000	6251.	6067.	6216.	6080.	.50	8.00
2	.000278832	.03133	.000	6216.	6080.	6134.	6004.	.50	8.00
2	.000278832	.04060	.000	6134.	6004.	6070.	5873.	.50	8.00
2	.000522816	.21648	.000	6009.	5789.	6138.	6182.	.50	15.00

TOTAL EMISSIONS .48337

PHASE VIII :

2	.000662226	.08837	.000	6025.	5783.	5966.	5664.	.50	19.00
2	.000522816	.07961	.000	5945.	5650.	6009.	5789.	.50	15.00

TOTAL EMISSIONS .16798

1

HIGHEST AND SECOND HIGHEST VALUES FOR 1 HOUR AVERAGES

RECEPTOR	X-COORDINATE	Y-COORDINATE	HIGHEST VALUE	ENDING HOUR	DEPOSITION	SECOND HIGH	ENDING HOUR	DEPOSTION
1	7354.3	6907.0	10.0093	212.	.1499	9.9822	6409.	.1541
2	7329.3	6878.6	8.9191	212.	.1346	8.8954	6409.	.1383
3	7307.2	6853.1	7.6987	212.	.1169	7.6785	6409.	.1202
4	7282.5	6824.8	10.1653	1203.	.1580	10.1597	1101.	.1589
5	7256.1	6742.7	18.3324	1203.	.2881	18.3227	1101.	.2898
6	7288.3	6640.1	13.6424	6820.	.2151	13.6306	5685.	.2171
7	7236.2	6689.0	15.8521	1203.	.2509	15.8439	1101.	.2524
8	7225.9	6655.3	11.0067	1203.	.1749	11.0011	1101.	.1759
9	7237.0	6641.6	12.5872	6820.	.2006	12.5766	5685	.2024
10	7117.9	6750.6	15.1757	1203.	.2450	15.1682	1101.	.2464
11	7084.1	6731.7	17.6727	1203.	.2878	17.6642	1101.	.2894
12	7061.1	6690.9	26.8390	1203.	.4407	26.8264	1101.	.4431
13	6946.6	6605.4	37.0032	1203.	.6262	36.9874	1101.	.6294
14	6913.3	6585.0	36.6989	1203.	.6264	36.6836	1101.	.6295
15	6900.0	6702.7	41.6190	212.	.6971	41.5353	6409.	.7132
16	6892.7	6680.9	37.1256	212.	.6247	37.0521	6409.	.6390
17	6886.2	6642.8	35.0598	1203.	.5998	35.0453	1101.	.6027
18	6867.8	6632.5	39.3839	1203.	.6772	39.3679	1101.	.6806
19	6853.1	6592.4	57.3175	1203.	.9927	57.2949	1101.	.9976
20	6851.6	6563.1	43.7982	1203.	.7597	43.7809	1101.	.7633
21	7034.7	6457.8	28.9372	911.	.4749	28.9326	220.	.4757
22	7023.0	6488.7	21.7659	6820.	.3642	21.7499	5685.	.3672

23	7056.5	6427.9	31.3459	911.	.5106	31.3408	220.	.5115
24	6953.6	6428.9	41.3957	911.	.6909	41.3894	220.	.6921
25	6813.7	6559.4	58.2881	1203.	1.0215	58.2660	1101.	1.0264
26	6800.4	6564.6	68.5183	1203.	1.2052	68.4927	1101.	1.2109
27	6794.2	6606.1	48.0271	1203.	.8428	48.0090	1101.	.8468
28	6749.4	6551.0	88.6293	1203.	1.5832	88.5983	1101.	1.5905
29	6728.6	6585.2	62.2683	212.	1.1053	62.1673	6409.	1.1283
30	6724.3	6524.7	77.2200	1203.	1.3899	77.1938	1101.	1.3962
31	6702.0	6525.8	101.8349	1203.	1.8471	101.8016	1101.	1.8554
32	6669.0	6517.3	126.3574	1203.	2.3182	126.3184	1101.	2.3283
33	6668.4	6584.0	123.3746	212.	2.2260	123.1889	6409.	2.2709
34	6634.6	6519.1	171.7843	1203.	3.1935	171.7352	1101.	3.2071
35	6857.8	6464.3	41.7438	911.	.7184	41.7382	220.	.7195
36	6779.0	6423.0	71.2583	911.	1.2450	71.2492	220.	1.2470
37	6719.3	6393.6	66.3996	8682.	1.2054	61.6594	127.	1.1371
38	6636.9	6388.1	107.3537	8682.	1.9945	100.7417	5569.	1.1687
39	6430.9	6508.3	168.0413	6913.	2.3501	167.9686	5210.	2.3660
40	6415.9	6488.4	203.5581	7183.	2.9667	203.4286	5310.	2.9986
41	6340.3	6522.6	109.1615	622.	1.4747	109.1581	7616.	1.4754
42	6300.0	6480.2	141.8776	4950.	1.9233	137.2321	1824.	2.6586
43	6277.3	6452.7	179.9383	1422.	2.4281	179.8740	8326.	2.4413
44	6214.5	6449.6	155.0514	7927.	2.9432	155.0415	1970.	2.9463
45	6164.6	6432.0	135.4153	886.	2.5065	135.3239	2275.	2.5313
46	6489.5	6428.2	340.0839	907.	4.8518	339.7461	5309.	4.9297
47	6449.5	6416.4	331.7280	907.	4.8069	331.4122	5309.	4.8819
48	6382.6	6386.3	252.	2276.	3.7575	244.6645	4208.	4.8110
49	6272.8	6317.8	187.5800	1363.	3.5644	187.1107	2276.	2.5254
50	6257.4	6324.4	226.3475	1363.	4.3302	217.8148	7557.	4.2106
51	6255.8	6310.3	188.5344	1363.	3.5745	181.4253	7557.	3.4766
52	6561.0	6263.8	64.2791	3794.	1.2083	53.8239	7037.	.6665
53	6300.9	6324.5	182.7272	2276.	2.4507	176.9043	5539.	3.4561
54	6400.7	6547.0	106.3666	7580.	1.4088	106.3466	8442.	1.4128
55	6196.8	6254.0	118.5460	1363.	2.1836	114.1185	7557.	2.1265
56	6194.5	6224.9	100.6238	5539.	1.8914	94.1977	2276.	1.0697
57	6238.9	6137.9	57.2239	5472.	1.0625	50.6329	1435.	.5520
58	6271.5	6094.8	48.4856	7539.	.8956	45.8828	3792.	.5039
59	6037.6	6309.5	92.8931	914.	1.6399	92.8269	847.	1.6548
60	6064.8	6223.7	73.8673	7147.	1.3667	71.1276	3763.	.7266
61	6091.5	6185.8	80.2211	1363.	1.4273	77.2803	7557.	1.3928
62	6092.3	6135.0	46.6557	5539.	.8418	45.9357	1363.	.8039
63	6042.4	6138.6	59.8383	1363.	1.0413	57.6718	7557.	1.0175
64	6025.6	6165.5	46.5458	1363.	.8137	44.8562	7557.	.7949
65	6048.5	6076.6	38.7744	5539.	.6844	34.8333	7923.	.6319
66	6227.4	6052.8	41.5092	7539.	.7573	38.7396	3792.	.4098
67	6176.4	6036.1	43.7879	5472.	.7901	37.6643	1435.	.3768
68	6151.3	5994.6	38.3038	5472.	.6831	32.6594	1435.	.3163
69	6112.2	5954.9	34.2727	5472.	.6042	29.0034	1435.	.2723
70	6133.4	5868.8	20.1398	7539.	.3496	18.6260	5472.	.3229
71	6041.5	6031.2	41.6975	5539.	.7273	37.4869	7923.	.6727
72	6051.9	5755.2	17.5336	5472.	.2959	14.5696	1435.	.1232
73	5790.6	5586.6	8.5390	5539.	.1337	7.7439	7923.	.1262
74	5903.4	5792.9	18.9361	5539.	.3105	17.1008	7923.	.2902
75	5892.5	5778.2	18.2437	5539.	.2980	16.4812	7923.	.2788
76	6750.0	6520.0	67.7476	6820.	1.2226	67.7100	5685.	1.2313
77	7170.0	6500.0	13.9283	6820.	.2255	13.9171	5685.	.2275
78	5992.2	6581.5	45.4288	1824.	.8001	45.4159	2832.	.8029
79	5965.4	6355.2	71.4995	3905.	1.2680	68.9243	1416.	1.2333
80	5860.3	6564.1	28.1728	1824.	.4843	28.1640	2832.	.4861
81	5795.1	6525.4	34.1812	7927.	.5719	34.1772	1970.	.5726

1

HIGHEST AND SECOND HIGHEST VALUES FOR 24 HOUR AVERAGES

RECEPTOR	X-COORDINATE	Y-COORDINATE	HIGHEST VALUE	ENDING HOUR	DEPOSITION	SECOND HIGH	ENDING HOUR	DEPOSTION
1	7354.3	6907.0	1.5253	6696.C	.0222	1.1821	4512.C	.0269
2	7329.3	6878.6	1.5884	6696.C	.0231	1.1231	4512.C	.0261
3	7307.2	6853.1	1.6597	6696.C	.0242	1.1609	1104.C	.0182
4	7282.5	6824.8	1.7652	6696.C	.0257	1.4458	6408.C	.0248
5	7256.1	6742.7	2.6135	6408.C	.0452	2.3429	360.C	.0409
6	7288.3	6640.1	3.0323	360.C	.0513	2.3466	6240.C	.0264
7	7236.2	6689.0	2.7476	360.C	.0480	2.5287	6240.C	.0297
8	7225.9	6655.3	3.0566	360.C	.0529	2.5939	6240.C	.0303
9	7237.0	6641.6	3.1874	360.C	.0546	2.5715	6240.C	.0296
10	7117.9	6750.6	2.6366	6696.C	.0397	2.1557	6408.C	.0381
11	7084.1	6731.7	2.9076	6696.C	.0440	2.5095	6408.C	.0447
12	7061.1	6690.9	3.8135	6408.C	.0684	3.3324	6240.C	.0409
13	6946.6	6605.4	6.0884	360.C	.1116	5.7554	6240.C	.0728
14	6913.3	6585.0	7.2063	360.C	.1324	6.5968	6240.C	.0842
15	6900.0	6702.7	5.1834	6696.C	.0831	4.6112	4512.C	.1079
16	6892.7	6680.9	5.4550	6696.C	.0875	4.2687	4512.C	.1013
17	6886.2	6642.8	5.7344	6696.C	.0911	4.9777	6408.C	.0924

APPENDIX 5

18	6867.8	6632.5	6.2086	6696.C	.0990	5.5921	6408.C	.1043
19	6853.1	6592.4	8.1818	6408.C	.1538	7.8389	360.C	.1469
20	6851.6	6563.1	9.4747	360.C	.1757	8.5802	6240.C	.1118
21	7034.7	6457.8	7.9787	5928.C	.1247	7.6097	5952.C	.1169
22	7023.0	6488.7	7.4118	5928.C	.1151	5.6581	5952.C	.0910
23	7056.5	6427.9	7.9782	5952.C	.1203	7.7448	5928.C	.1218
24	6953.6	6428.9	10.7245	5952.C	.1662	10.5333	5928.C	.1697
25	6813.7	6559.4	10.7314	360.C	.2015	10.0744	6240.C	.1337
26	6800.4	6564.6	10.6856	360.C	.2020	10.4250	6240.C	.1394
27	6794.2	6606.1	8.6824	6696.C	.1420	6.8218	6408.C	.1295
28	6749.4	6551.0	13.4193	360.C	.2570	13.3513	6240.C	.1832
29	6728.6	6585.2	12.3564	6696.C	.2076	8.2811	1104.C	.1451
30	6724.3	6524.7	18.5499	360.C	.3534	16.9050	6240.C	.2337
31	6702.0	6525.8	19.7408	360.C	.3804	18.8633	6240.C	.2653
32	6669.0	6517.3	24.2403	360.C	.4718	23.5466	6240.C	.3391
33	6668.4	6584.0	15.4799	6696.C	.2678	14.8196	4512.C	.3640
34	6634.6	6519.1	26.5268	6240.C	.3954	24.9333	360.C	.4939
35	6857.8	6464.3	14.3702	5928.C	.2339	12.1496	5952.C	.1997
36	6779.0	6423.0	20.1212	5928.C	.3444	19.9486	5952.C	.3279
37	6719.3	6393.6	20.0407	5928.C	.3655	19.4525	5952.C	.3349
38	6636.9	6388.1	27.7355	144.C	.6076	27.6981	984.C	.5179
39	6430.9	6508.3	46.0238	4488.	1.0539	44.7122	6144.C	.8075
40	6415.9	6488.4	67.6244	2424.C	1.3443	65.8573	6576.C	1.3499
41	6340.3	6522.6	53.0025	6576.C	1.0184	47.1239	5424.C	.8674
42	6300.0	6480.2	68.6448	6576.C	1.4003	65.9053	2424.C	1.2526
43	6277.3	6452.7	85.3678	2424.C	1.6361	83.8350	816.C	1.8010
44	6214.5	6449.6	48.2494	816.C	1.0200	41.6309	1824.C	.7200
45	6164.6	6432.0	42.2455	4440.C	.8027	29.6821	1176.C	.5405
46	6489.5	6428.2	162.8048	5928.C	3.2267	139.7674	5952.C	2.8969
47	6449.5	6416.4	173.2038	5928.C	3.5941	157.0687	5952.C	3.4744
48	6382.6	6386.3	91.2781	2208.	2.3198	88.9026	1608.C	2.1000
49	6272.8	6317.8	29.9770	7152.C	.5526	27.7930	6960.C	.6091
50	6257.4	6324.4	33.1003	7152.C	.6042	29.2413	7944.	.5942
51	6255.8	6310.3	27.5537	7152.C	.4910	25.8533	7944.	.5281
52	6561.0	6263.8	9.1876	3816.C	.1694	9.1067	6384.C	.2487
53	6300.9	6324.5	40.2649	6984.C	.9625	36.7009	6960.C	.8079
54	6400.7	6547.0	32.3169	6576.C	.5962	31.6696	5424.C	.5681
55	6196.8	6254.0	13.9262	7944.	.2803	13.6131	7152.C	.2201
56	6194.5	6224.9	12.7278	7944.	.2544	11.4938	7152.C	.1861
57	6238.9	6137.9	6.7356	6984.C	.1623	4.8104	6960.C	.1071
58	6271.5	6094.8	6.8428	6984.C	.1608	4.4484	6960.C	.0943
59	6037.6	6309.5	10.7363	1416.	.1833	8.4451	864.C	.1663
60	6064.8	6223.7	7.8032	2808.C	.1517	5.7080	7152.C	.1029
61	6091.5	6185.8	7.0369	7560.C	.1320	5.5016	7152.C	.0789
62	6092.3	6135.0	6.3216	7944.	.1225	5.5805	7152.C	.0823
63	6042.4	6138.6	5.2375	7560.C	.0961	3.8660	7152.C	.0525
64	6025.6	6165.5	4.1425	7560.C	.0775	3.8428	2808.C	.0754
65	6048.5	6076.6	4.8837	7944.	.0928	4.1413	7152.C	.0604
66	6227.4	6052.8	5.1902	6984.C	.1226	3.1369	5496.C	.0915
67	6176.4	6036.1	3.5259	6984.C	.0836	2.1975	5496.C	.0632
68	6151.3	5994.6	2.7375	6984.C	.0648	1.8242	5472.C	.0325
69	6112.2	5954.9	1.8686	6984.C	.0448	1.6462	1440.C	.0195
70	6133.4	5868.8	2.3738	6984.C	.0542	1.3515	5496.C	.0386
71	6041.5	6031.2	4.5869	7944.	.0858	3.7050	6960.C	.0715
72	6051.9	5755.2	1.4029	6984.C	.0321	.8607	5496.C	.0242
73	5790.6	5586.6	.8810	7944.	.0150	.7120	6960.C	.0128
74	5903.4	5792.9	1.9533	7944.	.0346	1.5435	6960.C	.0284
75	5892.5	5778.2	1.8822	7944.	.0332	1.4862	6960.C	.0273
76	6750.0	6520.0	17.4634	360.C	.3275	14.8883	6240.C	.2016
77	7170.0	6500.0	4.8713	5928.C	.0733	3.7653	5952.C	.0586
78	5992.2	6581.5	9.9830	816.C	.2047	7.8778	3408.C	.1766
79	5965.4	6355.2	7.5667	1416.	.1273	6.4472	1824.C	.0915
80	5860.3	6564.1	5.7941	816.C	.1145	5.0469	3024.C	.1135
81	5795.1	6525.4	5.1060	3744.C	.1012	4.9780	1992.	.1024

RUN ENDED ON 1/08/98 AT 19:41:41

Appendix 6

Sample Calculation of NO_2 Concentration Inside a Full Enclosure

APPENDIX 6

**Sample Calculation of NO_2 Concentration inside a Full Enclosure
(Making Use of the Theory Developed by Ohashi and Koso)**

1. Emission data

Weighted fleet average emission factor = 2.8 g/km-veh
Traffic flow at the bridge with full enclosure = 4380 veh/hr.
Assume 20% conversion of NOx to NO_2, the emission factor per unit length is given by:
w = 0.2 x 2.8 x 4380 / 1000 / 3600 = 0.00068 g/m-s

2. Vehicle data

Nominal dimensions of vehicles are given in Transport Planning and Design Manual, Vol.2 as:

Cars and Taxi:	1.7m (W) x 1.5m (H) x 4.6m (L)
Light Bus:	2.0m (W) x 3.0m (H) x 6.5m (L)
LGV:	2.1m (W) x 1.6m (H) x 5.2m (L)
MGV:	2.5m (W) x 4.0m (H) x 11m (L)
HGV:	2.5m (W) x 4.6m (H) x 16m (L)
Bus:	2.5m (W) x 4.6m (H) x 12m (L)

Based on these figures, nominal cross-sectional area of vehicles is given by:
[(1885+525)x1.7x1.5+220x2x3+480x2.1x1.6+570x2.5x4+350x2.5x4.6x2] /4380 = 5.21 m^2

Equivalent cross-sectional area of vehicles for each direction, assuming two lanes per direction is given by:

$A_v = 2 \times 5.21 = 10.42\ m^2$

Equivalent diameter of vehicle is given by:

$d_v = (4 \times A_v/\pi)^{0.5} = 3.64$ m

For normal traffic condition, traffic density per two lanes is given by:
N = traffic flow per second = 4380/3600 = 1.217 = 2v / l

Head to head distance of vehicles on a lane is given by:
l = 2v / N = 2x25x1000 / 3600 / 1.217 = 11.42 m
where v is the average vehicle speed in unit of m/s

3. Tunnel parameters

Tunnel length L = 122 m

Tunnel size A_T = width x height = 20 x 5.5 = 110 m^2

Equivalent diameter of the tunnel is given by:
$d_T = (4 \times A_T/\pi)^{0.5} = 11.83$ m

Effective length of the tunnel is given by:
$L_e = L + 3d_T = 157.50$ m

APPENDIX 6

4. Diffusion parameters

Reynolds number Re = v x d_v /σ = 25 x 1000 / 3600 x 3.64 / 15.6x10^{-6} = 1621744
where σ is kinetic viscosity at 20°C

According to Fig.16 (Ohashi and Koso)
Since 1 / d_T = 11.41 / 11.83 = 0.96
D / (N x d_T^2 x $Re^{0.13}$) = 0.18

Longitudinal diffusion coefficient is given by:
D = 0.18 x 1.217 x 11.83^2 x $(1621744)^{0.13}$ = 196.81 m^2s^{-1}

5. Maximum concentration of NO_2

C_{max} = w x L_e^2 / (8 x D x A_T)
= 0.00068 x 157.50^2 / (8 x 196.81 x 110) = 97 μg/m^3

The calculation assumed the boundary concentration of NO_2 is zero.

6. NO_2 concentration at boundary of full enclosure

Four assessment points at the boundary of a full enclosure with the same elevation as T3 are chosen. The boundary concentrations are predicted to be 245 μg/m^3 using CALINE4 model.

7. NO_2 concentration inside a full enclosure

97 + 245 = 342 μg/m^3 (NO_2 concentration calculated by Ohashi and Koso's Theory + Maximum NO_2 concentration at boundary of the full enclosure)

Assuming uniform concentration inside the full enclosure.

Appendix 7

Caline 4 : California Line Source Dispersion Model

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  17

        JOB: T3
        RUN: 50
  POLLUTANT: Nitrogen Dioxide - NO2
```

I. SITE VARIABLES

```
     U=   1.0 M/S             Z0= 100. CM          ALT=      1. (M)
   BRG=  50.0 DEGREES         VD=   0.0 CM/S
  CLAS=     4 (D)             VS=   0.0 CM/S
  MIXH=  500. M              AMB=   0.0 PPM
 SIGTH=   18. DEGREES       TEMP=  25.0 DEGREE (C)
```

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. 1	7243	6792	7229	6757	AG	2720	450.0	6.5	15.0
B. 2	7229	6757	7194	6648	BG	2720	450.0	14.8	15.0
C. 3	7194	6648	7167	6606	BG	2720	450.0	18.8	15.0
D. 4	7167	6606	7031	6542	BG	2720	450.0	17.3	15.0
E. 5	7030	6537	6708	6437	BG	3990	450.0	18.0	20.0
F. 6	6709	6442	6601	6439	BG	3990	450.0	15.0	20.0
G. 7a	6601	6439	6509	6441	BG	3990	450.0	20.8	20.0
H. 7b	6606	6454	6508	6453	BG	390	450.0	13.0	13.0
I. 8	6508	6446	6452	6434	BG	4380	450.0	21.3	26.0
J. 9	6452	6434	6404	6419	BG	4380	633.2	21.6	25.0
K. 10	6404	6419	6357	6402	BG	4380	816.3	22.3	25.0
L. 11	6232	6360	6191	6317	BG	4380	816.3	24.6	24.0
M. 12	6191	6317	6168	6263	BG	4380	803.4	24.2	24.0
N. 13	6163	6265	6143	6198	BG	7140	603.0	24.5	24.0
O. 14	6174	6193	6107	5978	AG	170	450.0	16.7	12.0
P. 15	6101	5980	6084	5933	BG	2070	1170.4	21.5	13.0
Q. 16	6084	5933	6068	5885	BG	2070	810.3	23.1	13.0
R. 17	6068	5885	6007	5726	BG	3010	450.0	22.8	21.0
S. 18	6007	5726	5863	5518	AG	3010	450.0	21.5	21.0
T. 19	7270	6399	7221	6540	BG	2790	450.0	18.9	18.0

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  18

      JOB: T3
      RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2
```

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. HG1	6231	6056	13.5
2. HG2	6180	6039	13.5
3. HG3	6154	5998	13.5
4. LPL	6114	5956	8.5
5. CWG	6133	5872	8.5
6. RH	6044	5759	4.1
7. STM	5791	5587	15.6
8. VDV1	5903	5793	44.1
9. VDV2	5893	5778	44.1
10. FY1	6861	6470	5.6
11. FY2	6783	6430	6.5
12. FY3	6724	6401	6.3
13. FY4	6649	6394	6.0
14. RC1	6020	5800	44.5
15. RC2	6750	6520	7.5
16. RC3	7170	6500	7.2
17. KSH	5992	6582	13.7
18. VH	5965	6355	23.8
19. PG1	5860	6564	22.3
20. PG2	5795	6525	22.3

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  19

        JOB: T3
        RUN: 50
  POLLUTANT: Nitrogen Dioxide - NO2
```

IV. MODEL RESULTS (PRED. CONC. INCLUDES AMB.)

RECEPTOR	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H	I	J
1. HG1	4.4	0.1	0.2	0.1	0.2	1.8	1.1	0.6	0.1	0.1	0.1
2. HG2	4.4	0.1	0.2	0.1	0.2	1.5	1.0	0.7	0.1	0.2	0.1
3. HG3	4.0	0.1	0.2	0.1	0.2	1.5	0.9	0.6	0.1	0.2	0.1
4. LPL	3.7	0.1	0.2	0.1	0.2	1.4	0.8	0.5	0.1	0.2	0.1
5. CWG	2.9	0.1	0.2	0.1	0.3	1.4	0.5	0.2	0.0	0.0	0.0
6. RH	2.4	0.0	0.2	0.1	0.2	1.1	0.4	0.2	0.0	0.1	0.0
7. STM	7.0	0.0	0.1	0.0	0.2	0.7	0.3	0.2	0.0	0.1	0.1
8. VDV1	5.0	0.0	0.1	0.0	0.2	0.8	0.4	0.3	0.0	0.2	0.2
9. VDV2	5.0	0.0	0.1	0.0	0.2	0.8	0.4	0.3	0.0	0.2	0.2
10. FY1	9.1	0.4	1.0	0.2	0.8	6.7	0.0	0.0	0.0	0.0	0.0
11. FY2	11.9	0.3	0.7	0.1	0.5	10.2	0.0	0.0	0.0	0.0	0.0
12. FY3	11.8	0.2	0.5	0.1	0.4	10.5	0.0	0.0	0.0	0.0	0.0
13. FY4	10.8	0.1	0.3	0.0	0.1	6.2	4.0	0.0	0.0	0.0	0.0
14. RC1	2.9	0.0	0.1	0.1	0.2	1.0	0.4	0.2	0.0	0.1	0.1
15. RC2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16. RC3	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17. KSH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18. VH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19. PG1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20. PG2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 7

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 20

JOB: T3
RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2

IV. MODEL RESULTS (PRED. CONC. INCLUDES AMB.) (CONT.)

RECEPTOR	CONC/LINK (PPM) K	L	M	N	O	P	Q	R	S	T
1. HG1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
2. HG2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
3. HG3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
4. LPL	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
5. CWG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
6. RH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
7. STM	0.1	0.0	0.0	0.1	0.0	0.4	0.5	2.5	1.4	0.1
8. VDV1	0.2	0.0	0.0	0.1	0.1	1.1	0.8	0.3	0.0	0.1
9. VDV2	0.2	0.0	0.0	0.1	0.1	1.1	0.8	0.4	0.0	0.1
10. FY1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11. FY2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12. FY3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13. FY4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14. RC1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.0	0.1
15. RC2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16. RC3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
17. KSH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18. VH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19. PG1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20. PG2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  17

     JOB: T3
     RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2
```

I. SITE VARIABLES

```
    U=   1.0 M/S          Z0= 100. CM        ALT=     1. (M)
  BRG=  50.0 DEGREES      VD=   0.0 CM/S
 CLAS=     4 (D)          VS=   0.0 CM/S
 MIXH=  500. M           AMB=   0.0 PPM
SIGTH=   18. DEGREES    TEMP=  25.0 DEGREE (C)
```

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. 20	7221	6540	7190	6586	BG	1900	450.0	25.1	14.0
B. 21	7190	6586	7138	6617	BG	1900	450.0	25.8	14.0
C. 22	7138	6617	7071	6619	BG	1900	450.0	25.8	14.0
D. 23	7071	6619	6967	6571	BG	1900	450.0	26.5	14.0
E. 24	6967	6571	6878	6541	BG	1900	450.0	21.8	14.0
F. 25	6878	6543	6699	6509	BG	520	450.0	22.5	12.0
G. 26	6699	6509	6646	6508	BG	520	450.0	27.5	12.0
H. 27	6646	6508	6603	6516	BG	520	450.0	28.5	12.0
I. 28	6603	6516	6560	6536	BG	520	450.0	29.5	12.0
J. 29	6560	6536	6407	6669	BG	520	450.0	29.5	12.0
K. 30	7218	6539	7124	6586	BG	890	450.0	20.9	12.0
L. 31	7124	6586	7007	6552	BG	890	450.0	22.5	12.0
M. 32	7248	6424	7200	6505	BG	1270	450.0	16.2	12.0
N. 33	7200	6505	7122	6544	BG	1270	450.0	17.7	12.0
O. 34	7122	6544	7031	6538	BG	1270	450.0	19.1	12.0
P. 35	6880	6535	6756	6502	BG	3330	450.0	18.0	21.0
Q. 36	6756	6502	6486	6476	BG	3330	450.0	24.3	21.0
R. 37	6488	6459	6298	6391	BG	3330	450.0	28.5	26.0
S. 38	6290	6418	6169	6399	AG	1050	450.0	18.0	14.0
T. 39	6169	6399	6092	6390	AG	1050	450.0	9.5	14.0

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  18

      JOB: T3
      RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2
```

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. HG1	6231	6056	13.5
2. HG2	6180	6039	13.5
3. HG3	6154	5998	13.5
4. LPL	6114	5956	8.5
5. CWG	6133	5872	8.5
6. RH	6044	5759	4.1
7. STM	5791	5587	15.6
8. VDV1	5903	5793	44.1
9. VDV2	5893	5778	44.1
10. FY1	6861	6470	5.6
11. FY2	6783	6430	6.5
12. FY3	6724	6401	6.3
13. FY4	6649	6394	6.0
14. RC1	6020	5800	44.5
15. RC2	6750	6520	7.5
16. RC3	7170	6500	7.2
17. KSH	5992	6582	13.7
18. VH	5965	6355	23.8
19. PG1	5860	6564	22.3
20. PG2	5795	6525	22.3

APPENDIX 7

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 19

JOB: T3
RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2

IV. MODEL RESULTS (PRED. CONC. INCLUDES AMB.)

RECEPTOR	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H	I	J
1. HG1	3.3	0.0	0.1	0.1	0.2	0.2	0.2	0.1	0.0	0.0	0.0
2. HG2	3.3	0.0	0.1	0.1	0.2	0.2	0.2	0.1	0.0	0.0	0.0
3. HG3	3.0	0.0	0.1	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.0
4. LPL	2.8	0.0	0.1	0.1	0.2	0.2	0.1	0.0	0.0	0.0	0.0
5. CWG	2.1	0.1	0.1	0.1	0.2	0.2	0.1	0.0	0.0	0.0	0.0
6. RH	1.8	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
7. STM	1.6	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
8. VDV1	2.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
9. VDV2	2.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
10. FY1	4.2	0.0	0.1	0.6	1.7	1.2	0.0	0.0	0.0	0.0	0.0
11. FY2	5.5	0.0	0.1	0.3	1.1	1.7	0.1	0.0	0.0	0.0	0.0
12. FY3	6.2	0.0	0.1	0.3	0.8	1.3	0.3	0.0	0.0	0.0	0.0
13. FY4	7.1	0.0	0.0	0.1	0.4	0.7	0.7	0.0	0.0	0.0	0.0
14. RC1	1.7	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
15. RC2	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
16. RC3	1.4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17. KSH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18. VH	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
19. PG1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20. PG2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  20

      JOB: T3
      RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2
```

IV. MODEL RESULTS (PRED. CONC. INCLUDES AMB.) (CONT.)

RECEPTOR	CONC/LINK (PPM) K	L	M	N	O	P	Q	R	S	T
1. HG1	0.0	0.1	0.0	0.0	0.1	0.7	1.3	0.1	0.0	0.0
2. HG2	0.0	0.1	0.0	0.0	0.1	0.6	1.5	0.2	0.0	0.0
3. HG3	0.0	0.1	0.0	0.0	0.1	0.6	1.2	0.1	0.0	0.0
4. LPL	0.0	0.1	0.0	0.0	0.1	0.5	1.1	0.2	0.0	0.0
5. CWG	0.1	0.1	0.0	0.1	0.1	0.5	0.6	0.0	0.0	0.0
6. RH	0.1	0.1	0.1	0.1	0.1	0.3	0.5	0.0	0.0	0.0
7. STM	0.0	0.0	0.0	0.0	0.1	0.2	0.5	0.2	0.0	0.0
8. VDV1	0.0	0.0	0.0	0.0	0.0	0.3	0.7	0.3	0.0	0.0
9. VDV2	0.0	0.0	0.0	0.0	0.0	0.3	0.7	0.3	0.0	0.0
10. FY1	0.0	0.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
11. FY2	0.0	0.2	0.0	0.0	0.1	1.7	0.0	0.0	0.0	0.0
12. FY3	0.0	0.2	0.0	0.0	0.1	3.2	0.0	0.0	0.0	0.0
13. FY4	0.0	0.1	0.0	0.0	0.0	4.1	1.2	0.0	0.0	0.0
14. RC1	0.0	0.1	0.0	0.0	0.1	0.3	0.5	0.1	0.0	0.0
15. RC2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16. RC3	0.3	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
17. KSH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18. VH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19. PG1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20. PG2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  17

     JOB: T3
     RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2
```

I. SITE VARIABLES

```
    U=   1.0 M/S           Z0= 100. CM          ALT=      1. (M)
  BRG=  50.0 DEGREES        VD=   0.0 CM/S
 CLAS=     4 (D)            VS=   0.0 CM/S
 MIXH=  500. M             AMB=   0.0 PPM
SIGTH=   18. DEGREES      TEMP=  25.0 DEGREE (C)
```

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. 40	6292	6409	6210	6351	BG	2280	450.0	23.7	21.0
B. 41	6210	6351	6173	6301	BG	2760	450.0	18.1	21.0
C. 42	6173	6301	6163	6265	BG	2760	450.0	23.9	21.0
D. 43	6143	6198	6086	6024	BG	2760	450.0	29.8	23.0
E. 44	6079	6027	6059	5984	BG	660	450.0	27.9	13.0
F. 45	6149	6196	6046	5880	BG	2140	450.0	35.6	14.0
G. 46	6059	5984	6018	5856	BG	660	450.0	34.5	13.0
H. 47	6090	6023	5975	5705	BG	2160	450.0	27.5	21.0
I. 48	5975	5705	5854	5527	BG	2160	450.0	27.0	21.0
J. 49	6229	6099	6148	6028	AG	940	450.0	16.3	13.0
K. 50	6148	6028	6109	5973	AG	940	450.0	22.9	13.0
L. 51	6109	5973	6071	5884	AG	940	450.0	28.1	13.0
M. 52	6201	6349	6176	6390	AG	480	450.0	13.5	16.0
N. 53	6176	6390	6097	6382	AG	480	450.0	9.4	16.0

APPENDIX 7

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 18

JOB: T3
RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2

III. RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (M) X	Y	Z
1. HG1	*	6231	6056	13.5
2. HG2	*	6180	6039	13.5
3. HG3	*	6154	5998	13.5
4. LPL	*	6114	5956	8.5
5. CWG	*	6133	5872	8.5
6. RH	*	6044	5759	4.1
7. STM	*	5791	5587	15.6
8. VDV1	*	5903	5793	44.1
9. VDV2	*	5893	5778	44.1
10. FY1	*	6861	6470	5.6
11. FY2	*	6783	6430	6.5
12. FY3	*	6724	6401	6.3
13. FY4	*	6649	6394	6.0
14. RC1	*	6020	5800	44.5
15. RC2	*	6750	6520	7.5
16. RC3	*	7170	6500	7.2
17. KSH	*	5992	6582	13.7
18. VH	*	5965	6355	23.8
19. PG1	*	5860	6564	22.3
20. PG2	*	5795	6525	22.3

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  19

     JOB: T3
     RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2
```

IV. MODEL RESULTS (PRED. CONC. INCLUDES AMB.)

RECEPTOR	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H	I	J
1. HG1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2. HG2	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7
3. HG3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
4. LPL	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
5. CWG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6. RH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7. STM	4.4	0.0	0.0	0.0	0.1	0.0	0.4	0.1	2.4	0.9	0.1
8. VDV1	6.0	0.0	0.0	0.0	0.4	0.1	1.9	0.6	2.0	0.0	0.3
9. VDV2	5.7	0.0	0.0	0.0	0.4	0.1	1.7	0.6	2.0	0.0	0.3
10. FY1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11. FY2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12. FY3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13. FY4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14. RC1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
15. RC2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16. RC3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17. KSH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18. VH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19. PG1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20. PG2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  20

     JOB: T3
     RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2
```

IV. MODEL RESULTS (PRED. CONC. INCLUDES AMB.) (CONT.)

RECEPTOR	CONC/LINK (PPM) K	L	M	N
1. HG1	0.0	0.0	0.0	0.0
2. HG2	0.0	0.0	0.0	0.0
3. HG3	0.0	0.0	0.0	0.0
4. LPL	0.1	0.0	0.0	0.0
5. CWG	0.0	0.0	0.0	0.0
6. RH	0.0	0.0	0.0	0.0
7. STM	0.1	0.2	0.0	0.0
8. VDV1	0.2	0.4	0.0	0.0
9. VDV2	0.2	0.4	0.0	0.0
10. FY1	0.0	0.0	0.0	0.0
11. FY2	0.0	0.0	0.0	0.0
12. FY3	0.0	0.0	0.0	0.0
13. FY4	0.0	0.0	0.0	0.0
14. RC1	0.0	0.1	0.0	0.0
15. RC2	0.0	0.0	0.0	0.0
16. RC3	0.0	0.0	0.0	0.0
17. KSH	0.0	0.0	0.0	0.0
18. VH	0.0	0.0	0.0	0.0
19. PG1	0.0	0.0	0.0	0.0
20. PG2	0.0	0.0	0.0	0.0

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  17

       JOB: T3
       RUN: 50
 POLLUTANT: Nitrogen Dioxide - NO2

 I.  SITE VARIABLES

       U=   1.0 M/S            Z0= 100. CM           ALT=      1. (M)
     BRG=  50.0 DEGREES        VD=   0.0 CM/S
    CLAS=     4 (D)            VS=   0.0 CM/S
    MIXH=  500. M             AMB=   0.0 PPM
   SIGTH=   18. DEGREES      TEMP=  25.0 DEGREE (C)

 II.  LINK VARIABLES
```

LINK DESCRIPTION	X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. 01	7375	6634	7228	6598	AG	1500	360.5	6.0	25.0
B. 02	7228	6598	7281	6398	AG	1465	360.5	5.8	30.0
C. 03	7228	6598	6990	6534	BG	2460	360.5	10.0	20.0
D. 04	6990	6534	6805	6471	BG	2460	360.5	10.5	20.0
E. 05	6805	6471	6682	6461	AG	2280	360.5	6.4	22.0
F. 06	6682	6461	6548	6474	AG	1390	360.5	7.4	18.0
G. 07	6548	6474	6342	6411	AG	1760	360.5	7.3	23.0
H. 21	6277	6798	6501	6630	BG	507	360.5	33.7	13.0
I. 22	6501	6630	6510	6501	BG	507	360.5	25.9	13.0
J. 23	6510	6501	6342	6411	BG	507	360.5	16.5	13.0
K. 24	6455	6590	6486	6500	BG	1060	360.5	19.3	13.0
L. 25	6486	6500	6353	6450	BG	1060	360.5	12.9	13.0
M. 27	7725	7500	7218	6762	AG	5920	360.5	5.8	27.0
N. 28	7218	6762	7146	6653	BG	4470	360.5	10.0	27.0
O. 29	7146	6653	7040	6574	BG	4470	360.5	18.4	28.0
P. 30	7040	6574	6848	6509	BG	4950	360.5	19.4	29.0
Q. 31	6848	6509	6687	6472	BG	2890	360.5	14.0	24.0
R. 32	6687	6472	6540	6528	BG	2890	360.5	16.6	24.0
S. 33	6540	6528	6276	6784	BG	2890	360.5	22.0	28.0

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  18

      JOB: T3
      RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2
```

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. HG1	6231	6056	13.5
2. HG2	6180	6039	13.5
3. HG3	6154	5998	13.5
4. LPL	6114	5956	8.5
5. CWG	6133	5872	8.5
6. RH	6044	5759	4.1
7. STM	5791	5587	15.6
8. VDV1	5903	5793	44.1
9. VDV2	5893	5778	44.1
10. FY1	6861	6470	5.6
11. FY2	6783	6430	6.5
12. FY3	6724	6401	6.3
13. FY4	6649	6394	6.0
14. RC1	6020	5800	44.5
15. RC2	6750	6520	7.5
16. RC3	7170	6500	7.2
17. KSH	5992	6582	13.7
18. VH	5965	6355	23.8
19. PG1	5860	6564	22.3
20. PG2	5795	6525	22.3

APPENDIX 7

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 19

JOB: T3
RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2

IV. MODEL RESULTS (PRED. CONC. INCLUDES AMB.)

RECEPTOR	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H	I	J
1. HG1	6.6	0.1	0.1	0.3	0.5	0.6	0.3	0.1	0.0	0.0	0.0
2. HG2	6.2	0.1	0.1	0.3	0.4	0.5	0.4	0.2	0.0	0.0	0.0
3. HG3	5.9	0.1	0.1	0.3	0.4	0.4	0.3	0.2	0.0	0.0	0.0
4. LPL	5.6	0.1	0.1	0.3	0.4	0.4	0.3	0.2	0.0	0.0	0.0
5. CWG	4.9	0.1	0.1	0.4	0.4	0.3	0.1	0.0	0.0	0.0	0.0
6. RH	4.1	0.1	0.1	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0
7. STM	3.3	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.0	0.0	0.0
8. VDV1	3.8	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.0	0.0	0.0
9. VDV2	3.7	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.0	0.0	0.0
10. FY1	28.0	0.0	0.0	1.3	9.2	0.0	0.0	0.0	0.0	0.0	0.0
11. FY2	25.0	0.0	0.0	0.7	7.8	0.5	0.0	0.0	0.0	0.0	0.0
12. FY3	21.4	0.0	0.0	0.5	4.3	2.8	0.0	0.0	0.0	0.0	0.0
13. FY4	18.3	0.0	0.0	0.2	1.1	5.2	0.1	0.0	0.0	0.0	0.0
14. RC1	3.8	0.1	0.1	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0
15. RC2	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16. RC3	5.7	2.8	2.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17. KSH	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
18. VH	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
19. PG1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20. PG2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 7

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 20

JOB: T3
RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2

IV. MODEL RESULTS (PRED. CONC. INCLUDES AMB.) (CONT.)

RECEPTOR	CONC/LINK (PPM) K	L	M	N	O	P	Q	R	S
1. HG1	0.0	0.0	1.7	0.3	0.3	0.9	0.8	0.6	0.0
2. HG2	0.0	0.0	1.6	0.3	0.3	0.7	0.7	0.6	0.1
3. HG3	0.0	0.0	1.5	0.3	0.3	0.7	0.6	0.5	0.1
4. LPL	0.0	0.0	1.4	0.3	0.3	0.7	0.6	0.5	0.1
5. CWG	0.0	0.0	1.4	0.3	0.3	0.7	0.5	0.2	0.0
6. RH	0.0	0.0	1.2	0.2	0.3	0.6	0.3	0.2	0.0
7. STM	0.0	0.0	0.9	0.2	0.2	0.4	0.2	0.2	0.1
8. VDV1	0.0	0.1	1.1	0.2	0.2	0.4	0.3	0.3	0.1
9. VDV2	0.0	0.1	1.0	0.2	0.2	0.4	0.3	0.3	0.1
10. FY1	0.0	0.0	5.2	2.1	2.4	7.8	0.0	0.0	0.0
11. FY2	0.0	0.0	4.5	1.4	1.4	7.5	1.0	0.0	0.0
12. FY3	0.0	0.0	4.0	1.1	1.0	5.2	2.6	0.0	0.0
13. FY4	0.0	0.0	3.5	0.6	0.4	1.9	5.2	0.0	0.0
14. RC1	0.0	0.0	1.1	0.2	0.2	0.5	0.3	0.2	0.0
15. RC2	0.0	0.0	4.3	0.3	0.0	0.0	0.0	0.0	0.0
16. RC3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
17. KSH	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.6
18. VH	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	1.3
19. PG1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1
20. PG2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1

APPENDIX 7

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE  17

      JOB: T3
      RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2
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I. SITE VARIABLES

```
    U=   1.0 M/S              Z0= 100. CM           ALT=      1. (M)
  BRG=  50.0 DEGREES          VD=   0.0 CM/S
 CLAS=     4 (D)              VS=   0.0 CM/S
 MIXH=  500. M               AMB=   0.0 PPM
SIGTH=   18. DEGREES        TEMP=  25.0 DEGREE (C)
```

II. LINK VARIABLES

LINK DESCRIPTION	*	X1	Y1	X2	Y2	*	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. 08	*	6342	6411	6262	6354	*	AG	2590	360.5	8.4	17.0
B. 09	*	6146	6266	6262	6354	*	AG	1890	360.5	9.4	23.0
C. 10	*	6015	6499	6081	6384	*	AG	3080	360.5	8.9	22.0
D. 11	*	6081	6384	6146	6266	*	AG	2140	360.5	8.9	26.0
E. 12	*	6146	6266	6237	6114	*	AG	2260	360.5	10.4	28.0
F. 13	*	6237	6114	6338	5973	*	AG	2480	360.5	7.1	26.0
G. 14	*	6338	5973	6125	5797	*	AG	1070	360.5	7.3	18.0
H. 15	*	6125	5797	6044	5883	*	FL	1070	360.5	14.3	14.0
I. 16	*	6108	6057	5964	5961	*	AG	660	360.5	28.0	16.0
J. 17	*	5964	5961	5990	5762	*	AG	660	360.5	37.0	17.0
K. 18	*	5990	5762	5821	5663	*	AG	660	360.5	47.0	18.0
L. 19	*	5821	5663	5750	5576	*	AG	660	360.5	50.0	17.0
M. 26	*	6353	6450	6174	6304	*	AG	1060	360.5	13.3	13.0
N. 20	*	5750	5576	5600	5520	*	AG	660	360.5	61.0	17.0
O. 50	*	7279	6871	7218	6761	*	AG	5920	360.5	5.8	27.0

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CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 18

JOB: T3
RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. HG1	6231	6056	13.5
2. HG2	6180	6039	13.5
3. HG3	6154	5998	13.5
4. LPL	6114	5956	8.5
5. CWG	6133	5872	8.5
6. RH	6044	5759	4.1
7. STM	5791	5587	15.6
8. VDV1	5903	5793	44.1
9. VDV2	5893	5778	44.1
10. FY1	6861	6470	5.6
11. FY2	6783	6430	6.5
12. FY3	6724	6401	6.3
13. FY4	6649	6394	6.0
14. RC1	6020	5800	44.5
15. RC2	6750	6520	7.5
16. RC3	7170	6500	7.2
17. KSH	5992	6582	13.7
18. VH	5965	6355	23.8
19. PG1	5860	6564	22.3
20. PG2	5795	6525	22.3

APPENDIX 7

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 19

JOB: T3
RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2

IV. MODEL RESULTS (PRED. CONC. INCLUDES AMB.)

RECEPTOR	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H	I	J
1. HG1	3.5	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0
2. HG2	3.3	0.0	0.0	0.0	0.0	0.4	2.5	0.0	0.0	0.0	0.0
3. HG3	3.0	0.0	0.0	0.0	0.0	0.3	2.5	0.0	0.0	0.0	0.0
4. LPL	3.0	0.0	0.0	0.0	0.0	0.3	2.4	0.0	0.0	0.0	0.0
5. CWG	3.0	0.0	0.0	0.0	0.0	0.0	2.2	0.4	0.0	0.0	0.0
6. RH	6.1	0.0	0.0	0.0	0.0	0.0	1.3	2.8	1.8	0.0	0.0
7. STM	2.6	0.0	0.0	0.0	0.0	0.1	0.7	0.7	0.5	0.0	0.2
8. VDV1	2.0	0.1	0.0	0.0	0.0	0.3	0.6	0.0	0.0	0.1	0.7
9. VDV2	2.0	0.1	0.0	0.0	0.0	0.3	0.6	0.0	0.1	0.1	0.7
10. FY1	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11. FY2	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12. FY3	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13. FY4	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14. RC1	1.1	0.0	0.0	0.0	0.0	0.0	0.7	0.1	0.0	0.0	0.0
15. RC2	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16. RC3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17. KSH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18. VH	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19. PG1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20. PG2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 7

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 20

JOB: T3
RUN: 50
POLLUTANT: Nitrogen Dioxide - NO2

IV. MODEL RESULTS (PRED. CONC. INCLUDES AMB.) (CONT.)

RECEPTOR	CONC/LINK (PPM) K	L	M	N	O
1. HG1	0.0	0.0	0.0	0.0	0.4
2. HG2	0.0	0.0	0.0	0.0	0.3
3. HG3	0.0	0.0	0.0	0.0	0.3
4. LPL	0.0	0.0	0.0	0.0	0.3
5. CWG	0.0	0.0	0.0	0.0	0.3
6. RH	0.0	0.0	0.0	0.0	0.2
7. STM	0.2	0.0	0.0	0.0	0.2
8. VDV1	0.0	0.0	0.0	0.0	0.2
9. VDV2	0.0	0.0	0.0	0.0	0.2
10. FY1	0.0	0.0	0.0	0.0	1.9
11. FY2	0.0	0.0	0.0	0.0	1.5
12. FY3	0.0	0.0	0.0	0.0	1.2
13. FY4	0.0	0.0	0.0	0.0	0.9
14. RC1	0.0	0.0	0.0	0.0	0.2
15. RC2	0.0	0.0	0.0	0.0	0.9
16. RC3	0.0	0.0	0.0	0.0	0.0
17. KSH	0.0	0.0	0.0	0.0	0.0
18. VH	0.0	0.0	0.0	0.0	0.0
19. PG1	0.0	0.0	0.0	0.0	0.0
20. PG2	0.0	0.0	0.0	0.0	0.0

Appendix 8

Air Quality Monitoring Results

Results of High Volume Sampling (24 hours Average)

Date	TSP (μg/m3)	RSP (μg/m3)
08.01.95	112	84
09.01.95	89	66
10.01.95	81	62
11.01.95	77	57
12.01.95	87	56
13.01.95	76	56
14.01.95	81	59
15.01.95	88	66
16.01.95	94	67
17.01.95	64	49
18.01.95	66	47
19.01.95	68	52
20.01.95	57	45
21.01.95	42	34
22.01.95	74	52
23.01.95	58	41
24.01.95	71	57
25.01.95	55	38
26.01.95	40	30
27.01.95	16	13

Monitoring Results of Carbon Monoxide and Nitrogen Oxides (1)

Date	Time (Hour)	CO (ppm)	NO2 (ppb)	NOx (ppb)	NO (ppb)
08.01.95	14:00	0.4	68	92	24
	15:00	0.6	124	174	50
	16:00	0.4	121	192	72
	17:00	0.6	122	234	112
	18:00	0.7	114	166	51
	19:00	0.6	108	141	33
	20:00	0.5	100	145	45
	21:00	0.5	90	123	33
	22:00	0.6	86	143	57
	23:00	0.7	82	190	108
	Daily Avg.	0.6	105	168	62
09.01.95	00:00	0.8	79	207	128
	01:00	0.7	73	159	86
	02:00	0.6	68	108	39
	03:00	0.5	53	65	12
	04:00	0.5	44	45	<2
	05:00	0.5	39	40	<2
	06:00	0.6	38	43	4
	07:00	0.8	43	110	67
	08:00	1.4	79	421	342
	09:00	1.8	131	615	483
	10:00	1.4	134	387	254
	11:00	0.8	116	165	50
	12:00	*Daily Calibration*			
	13:00	0.5	81	93	12
	14:00	0.6	109	135	27
	15:00	0.5	131	166	35
	16:00	0.4	120	139	19
	17:00	0.4	132	147	15
	18:00	0.5	104	110	6
	19:00	0.5	92	111	19
	20:00	0.6	90	124	33
	21:00	0.6	86	132	46
	22:00	0.6	78	118	39
	23:00	0.6	70	117	47
	Daily Avg.	0.7	87	63	77

Remarks : *Detection Limit of CO is 0.1 ppm*
Detection Limit of NOx is 2 ppb

Monitoring Results of Carbon Monoxide and Nitrogen Oxides (2)

Date	Time (Hour)	CO (ppm)	NO2 (ppb)	NOx (ppb)	NO (ppb)
01.01.95	00:00	0.7	64	134	70
	01:00	0.7	59	112	53
	02:00	0.7	61	131	70
	03:00	0.6	57	81	24
	04:00	0.5	39	42	2
	05:00	0.4	7	7	<2
	06:00	0.4	24	24	<2
	07:00	0.4	31	31	<2
	08:00	0.5	32	34	<2
	09:00	0.5	36	40	4
	10:00	0.4	24	27	2
	11:00	0.4	23	25	3
	12:00	*0.4*	*16*	*17*	*<2*
	13:00	*Daily Calibration*			
	14:00	*Daily Calibration*			
	15:00	0.6	35	38	4
	16:00	0.6	39	41	2
	17:00	0.6	47	48	<2
	18:00	0.6	56	58	<2
	19:00	0.6	47	48	<2
	20:00	0.5	21	21	<2
	21:00	0.5	15	15	<2
	22:00	0.4	16	16	<2
	23:00	0.4	13	13	<2
	Daily Avg.	0.5	35	46	11
11.01.95	00:00	0.4	10	10	<2
	01:00	0.4	9	9	<2
	02:00	0.4	6	7	<2
	03:00	0.4	3	3	<2
	04:00	0.4	3	3	<2
	05:00	0.3	5	5	<2
	06:00	0.3	12	12	<2
	07:00	0.3	22	23	<2
	08:00	0.4	33	37	4
	09:00	0.4	28	33	5
	10:00	0.5	30	38	8
	11:00	*Daily Calibration*			
	12:00	*Daily Calibration*			
	13:00	0.4	*30*	39	*9*
	14:00	0.4	*32*	*41*	*8*
	15:00	0.3	49	60	12
	16:00	0.3	55	64	9
	17:00	0.3	74	82	7
	18:00	0.3	56	61	5
	19:00	0.5	69	106	36
	20:00	0.5	62	97	35
	21:00	0.4	57	86	29
	22:00	0.4	56	94	38
	23:00	0.5	53	139	36
	Daily Avg.	0.4	34	48	13

Remarks : *Detection Limit of CO is 0.1 ppm*
Detection Limit of NOx is 2 ppb

Monitoring Results of Carbon Monoxide and Nitrogen Oxides (3)

Date	Time (Hour)	CO (ppm)	NO2 (ppb)	NOx (ppb)	NO (ppb)
12.01.95	00:00	0.7	53	202	149
	01:00	0.7	53	168	115
	02:00	0.8	58	84	25
	03:00	0.6	21	22	<2
	04:00	0.5	13	14	<2
	05:00	0.5	15	15	<2
	06:00	0.4	25	28	3
	07:00	0.4	22	24	2
	08:00	0.5	35	53	18
	09:00	0.6	48	119	71
	10:00	0.7	54	148	93
	11:00	*Daily Calibration*			
	12:00	0.7	*63*	*105*	*42*
	13:00	0.6	*55*	*67*	*12*
	14:00	0.7	*61*	*74*	*13*
	15:00	0.7	66	76	10
	16:00	0.7	60	64	4
	17:00	0.7	58	59	<2
	18:00	0.7	52	52	<2
	19:00	0.8	50	50	<2
	20:00	0.7	28	28	<2
	21:00	0.6	20	20	<2
	22:00	0.6	29	30	<2
	23:00	0.5	25	26	<2
	Daily Avg.	0.6	42	66	24
13.01.95	00:00	0.6	44	53	9
	01:00	0.6	33	35	<2
	02:00	0.5	28	28	<2
	03:00	0.5	14	14	<2
	04:00	0.5	14	14	<2
	05:00	0.5	11	11	<2
	06:00	0.5	12	12	<2
	07:00	0.5	17	19	<2
	08:00	0.6	37	57	20
	09:00	0.7	37	65	28
	10:00	0.7	43	90	47
	11:00	0.6	58	143	86
	12:00	*Daily Calibration*			
	13:00	0.7	41	53	11
	14:00	0.6	50	62	12
	15:00	0.6	46	51	5
	16:00	0.7	109	150	41
	17:00	0.7	81	100	19
	18:00	0.6	44	46	<2
	19:00	0.5	18	18	<2
	20:00	0.5	17	18	<2
	21:00	0.4	18	18	<2
	22:00	0.4	17	18	<2
	23:00	0.4	13	14	<2
	Daily Avg.	0.6	35	47	12

Remarks : *Detection Limit of CO is 0.1 ppm*
Detection Limit of NOx is 2 ppb

Monitoring Results of Carbon Monoxide and Nitrogen Oxides (4)

Date	Time (Hour)	CO (ppm)	NO2 (ppb)	NOx (ppb)	NO (ppb)
14.01.95	00:00	0.4	14	15	<2
	01:00	0.4	16	17	<2
	02:00	0.4	11	12	<2
	03:00	0.4	10	11	<2
	04:00	0.4	7	8	<2
	05:00	0.3	8	9	<2
	06:00	0.3	11	12	<2
	07:00	0.3	15	17	<2
	08:00	0.3	20	23	3
	09:00	0.3	24	30	6
	10:00	0.4	29	39	10
	11:00	0.4	34	47	14
	12:00	0.3	*28*	37	*9*
	13:00	*Daily Calibration*			
	14:00	0.5	*45*	*59*	*14*
	15:00	0.5	51	65	14
	16:00	0.4	51	63	12
	17:00	0.4	56	64	8
	18:00	0.3	43	44	<2
	19:00	0.2	23	23	<2
	20:00	0.2	15	16	<2
	21:00	0.3	31	32	<2
	22:00	0.3	22	22	<2
	23:00	0.3	22	22	<2
	Daily Avg.	0.3	26	30	4
15.01.95	00:00	0.3	18	18	<2
	01:00	0.4	27	32	5
	02:00	0.3	14	14	<2
	03:00	0.4	11	11	<2
	04:00	0.4	10	11	<2
	05:00	0.4	8	8	<2
	06:00	0.4	8	9	<2
	07:00	0.3	10	10	<2
	08:00	0.3	15	16	<2
	09:00	0.4	25	27	2
	10:00	0.4	20	23	3
	11:00	0.4	34	39	5
	12:00	0.5	43	52	9
	13:00	0.4	36	43	7
	14:00	0.3	13	14	<2
	15:00	0.3	22	25	2
	16:00	0.3	24	25	<2
	17:00	0.3	35	35	<2
	18:00	0.3	39	40	<2
	19:00	0.4	74	90	16
	20:00	0.4	39	39	<2
	21:00	0.5	64	77	13
	22:00	0.6	62	83	21
	23:00	0.5	43	47	4
	Daily Avg.	0.4	29	33	4

Remarks : *Detection Limit of CO is 0.1 ppm*
Detection Limit of NOx is 2 ppb

Date	Time (Hour)	CO (ppm)	NO (ppb)	NO2 (ppb)
16.1.95	0:00	0.4	<2	15
	1:00	0.4	<2	13
	2:00	0.4	<2	8
	3:00	0.4	<2	9
	4:00	0.4	<2	7
	5:00	0.4	<2	15
	6:00	0.4	<2	24
	7:00	0.5	13	46
	8:00	0.5	15	38
	9:00	0.6	59	47
	10:00	0.6	61	54
	11:00	0.6	44	57
	12:00	0.6	42	63
	13:00	*Daily Calibration*		
	14:00	0.6	15	80
	15:00	0.6	33	110
	16:00	0.7	70	129
	17:00	0.8	84	117
	18:00	0.5	6	50
	19:00	0.6	32	73
	20:00	0.5	13	50
	21:00	0.4	28	54
	22:00	0.5	38	59
	23:00	0.5	52	57
	Daily Avg.	0.5	25	51
17.1.95	0:00	0.4	<2	11
	1:00	0.4	33	46
	2:00	0.5	30	44
	3:00	0.4	<2	11
	4:00	0.4	<2	7
	5:00	0.5	<2	8
	6:00	0.5	<2	8
	7:00	0.6	9	26
	8:00	0.6	6	30
	9:00	0.6	8	37
	10:00	0.5	9	32
	11:00	0.5	7	25
	12:00	0.5	18	39
	13:00	*Daily Calibration*		
	14:00	0.5	16	45
	15:00	0.4	19	51
	16:00	0.4	18	58
	17:00	0.4	8	59
	18:00	0.4	<2	54
	19:00	0.4	<2	56
	20:00	0.3	<2	42
	21:00	0.3	<2	33
	22:00	0.2	<2	19
	23:00	0.3	<2	29
	Daily Avg.	0.4	8	33

Remark: *The detection limit of CO analyser is 0.1 ppm*
The detection limit of NOx analyser is 2.0 ppb

Date	Time (Hour)	CO (ppm)	NO (ppb)	NO2 (ppb)
18.01.95	0:00	0.3	<2	18
	1:00	0.3	<2	9
	2:00	0.3	<2	8
	3:00	0.3	<2	8
	4:00	0.3	<2	5
	5:00	0.3	<2	5
	6:00	0.3	<2	10
	7:00	0.3	<2	13
	8:00	0.4	<2	30
	9:00	0.4	<2	23
	10:00	0.4	11	42
	11:00	0.4	14	51
	12:00	0.4	7	42
	13:00	0.4	4	39
	14:00	0.4	7	45
	15:00	0.4	5	56
	16:00	0.4	3	54
	17:00	0.4	<2	47
	18:00	0.3	<2	33
	19:00	0.3	<2	26
	20:00	0.3	10	51
	21:00	0.3	3	35
	22:00	0.3	<2	21
	23:00	0.2	<2	13
	Daily Avg	0.3	3	29
19.01.95	0:00	0.2	<2	8
	1:00	0.2	<2	8
	2:00	0.2	<2	6
	3:00	0.2	<2	4
	4:00	0.3	<2	20
	5:00	0.3	<2	39
	6:00	0.4	4	53
	7:00	0.4	34	70
	8:00	0.7	110	81
	9:00	0.5	19	53
	10:00	0.5	11	45
	11:00	0.5	8	37
	12:00	0.4	5	31
	13:00	0.3	3	20
	14:00	0.2	3	24
	15:00	0.1	15	49
	16:00	0.1	7	60
	17:00	<0.1	<2	58
	18:00	<0.1	<2	62
	19:00	0.1	<2	50
	20:00	0.2	<2	57
	21:00	0.2	21	72
	22:00	0.4	66	79
	23:00	0.5	72	77
	Daily Avg	0.3	16	44

Remark: *The detection limit of CO analyser is 0.1 ppm*
The detection limit of NOx analyser is 2.0 ppb

Date	Time (Hour)	CO (ppm)	NO (ppb)	NO2 (ppb)
20.01.95	0:00	0.5	57	71
	1:00	0.4	22	64
	2:00	0.4	22	60
	3:00	0.3	<2	41
	4:00	0.3	3	43
	5:00	0.3	5	41
	6:00	0.3	5	45
	7:00	0.3	<2	49
	8:00	0.5	11	54
	9:00	0.4	16	51
	10:00	0.4	11	41
	11:00	0.4	12	42
	12:00	0.4	6	25
	13:00	0.3	8	32
	14:00	0.3	6	28
	15:00	0.3	8	37
	16:00	0.2	3	34
	17:00	0.3	13	66
	18:00	0.3	3	62
	19:00	0.2	<2	34
	20:00	0.1	<2	18
	21:00	0.1	<2	18
	22:00	0.2	<2	27
	23:00	0.2	<2	40
	Daily Avg	0.3	9	43
19.01.95	0:00	0.3	<2	31
	1:00	0.2	<2	11
	2:00	0.1	<2	8
	3:00	0.1	<2	6
	4:00	0.1	<2	4
	5:00	<0.1	<2	5
	6:00	<0.1	<2	7
	7:00	0.1	<2	28
	8:00	0.4	19	54
	9:00	0.3	16	50
	10:00	0.3	31	53
	11:00	0.3	25	47
	12:00	0.3	24	43
	13:00	*Daily Calibration*		
	14:00	0.4	13	37
	15:00	0.3	6	34
	16:00	0.3	9	48
	17:00	0.3	4	43
	18:00	0.3	5	48
	19:00	0.2	2	30
	20:00	0.2	<2	22
	21:00	0.3	5	52
	22:00	0.4	17	78
	23:00	0.3	<2	52
	Daily Avg	0.2	7	34

Remark: *The detection limit of CO analyser is 0.1 ppm*
The detection limit of NOx analyser is 2.0 ppb

Date	Time (Hour)	CO (ppm)	NO (ppb)	NO2 (ppb)
20.01.95	0:00	0.5	57	71
	1:00	0.4	22	64
	2:00	0.4	22	60
	3:00	0.3	<2	41
	4:00	0.3	3	43
	5:00	0.3	5	41
	6:00	0.3	5	45
	7:00	0.3	<2	49
	8:00	0.5	11	54
	9:00	0.4	16	51
	10:00	0.4	11	41
	11:00	0.4	12	42
	12:00	0.4	6	25
	13:00	0.3	8	32
	14:00	0.3	6	28
	15:00	0.3	8	37
	16:00	0.2	3	34
	17:00	0.3	13	66
	18:00	0.3	3	62
	19:00	0.2	<2	34
	20:00	0.1	<2	18
	21:00	0.1	<2	18
	22:00	0.2	<2	27
	23:00	0.2	<2	40
	Daily Avg.	0.3	9	43
21.01.95	0:00	0.3	<2	31
	1:00	0.2	<2	11
	2:00	0.1	<2	8
	3:00	0.1	<2	6
	4:00	0.1	<2	4
	5:00	<0.1	<2	5
	6:00	<0.1	<2	7
	7:00	0.1	<2	28
	8:00	0.4	19	54
	9:00	0.3	16	50
	10:00	0.3	31	53
	11:00	0.3	25	47
	12:00	0.3	24	43
	13:00	*Daily Calibration*		
	14:00	0.4	13	37
	15:00	0.3	6	34
	16:00	0.3	9	48
	17:00	0.3	4	43
	18:00	0.3	5	48
	19:00	0.2	2	30
	20:00	0.2	<2	22
	21:00	0.3	5	52
	22:00	0.4	17	78
	23:00	0.3	<2	52
	Daily Avg.	0.2	7	34

Remark: *The detection limit of CO analyser is 0.1 ppm*
The detection limit of NOx analyser is 2.0 ppb

Date	Time (Hour)	CO (ppm)	NO (ppb)	NO2 (ppb)
22.01.95	0:00	0.4	8	51
	1:00	0.3	<2	22
	2:00	0.4	<2	24
	3:00	0.4	<2	22
	4:00	0.4	<2	15
	5:00	0.4	<2	15
	6:00	0.4	<2	31
	7:00	0.5	8	38
	8:00	0.6	83	58
	9:00	0.6	93	62
	10:00	0.5	19	38
	11:00	0.5	17	36
	12:00	0.4	6	34
	13:00	0.4	3	22
	14:00	0.4	14	45
	15:00	0.4	16	60
	16:00	*Daily Calibration*		
	17:00	0.4	27	87
	18:00	0.4	26	88
	19:00	0.4	49	82
	20:00	0.4	55	71
	21:00	0.6	85	67
	22:00	0.7	88	65
	23:00	0.7	91	61
	Daily Avg.	0.5	29	48
23.01.94	0:00	0.5	63	54
	1:00	0.4	31	50
	2:00	0.3	12	37
	3:00	0.4	45	38
	4:00	0.4	63	38
	5:00	0.4	51	38
	6:00	0.4	50	38
	7:00	0.6	92	42
	8:00	1.3	382	76
	9:00	0.8	53	44
	10:00	0.7	23	41
	11:00	0.6	7	29
	12:00	0.6	7	27
	13:00	0.6	13	31
	14:00	0.6	15	36
	15:00	*Daily Calibration*		
	16:00	0.5	6	36
	17:00	0.5	<2	32
	18:00	0.4	<2	34
	19:00	0.4	<2	27
	20:00	0.3	<2	17
	21:00	0.3	<2	22
	22:00	0.3	<2	25
	23:00	0.4	<2	33
	Daily Avg.	0.5	38	37

Remark: *The detection limit of CO analyser is 0.1 ppm*
The detection limit of NOx analyser is 2.0 ppb

Date	Time (Hour)	CO (ppm)	NO (ppb)	NO2 (ppb)
24.01.95	0:00	0.3	<2	18
	1:00	0.3	<2	21
	2:00	0.3	<2	17
	3:00	0.3	<2	10
	4:00	0.3	<2	6
	5:00	0.4	<2	10
	6:00	0.4	<2	18
	7:00	0.4	4	29
	8:00	0.5	<2	22
	9:00	0.5	8	28
	10:00	0.6	10	32
	11:00	0.6	7	27
	12:00	0.7	19	36
	13:00	0.6	5	27
	14:00	0.6	13	43
	15:00	0.7	24	51
	16:00	*Daily Calibration*		
	17:00	*Daily Calibration*		
	18:00	0.7	<2	34
	19:00	0.6	<2	43
	20:00	0.6	<2	21
	21:00	0.6	<2	18
	22:00	0.6	<2	21
	23:00	0.6	2	30
	Daily Avg.	0.5	4	26
25.01.95	0:00	0.6	<2	32
	1:00	0.6	<2	12
	2:00	0.6	<2	9
	3:00	0.6	<2	16
	4:00	0.7	<2	15
	5:00	0.7	<2	15
	6:00	0.7	<2	17
	7:00	0.8	33	31
	8:00	1.0	110	38
	9:00	1.0	67	39
	10:00	1.0	62	43
	11:00	1.0	34	39
	12:00	0.8	19	40
	13:00	0.8	6	28
	14:00	0.7	13	37
	15:00	*Daily Calibration*		
	16:00	0.7	21	59
	17:00	0.7	14	59
	18:00	0.6	3	44
	19:00	0.6	6	54
	20:00	0.5	2	39
	21:00	0.3	<2	29
	22:00	0.3	<2	24
	23:00	0.2	<2	23
	Daily Avg.	0.7	16	32

Remark: *The detection limit of CO analyser is 0.1 ppm*
The detection limit of NOx analyser is 2.0 ppb

Date	Time (Hour)	CO (ppm)	NO (ppb)	NO2 (ppb)
26.01.95	0:00	0.2	<2	9
	1:00	0.1	<2	6
	2:00	0.1	<2	6
	3:00	0.1	<2	4
	4:00	0.1	<2	5
	5:00	0.1	<2	11
	6:00	0.1	<2	13
	7:00	0.2	<2	21
	8:00	0.2	<2	21
	9:00	0.2	6	30
	10:00	0.3	9	33
	11:00	0.3	14	38
	12:00	0.3	13	44
	13:00	0.4	20	53
	14:00	0.5	14	55
	15:00	0.6	8	47
	16:00	*Daily Calibration*		
	17:00	0.5	<2	28
	18:00	0.6	22	44
	19:00	0.4	4	31
	20:00	0.4	<2	24
	21:00	0.4	13	38
	22:00	0.5	43	39
	23:00	0.6	64	36
	Daily Avg.	0.3	10	28
27.01.95	0:00	0.5	40	32
	1:00	0.4	6	24
	2:00	0.4	<2	16
	3:00	0.4	<2	12
	4:00	0.3	<2	9
	5:00	0.3	<2	13
	6:00	0.4	<2	14
	7:00	0.4	10	25
	8:00	0.5	5	24
	9:00	0.6	31	30
	10:00	0.7	40	31
	11:00	0.7	27	34
	12:00	0.6	12	28
	13:00	0.6	13	30
	14:00	0.6	10	26
	15:00	*Daily Calibration*		
	16:00	0.7	36	39
	17:00	0.8	36	45
	18:00	0.7	14	37
	19:00	0.6	6	30
	20:00	0.5	3	21
	21:00	0.6	52	37
	22:00	0.7	66	42
	23:00	0.7	79	44
	Daily Avg.	0.6	20	28

Remark: *The detection limit of CO analyser is 0.1 ppm*
The detection limit of NOx analyser is 2.0 ppb

Date	Time (Hour)	CO (ppm)	NO (ppb)	NO2 (ppb)
28.01.95	0:00	0.7	22	38
	1:00	0.6	<2	12
	2:00	0.5	<2	5
	3:00	0.5	<2	4
	4:00	0.5	<2	5
	5:00	0.5	<2	5
	6:00	0.5	<2	6
	7:00	0.5	<2	8
	8:00	0.5	<2	12
	9:00	0.6	4	15
	10:00	0.7	36	33
	11:00	0.7	20	29
	12:00	0.7	12	26
	13:00	0.8	30	35
	14:00	0.7	14	28
	Daily Avg.	0.3	10	28

* Measurement stopped at 14:00

Remark: *The detection limit of CO analyser is 0.1 ppm*
The detection limit of NOx analyser is 2.0 ppb

Appendix 9

Summary of Comments and Responses

Comments given in letter by D of EP on <u>the revised draft updated Noise assessment report</u>, ref : ( ) in EP2/N1/27 VII dated 13 March 1998.

(a) <u>Table 2.1</u>

Comment	Response
It is noted all NSRs considered in the assessment are existing. The Consultant is to confirm there is no planned NSRs (noise sensitive NSRs in the OZP) which will be affected by noise from traffic on T3.	We confirm that there are no planned NSRs in the current OZP within the Study Area which will be affected by noise from traffic on T3.

(b) <u>Table 2.2</u>

Comment	Response
The Consultant should clarify if breakers will be required for road opening in connection with the drainage work.	No breaker will be required.

(c) <u>2.4 - Operational Noise</u>

Comment	Response
1st para. : 55 dB(A) should be applicable to diagnostic rooms and wards only in clinics and homes for the aged.	Noted. The text will be amended accordingly.

(d) <u>2.5.4</u>

Comment	Response
(i) Use of Silenced PME: The Consultants should present in the report the specified SWL each item of silenced PME available in the market and based on the specific SWLs to assess the mitigated noise impact.	We have itemized possible remedies to the equipment with possible sound reduction for each item of PME based on current technologies and BS5228:Part1:1984.
(ii) Use of Effective Mobile Screens: Use of mobile noise screens is not applicable for all PME, in patricular those mobile PME. Hence, the Consultant should not assume a reduction of noise by 10 dB(A) at the NSRs by such measures.	Temporary barriers can be placed along the works site boundary to screen the nearby NSR's and in particular the lower floor receivers from ground level works. The noise reduction is expected to be about 10 dB(A). Also, mobile barriers can be used to screen the fixed plant.
(iii) If the will be residual impact at the schools even with all the direct noise mitigation measures, the Consultants should propose improved windows and air-conditioning for the affected schools for the duration of the construction activities in accordance with Prepack Note 2/93.	Noted. A few schools along the alignment are likely to be exposed to construction noise levels close to or exceeding 70 dB(A) as recommended in ProPECC Note 2/93 for educational institutions. The maximum exceedances are in the order of 5-10 dB(A), taking into account cumulative effects from multiple activities near the receivers. These schools include Shatin Public School, a kindergarten in Tung Lo Wan Hill Road and Lau Pak Lok Secondary School. It is expected that each school will be exposed to construction noise for no more than about 3 months and the duration of maximum noise levels is no more than about one month. In view of the short duration in which the noise level exceeds the Construction Noise Guideline, no sound insulation is recommended for the construction phase.

Comments	Responses
(e) Table 2.11	
I understand that the predicted traffic data being commented by TD. My following comments on the operational noise are based on this understanding. nonetheless, I consider that only the design year figures should be included in the report.	Agreed.
(f) 2.6.3 - Scenario 2	
(i) Barrier Segments: I note that the Consultant has provided some qualitative assessment to justify their recommendations of different forms of noise mitigation measures. Nonetheless, the Consultant should be required to provide further justification in terms of noise reduction effectiveness of different options considered and engineering constraints, for each section, to demonstrate why the currently recommended measures are effective and why more extensive measures (e.g. taller and longer barriers, partial enclosure instead of barriers) are not recommended.	Noted. More justification is given below and the text will be revised to include this justification.
(ii) In particular, the Consultant is requested to review the noise mitigation measures on the following segments:	
Barrier segment e-f	
The Consultant is required to review the effectiveness of the section of noise barrier proposed on T3 in front of Tung Lo Wan Village as the noise figures in Table A4.4 indicate that the barrier will only bring very small further noise reduction when compared with "Mitigation Scenario 1".	Agreed that barrier segment e-f on Road T4 is not totally effective for TLW's since these receivers would be partially screened by crush barriers on the new Roads. Additional barriers on T4 are not expected to produce a significant noise reduction. Furthermore, the noise contribution from the existing roads is comparable to the new roads and this makes the overall noise reduction from the barrier small and therefore insignificant. After re-examining the case, we propose to cut short the barrier segment to about 370m just to protect OTT's, HL's, MV's, PRC's, and VLP's, for which the barrier segment is effective. Proposed barrier segment e-f is revised on Figure 2.4.
Barrier segments g-h, h-i, h-j and l-m	
According to Table A4.3, the dominant noise sources will still be the new roads in "Mitigation Scenario 2" at upper floors of MFH3 & MFH4. The Consultants is required to examine the effectiveness of extending the full noise enclosure on west bound of T3 in reducing the noise from the new roads and hence the overall noise levels at MFH3 & MFH4.	Extending the full enclosure on the west bound (W/B) carriageway of T3 will create fire fighting and ventilation problems. On the other hand, an inverted-L barrier for g-h is insufficient to screen the high rise receivers in Mei Lam Estate from the heavy traffic (about 3,000 veh/hr.) on E/B of T3. Therefore a partial enclosure is recommended for this section. The 4m barrier along h-i is necessary to protect the low and middle floor receivers in MFH's because the slip road is very close to the

buildings. However, no additional protection is justified because the traffic flow is about 900 veh/hr. Further extension of the barrier towards Mei Tin Road is not feasible because of the presence of an existing footbridge. The shadow zone of the proposed inverted-L barrier along h-j is sufficient to cover all the receivers in MFH's which are 20 storeys high.

Barrier segments k-l

According the Table A4.3, noise from the new roads will be higher than or comparable to that from the existing roads at CCS1-3, in particular at the upper floors. The Consultant is required to examine the effectiveness of a taller barrier to reduce noise from the new roads at the above NSRs.

Agreed that the proposed inverted-L barrier along k-l is insufficient to provide the required noise reduction for the heavy traffic (about 4,000 veh/hr) on W/B of T3. We propose to replace the segment by a partial enclosure with an overhang of 5m to provide additional protection for CCS1-3.

Barriers segments m-n and n-p

The Consultant is requested to advise if effectiveness of inverted noise barrier is comparable to the proposed semi-enclosure in protecting the low rise STPH and GLG which is a distance from T3.

The upper floors of the school, STPS, will be just within the margin of the shadow zone of the proposed inverted -L barrier. In view of the heavy traffic (about 4,000 veh/hr) on the W/B of T3 and the close proximity of STPS's to the road, a partial enclosure along m-p is required to adequately protect the school.

Barrier segments n-p, p-r and n-x

The Consultant is requested to advise if effectiveness of 3 inverted barriers (one on the north bound of T3 and two on the south-bound of T3 is comparable to the proposed semi-enclosure in protecting GLG, GRG &HG.

An inverted-L barrier along n-r is sufficient to screen HG's GRG's, GLG's from the medium traffic (about 1,200) on S/B of T3. Also, another similar inverted L-barrier along n-r on the N/B of T3 is sufficient to screen HG's, GRG's, GLG's from the traffic (about 3,000 veh/hr.) on the N/B carriageway. As a cost-effective alternative, we propose to extend the partial enclosure along n-x to cover the whole width of the S/B carriageway in order to protect adequately HG's GRG's, GLG's from both the heavy traffic on N/B and the medium traffic on S/B of T3.

Barrier segment q-r-s

According to Table 4.3, the dominant noise source affecting HG4, LPL & CWG will be the new roads. The consultant is requested to advise if the main source is the north bound of T3. If yes, effective noise mitigation measure should be recommended for the north bound of T3 to further reduce the noise levels.

In view of the close proximity of the slip road in front of HG's, we propose to extend the inverted-L barrier along q-r-s for an overhang of 5m to protect the high-rise receivers.

Road segment in front of VDV

According to Table A4.3, VDV will be mainly affected by noise from the new roads and exposed to noise levels exceeding 70 dB(A). The Consultant is required to explain

No barrier is proposed to protect VDV from traffic on Tai Po Road (Shatin Heights) because of space limitation and traffic safety. Noise barriers can only be placed on the N/B edge of the loop road leading from Tai Po Road (Sha

why no direct noise mitigation measures has been recommended.	Tin Heights) to Lower Shing Mun Road. However, the barrier can only be extended for about 100m. Further extension of this barrier will obstruct the visibility splays and stopping sight distance creating a safety problem. A barrier of this length is insufficient to protect VDV's.
(g) 2.7.1	
The Consultant is required to take into account my comments to review the assessment, and hence the conclusions in this section.	Noted.
(h) Table A3.2	
It is noted that mitigated noise levels are in general 20 dB(A) lower than the unmitigated noise levels. Taking into my above comment (d), the mitigated noise levels are not realistic. The Consultants is required to review their assessment and to give the cumulative construction noise impact (from both at-grade work and elevated work) as well as the expected duration of noise exposure at each NSR.	Revised Table A3.2 submitted to EPD separately.
(i) Appendix 2	
Please request the Consultant to refer to our standard construction noise control clauses.	Noted.
(j) Appendix 4	
(i) For easy reference, the Consultant is required to include a map which clearly shows the existing road sections and the new road sections.	Noted.
(ii) According to the report, the current noise levels are assessed based on the traffic situation in 2002. Nonetheless, I note that the current noise levels in Table A4.1, A4.2, A4.3 & A4.5 are exactly the same as the corresponding figures in Appendix 4 of the Draft Updated Noise Assessment Report of November 97 in which the current noise levels were assessed based on the traffic situation in 1996. The Consultant should be required to review their assessment results.	The prevailing noise levels will be reviewed.
(iii) Given that there will be new roads (T3 and its slip roads) in operation, the Consultant is also requested to explain why the unmitigated noise levels for the year 2001 are lower than the current noise levels at many assessment points (e.g. TLW_8, MFH_8, KSH_8, PG_8, TWV_8,	In general, the discrepancies arise from the re-distribution of traffic on the at-grade and elevated roads in 2011 compared to 2002. In 2011, more traffic will be found on the elevated roads than the at-grade roads. (a) Low-rise NSRs e.g. TLW's and TWV8, HA which

HA, VDV_8, STH).	are affected by the at-grade roads in 2002 will be exposed to lesser noise in 2011 because the traffic is re-distributed to the elevated T3 which is situated higher than most of the TLW's. The traffic on at-grade roads will be lesser and as a result, noise levels will be lower in 2011 than in 2002. (b) Lower noise levels at KSH's and PG's in 2011 are caused by a re-distribution of the at-grade road traffic along Heung Fan Lui Road, Pik Tin Road and Mei Tin Road near these receivers. Revised traffic flows in 2011 for these roads are shown in Figure 2.3.. (c) Lower noise levels in 2011 at MFH's are caused by a re-distribution of traffic on Mei Tin Road and gyratory road in front of the NSR's. (d) Lower noise levels at STH and VDV's are caused by a re-distribution of traffic on Tai Po Road - Shatin Heights section and the other link roads to the extent that traffic on this road will be lesser in 2011 than in 2002.
(iv) It is noted from Fig. 2.1 that STH is near the existing roads but will be far from the new roads. The Consultants is required to explain why in Table 4.3, the predicted noise levels from the new roads will be much higher than those from the existing roads.	There was a typo error in the predicted noise levels for 2011. The noise level at STH will be lower in 2011 but not as much as by 10 dB(A). The Table will be amended.
(v) For our spot checking purpose, the Consultant is requested to provide some sample calculations.	Sample calculation submitted to EPD separately.

By Fax & Post

MEMO

From Director of Environmental Protection	**To** PM/NTE, TDD (Attn: Mr. Joseph Wong, fax: 2721 8630)
Ref ( ) in EP2/N1/27 (VII)	
Tel No. 2835-1751 (FAX 2591-0558)	**Your Ref**
Date 25 March 1998	**Dated**

Sha Tin New Town, Stage II
Trunk Road T3 (Tai Wai)
Environmental Impact Assessment (EIA)

I refer to the letter dated 10 March 1998 by Maunsell Consultants Asia Ltd., enclosing their Draft Updated Final EIA Report dated March 1998 for the captioned EIA Study.

2. Please be informed that the Environmental Study Management Group (ESMG) is pleased to endorse the captioned report subject to the following amendments to be made in the final report:

a) Landscape and Visual Issue
   i) Revised Figures 6.11 a to d showing the location of amenity lighting, according to Maunsell's letter dated 12 March 1998 to SLA; and
   ii) revised Para. 6.10 and Table 6.5 regarding visual and landscape impact and corresponding mitigation measures, according to Maunsell's letters dated 20 and 23 March 1998 to SLA;

b) Noise Issue
   i) Report revision according the letter from ENPAC dated 20 March 1998 (received on 23 March 98);
   ii) revised Table 2.12 indicating size of the overhang of the semi-enclosures;
   iii) a new set of predicted noise level of 2011 based on the revised recommendation of package of mitigation measures (scenario 2);
   iv) a remark on the prevailing noise level saying that the prevailing noise figures given are for the year 1996. For 2002, i.e. the year just before the commencement of construction of T3, all the prevailing noise levels should be higher; and
   v) an estimate of the number of dwellings benefited from the recommended mitigation measures.

3. Would you please ask your consultants to produce the draft EM&A Manual and Executive Summary urgently for us to comment. It is expected that all the final versions of the EIA documents be ready by 30 March 1998.

4. As agreed with your consultant ENPAC, please provide the following additional information for our reference within the noted time of the submission of the final EIA report:

a) Drawings indicating new roads and existing roads (within one week); and
b) one of the following regarding air modelling (within two weeks):-
   - a supporting document from USEPA / the model developer for their endorsement on the model modification; or
   - a copy of the consultant's modified programme for our reference, and further discussions and explanations as necessary; or
   - detailed modelling results based on a methodology agreed with EPD.

(Lawrence K.K. NGO)
Senior Environmental Protection Officer
for Director of Environmental Protection

cc	Attention	Fax
S for T		
AC for T/NT, TransportD		
RHE/NT, HyD		
SLA, HyD	Mr. T.M. Luk	2762 3389
DPO/ST&NE		
CP/DDT		
DLO/ST, LandsD		
DO/ST		
D of Housing		
D of RS		
D of FS		
DAF		
CE/MS, DSD		
CTA/SP, ASD		

Maunsell Consultants Asia Ltd. Attn: Mr. N.C. Cheung
(Address: 8/F Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, N.T., H.K.)

Internal - f.i.

S(AP)2
S(NP)4
S(WP)4

Comments on the draft updated final EIA report given in memo from D of EP ref: ( ) in EP2/N1/27 (VII) dated 25 March 1998

Comments	Responses
2. Please be informed that the Environmental Study Management Group (ESMG) is pleased to endorse the captioned report subject to the following amendments to be made in the final report :	Noted.
a) Landscape and Visual Issue	
i) Revised Figure 6.11 a to d showing the location of amenity lighting, according to Maunsell's letter dated 12 March 1998 to SLA; and	Revised Figure 6.11 a to d included in the updated final report.
ii) revised para. 6.10 and Table 6.5 regarding visual and landscaping impact and corresponding mitigation measures, according to Maunsell's letters dated 20 and 23 March 1998 to SLA;	Revised para. 6.10 and Table 6.5 included in the updated final report.
b) Noise Issue	
i) Report revision according the letter from Enpac dated 20 March 1998 (received on 23 March 98);	Revision included in the updated final report.
ii) revised Table 2.12 indicating size of the overhang of the semi-enclosures;	Table 2.12 revised accordingly.
iii) a new set of predicted noise level of 2011 based on the revised recommendation of package of mitigation measures (scenario 2);	Noted and included in the updated final report.
iv) a remark on the prevailing noise level saying that the prevailing noise figures given are for the year 1996. For 2002, i.e. the year just before the commencement of construction of T3, all the prevailing noise levels should be higher; and	This has been overtaken by event as a new set of calculation has been submitted at the request of EDP and therefore new assessment incorporated in the updated final report.
v) an estimate of the number of dwellings benefited from the recommended mitigation measures.	Included in the updated final report.
3. Would you please ask your consultants to produce the draft EM&A Manual and Executive Summary urgently for us to comment. It is expected that all the final versions of the EIA documents be ready by 30 March 1998.	Draft EM&A Manual have been submitted to EPD and PM/NTE by letter ref: PKY:wc:63494/10.3-0375 dated 24 March 1998 and draft Executive Summary by letter ref: PKY:wc:63494/10.3-0376 dated 24 March 1998.
4. As agreed with your consultant Enpac, please provide the following additional information for our reference within the noted time of the submission of the final EIA report:	
a) Drawings indicating new roads and existing roads (within one week); and	Drawings to be submitted separately.
b) one of the following regarding air modelling (within two weeks):- - a supporting document from USEPA / the model developer for their endorsement on the model modification; or - a copy of the consultant's modified programme for our reference, and further discussions and explanations as necessary; or - detailed modelling results based on a methodology agreed with EPD.	Endorsement from USEPA,, fax dated 7 March 1998, has been attached as Annex 1 to the Appendix 9 "Summary of Comments and Responses" in the Draft Updated Final Report submitted to EPD and PM/NTE in MCAL letter ref:PKY:wc:63494/10.3 dated 10 March 1998.

Subject: CALINE4 Source Height Modification
Date: Fri, 27 Feb 1998 13:58:20 -0800
From: Paul Benson <pbenson@trmx3.dot.ca.gov>
To: enpacltd@HK.Super.NET

ATTN: Derek C.F. Lam

The source height parameter used in CALINE4 is referenced to the local ground level. It is not an elevation, but instead is meant to represent the height of bridge and fill structures. Many users misinterpret the input as the elevation of the roadway.

If you are dealing with a bridge structure that exceeds 10m in height, you can safely ignore the 10m limitation. However, for fill structures you cannot. The fill algorithm is based completely field results from fills not exceeding 10m.

I hope this answers your question.

Appendix 10

Landscape Character Assessment
Landscape Quality

Appendix 10 : Landscape Character Assessment - Landscape Quality

1.0 Description of the components and character of the landscape

1.1 Introduction

Based on the listing within Table 6.1, a detailed description is provided to delineate the components and character of the main land uses within the landscape "affected" by the proposed alignment of Sha Tin Trunk Road T3. An example of these five categories, as indicative photographs are provided, in Figure 6.1a and b.

- Highest Quality Landscape - HQL
- Very Attractive Landscape - VAL
- Good Landscape - GL
- Ordinary Landscape - OL
- Poor Landscape - PL

1.2 Sha Tin Heights (1) - HQL

The Sha Tin Heights comprises an exclusive low-rise residential area, spatially located along the twisting Sha Tin Heights Road and the nearby Woodcrest Hill, both of which have access from the Tai Po Road. The buildings are either single units or small groupings with road access and surrounded by substantial vegetative cover to create a high level of privacy, amenity and "isolation". They are individually designed, mostly under 15 years old, and offer a range of building materials including tile, glass panels, stone and brick finish. The Sha Tin Heights area is located towards the southwest of Tai Wai New Town on the foothills of Cham Shan (Needle Hill)., with an average height between ~+110m PD and ~130m PD. When viewing the Sha Tin Heights from a distance the skyline impression is that of a densely vegetated hillslope punctuated by upper residential levels and rooftops.

Due to the combination of landform, vegetation and well-designed urban form the landscape character is of a high quality.

1.3 Residential Estates in Sha Tin Southwest (2) -OL

The southwestern area of Sha Tin is composed of large public and private sector high rise estates. The tower blocks are constructed from a pre-cast concrete panelling system and are between 20 to 30 stories in height. Some of the blocks are free standing and many are built on a three storey podium which incorporates car parking and shopping facilities. The residential blocks are surrounded by large open areas which are utilized for circulation networks and passive/active recreation.

Due to the density and height of the residential estates this area is considered to be of an ordinary landscape quality, despite the surrounding open space.

1.4 Route 16 / T3 Interface (A) - VAL

The complicated interchange between Route 16 and Sha Tin Trunk Road T3 is located in a transitional area between the naturalistic and built urban forms. A prominent vegetated knoll provides the backdrop for the Route 16 alignment on approach to Sha Tin Trunk Road T3. The interchange is located in an area of woodland planting with two "sitting-out areas". Firstly, there is a wooded sitting-out area and viewpoint overlooking Tai Wai and Sha Tin Central Area. Below this lookout, denser mature vegetation and trees grow on the extremely steep constructed slope. Secondly, there is a passive recreational area north-west of Lau Pau Lok School playground. This area is very overgrown with a large number of mature trees. These extend to a significant wooded area below Tai Po Road, between the junction with Chin Wan Street and the viaduct across Mei Tin Road, which is planted with eucalyptus and has developed a dense undergrowth of shrubs.

Due to the landform and vegetation the area is considered to be a very attractive landscape.

1.5 Cheng Wing Gee College / Lau Pau Lok Secondary School (B) - OL

The educational establishments comprise two 6 and 7 storey blocks of class rooms, functionally designed from pre-cast concrete panels with glass panelling. The fabric of the buildings is in a good condition. Surrounding the school buildings is a sports playground area, allowing for basketball, soccer and physical education. The playground is surrounded by an existing parapet wall. There is significant planting of small trees along the wall within the school grounds.

Due to the architectural form and lack of significant vegetation this area is considered to be an ordinary landscape.

1.6 Holford Garden / Tai Po Road - Tai Wai (C) - OL

Three 25 storey high-rise private tower blocks comprise the Holford Garden Estate. They are in close proximity to each other and designed from pre-cast concrete panels, finished with grey tiling. Adjacent to the blocks is the Mei Tin Road and the Cheng Wing Gee College. At present, the Tai Po Road - Tai Wai is partially screened from the estate by a substantial woodland area of Eucalyptus. The open space is minimal and is comprised of small sitting-out areas and a childrens playground.

Due to the density of the residential complex; the chromatic scheme and lack of open space, this area is assessed as being an ordinary landscape.

1.7 Tai Wai New Village (D) - GL

The Village comprises of three storey modern "villa" style housing built in relatively straight terraces. The main spatial area of the village incorporates five terraces of approximately 10 houses each, running parallel to the existing Tai Po Road. The units within the terraces are divided into blocks, the largest block being a row of seven units. The lower area of the Village is at ~+22mPD rising to ~+32mPD along the access road to the smaller area of the Village which overlooks Mei Tin Road. This area is composed of a dense layout of new units built in three rows. The villas are built from a standard design utilizing a concrete frame infilled with brick. The typical finish is white tiles with a brick tile for the roof overhang. There is minimal open space or existing vegetation within the layout of the Village aside from a small grassed area adjacent to the Tai Po Road and the small tiled utility areas around the units. When viewed from a distance the Village has the skyline impression of an ordered, yet dense housing area.

Though the area is dense in nature, due to the landform and architectural design it is considered as being a good landscape.

1.8 Mei Tin Road (E) - GL

The Mei Tin Road is a busy dual-carriageway at ~+7mPD, which acts as a local distributor between the Tai Po Road and the urban structure of Tai Wai New Town and southern Sha Tin. It is diagonally crossed by the Tai Po Road viaduct. Towards the north of the Tai Po Road it provides access to the large public housing estates of Mei Lam and May Shing, the Mui Lee T.H.A. and the village of Heung Fan Liu. The existing junction with the Tai Po Road comprises of a circular loop road, which provides access when exiting from Hong Kong. Within the spatial area defined by the loop is a small grassed sitting-out area with tall planting providing a buffer screen to the access road. Towards the south of the Tai Po Road viaduct are the smaller housing estates of Holford Garden and Grandeur Garden, beyond which is the KCR viaduct and the expanse of south Sha Tin. Towards the north of the junction the road is faced by pedestrian pavement and vegetation. The 25 storey blocks of Mei Lam Estate overlook from the northeast and the village housing of Tai Wai New Village from the northwest. From the southwest the junction is overlooked by Holford Garden and from the southwest by the residential blocks of Glamour Garden and Grandeur Garden.

Mei Tin Road whilst an average landscape provides a 'breathing' space and amenity to the surrounding residential areas and is considered as a good landscape.

1.9 Sha Tin Public School / Tai Po Road - Tai Wai (F) - OL

The educational establishment comprise a 4 storey building of class rooms, functionally designed from brick and located at ~12mPD. The building is old and the fabric is in a fair condition. Surrounding the school buildings is a sports playground area, allowing for basketball, soccer and physical education. The playground is surrounded by an existing parapet wall. There is significant planting of small trees along the wall within the school grounds.

Due to the architectural design and lack of significant planting, the area is considered as an ordinary landscape.

1.10 Glamour Garden / Grandeur Garden (G) - OL

Glamour Garden comprises of a 20 storey high rise residential podium block located along the Mei Tin Road, behind the Sha Tin Public School grounds. Grandeur Garden is located behind Glamour Garden on the opposite side of Chin Fa Street and comprises six high-rise residential blocks of 18 storeys each built on podium areas. They are all designed from pre-cast concrete panels and finished with white tiling. The podium incorporates small retail outlets which have street access to Mei Tin Road. The podium space provides small sitting-out areas and planters. When viewing the development from a distance the skyline impression is that of a dense block of residential towers.

Due to the height and density of the residential, areas the area is considered as an ordinary landscape.

1.11 Che Kung Miu Road / KCR (3) - GL

The Che Kung Miu Road is the main local distributor for the southern area of Sha Tin, at ~+7mPD. It is bounded at the north by district open spaces and the Shing Mun River Channel. Towards the south of the Road are the large public and private housing estates, including Carado Garden, Sun Chui and Chun Shek Estate. The estates are mostly 20 to 30 storeys in height with access throughout the podium space areas. The existing Tai Po Road can be viewed from a small number of positions along the Road and KCR. The main viewing position will be at the junction of the Mei Tin Road.

This area whilst a reasonably average landscape, provides a 'breathing space' and amenity to the surrounding residential areas, and can be classified as a good landscape.

1.12 Shing Mun Tunnel Road / May Shing Court (4) - GL

The Shing Mun Tunnel Road (Route 5) is one of the main trunk roads within Hong Kong, providing a link between the Sha Tin Area and the southwest of the New Territories. It is a dual carriageway and joins the Tai Po Road in a major junction to the north of Tai Wai. The alignment of the road rises significantly as it leaves Tai Wai, at ~+15mPD and follows the curvature of the vegetated valley as it rises to the Shing Mun Tunnel which is located at ~+100mPD . May Shing Court comprises a medium size high rise residential estate. The tower blocks are constructed from a pre-cast concrete panelling system and are between 20 to 30 stories in height. The residential blocks are surrounded by large open areas which are utilized for circulation networks and passive/active recreation. When viewing May Shing Court from a distance the skyline impression is that of a dense block of high rise towers interspersed by the backdrop of the Cham Shan (Needle Hill).

Due to the extent of the large open areas and the contrast between the residential estate and Chan Sha creating visual interest, the area can be classified as a good landscape.

1.13 Kam Shan Building (H) - PL

The Kam Shan Building comprises a medium rise residential block of 10 storeys in height, which is orientated in a perpendicular direction to the Tai Po Road. The structure is old and the fabric is in a poor condition. The block is one apartment in width, with the end units having facades facing directly towards the Tai Po Road. The ground floor facing north is utilized for retail and financial outlets which face the Tai Wai Road, a busy pedestrian access route.
Due to the architectural form and condition, this area is considered as a poor landscape.

1.14 Chik Chuen Street / Shing Ho Road (I) - GL

The southern side of Chik Chuen Street and the perpendicular Shing Ho Road comprise the northern and eastern boundary of the Tai Wai Town Centre, respectively. The medium rise buildings are up to 7 storeys with commercial outlets at the ground level. There is intense pedestrian activity. Chik Chuen Street is separated from the existing Tai Po Road by a small planted amenity strip and a petrol filling station at the junction of Tai Wai Road. There are a number of mature trees within the amenity planting strip which provide a level of screening for the Tai Po Road and the slip road to the Shing Mun Tunnel Road. The Shing Ho Road runs adjacent to the Shing Mun River Channel and has buildings on one side.

Due to the level of 'people' activity and the adjacent Shing Mun River the area is considered as a good landscape.

1.15 Mei Lam Estate (J) - OL

The Mei Lam Estate comprises a large and imposing public sector housing estate of 20 to 30 storey housing "complex" blocks. The estate was built from pre-cast concrete panelling approximately 25 years ago and the fabric has been maintained in a good condition, with white and green tiling. Mei Fung and Mei Too House are located in parallel with the existing Tai Po Road. The blocks are surrounded by open space which encompasses sitting out areas and active recreation areas, with small covered structures for restaurants. The ground floor of the blocks are used for access, community facilities and restaurants. A busy pedestrian subway provides access between the Mei Lam Estate and Tai Wai Town Centre. When viewing the Mei Lam Estate from a distance the skyline impression is that of large high rise building blocks, with the massing creating a major impression on the skyline as opposed to single tower blocks.

Due to the height and massing of the residential estate the area is considered as an ordinary landscape, despite the open space and 'people' activity.

1.16 Wong Wan Tin College (K) - OL

The educational establishment comprises a 6 storey block, functionally designed with pre-cast concrete panels. The building fabric is in a good condition. Surrounding the school buildings, towards the northeast is a sports playground area, allowing for basketball, soccer and physical education. The playground is surrounded by an existing fence wall. There is planting of small trees along the wall within the school grounds. The landscape surrounding the college has been significantly modified by the junction between the Shing Mun Tunnel Road and Tai Po Road. The elevated junction arrangement is on an elevated structure which passes close to the eastern boundary.

Due to the surrounding landscape, already impacted upon by the existing highway/ road corridors, the college area is considered as an ordinary landscape.

1.17 Shing Chuen Road (L) - PL

The Shing Chuen Road at ~+8mPD provides vehicular access to eight "flatted" factories, below 8 stories in height. They are functionally designed to provide large workspaces and the facades do not incorporate any viewing positions of the Tai Po Road. The styles of building design are a mixture of pre-cast concrete panels and the condition of the facades are in fair condition. Two factories are located at the junction of Shing Chuen Road and the existing Tai Po Road, which is located on an elevated structure at the level of the fourth floor of the factory. The remaining factories are located around the Shing Chuen Road and the smaller Shing Wan Road and Shing Hing Road. Between these factories and the existing Tai Po Road is a parcel of land which has been gazetted for the Sha Tin Trunk Road T3. When viewing the Shing Chuen Road from a distance the skyline impression is that of a grouping of 'faceless' factory blocks which create a "wall effect" across the horizon and therefore the area has been classified as a poor landscape.

1.18 Man Lai Court (5) - GL

On the opposite side of the Shing Chuen Road, away from the Tai Po Road, is Man Lai Court. This comprises four high rise residential blocks in a good condition, designed with concrete panels and finished with white tiling. They are approximately 20 stories in height and overlook a curve in the Shing Mun River Channel. The structures are surrounded by a small area of open space for sitting-out and a cycle path. The Man Lai Court offers views of the Tai Po Road from a small number of positions.

Due to the context of the residential estate it is considered as a good landscape.

1.19 Government Offices / Tung Lo Wan Hill (6) - VAL

The governmental offices which cover the planning and related issues for the northeast of the New Territories are located at ~+34mPD up the Tung Lo Wan Hill Road, an attractive small two-lane tree lined access route to the foothills of Cham Shan (Needle Hill). The Government offices comprise a three storey brick built structure surrounded by a small car parking area. The offices are screened from the existing Tai Po Road by vegetation and their orientation towards the Tung Lo Wan Hill. Additional land uses located further up the Tung Lo Wan Hill Road include a Home for the Aged and a small low rise residential development.

Due to the extent of vegetation and interesting landform, the area is considered as a very attractive landscape.

1.20 Tung Lo Wan Village / Harmony Lodge (M) - GL

The main village area adjacent to Tung Lo Wan Hill Road comprises relatively straight rows of individually styled low rise residential units at ~+7mPD, running parallel to the hill slope and slightly off parallel to the existing Tai Po Road. The urban structure of the village is typical of the old style Chinese villages with pedestrian pathways interspersed by stone built old village housing. The condition of some of the structures are poor as there has been little maintenance, or the houses are derelict. However the large majority are well maintained one storey units. There is minimal open space or existing vegetation within the layout of the Village. There is a significant line of mature roadside trees and a small fenced sitting-out area which separates the close knit urban character from the existing elevated transport corridor. Towards the northeast of the main village area enclosed by To Fung Shan Road are a group of individual residential / religious structures surrounded by garden areas at ~+7mPD. Overlooking is Harmony Lodge, a small group of three storey villa style residential units at ~+23mPD. The villas are built from a standard design utilizing a concrete frame infilled with brick. The typical finish is white tiles with a blue tile for the roof overhang. When viewing the Tung Lo Wan Village from a distance the skyline impression is that of a dense urban structure punctuated by upper residential levels and rooftops.

Due to the visual interest; architectural forms and vegetation pockets, the area is considered as a good landscape.

1.21 Pristine Villa (7) - VAL

Pristine Villas are typical of the contemporary luxury medium rise residential developments throughout Hong Kong. They comprise an attractive eight storey complex of residential blocks built upon a three-storey podium, at ~+50mPD along the Tung Lo Wan Hill Road. The concrete frame is finished with light and dark pink tiling. The podium spaces are utilized for active recreational pursuits within a clubhouse style environment. The next phase of expansion of the Pristine Villa complex is underway at present. When viewing the Pristine Villa from a distance the impression is that of a string of residential blocks along the skyline.

Due to the architectural form; layout and topography the area is considered as a very attractive landscape.

1.22 Mantex Villa / On Lok Villa (8) - VAL

Mantex Villa comprises a small terrace of 11 two storey residential units located at ~+27mPD immediately behind Harmony Lodge. They offer car parking spaces on the ground floor with a tarmac car parking area for the units at the front with access to the To Fung Shan Road. They are architecturally designed and the facades of the units are in a good condition with extensive use of glass panelling. On Lok Villa and three smaller villas of the same style, are located adjacent to the Mantex Villa further up the To Fung Shan Road. They comprise small five storey apartment blocks with two units on each floor and a central access and street level parking. They are in a good condition with attractive well designed facades .

Due to the architectural form and layout the area is considered as a very attractive landscape.

1.23 Villa Maria / Villa Augustan (N) - VAL

Villa Maria and Villa Augustin comprise of very large free standing three storey houses located in spacious grounds towards the northeast of the To Fung Shan Road at ~+12mPD. The facades of the units are in a good condition and the grounds are well kept with a dense wall of planting to shield the existing Tai Po Road. Both have car access to the To Fung Shan Road.

Due to the ratio between the built form and vegetation the area is considered as a very attractive landscape.

1.24 To Fung Shan (9) - VAL

To Fung Shan comprises of a large number of three storey "villa" style housing units which are located towards the summit of the To Fung Shan Road, rising from ~+7mPD up towards ~+150mPD at the top. The villas are typically built from a standard design, utilizing a concrete frame infilled with brick. The typical finish is white tiles with a red or blue tile for the roof overhang. When viewing the Sha Tin Heights from a distance the skyline impression is that of a densely vegetated hillslope punctuated by upper residential levels and rooftops and therefore is considered as a very attractive landscape.

1.25 Caritas School / Telephone Exchange / Sha Tin Clinic (O) - GL

The educational establishment comprises of two 6 storey interconnected blocks of class rooms, functionally designed from pre-cast concrete panels with glass paneling. The fabric of the buildings are in a good condition. Surrounding the school buildings is a sports playground area, allowing for basketball, soccer and physical education. The playground is surrounded by an existing parapet wall. There is significant planting of tall mature trees along the wall within the school grounds. The Telephone Exchange is a 6 storey functional office/ automated technology block which is located towards the south of the Tai Po Road, adjacent to the Caritas School, at ~+10mPD. The facade of the building is in a good condition with white tiling and small windows. The Sha Tin Clinic is an attractive two storey block designed from pre-cast concrete with yellow paneling below the windows. It is orientated towards the Tai Po Road and the intermediate KCR line, but separated by a line of tall screen planting.
The area, due to the low density and height of the built form and the mature planting, is considered a good landscape.

1.26 Residential Estates in Sha Tin South (10) - OL

The southern area of Sha Tin is composed of large public and private sector high rise estates. The tower blocks are constructed from a pre-cast concrete paneling system and are between 20 to 30 stories in height. Some of the blocks are free standing and many are built on a three storey podium which incorporates car parking and shopping facilities. The residential blocks are surrounded by large open areas which are utilized for circulation networks and passive/active recreation.

Due to the density and height of the residential estates, this area is considered to be of an ordinary landscape quality, despite the surrounding open space.

1.27 Villa Le Parc (P) - HQL

Villa Le Parc (Lai Chi Yuen) comprises of an exclusive grouping of 11 low rise three storey exclusive residential units, spatially located around a small cul-de-sac access road at ~+42mPD. The buildings are all single units and are built from concrete with attractive white tile finish and red roofs. They all incorporate balconies which offer views across Sha Tin Town Centre and Tai Wai. The grouping is surrounded by substantial vegetative cover to create a high level of privacy, amenity and "isolation". When viewing Villa Le Parc from a distance the skyline impression is that of a densely vegetated footslope above which are the upper two residential levels and rooftops and therefore the area is considered as a high quality landscape.

1.28 Lion Road Tunnel Road (11) - PL

The Lion Rock Tunnel Road is a busy dual-carriageway at ~+7mPD, which acts as a local distributor between the Tai Po Road, southern Sha Tin and the Lion Rock Tunnel providing access to Kowloon. The existing junction with the Tai Po Road provides access when approaching from the north. The signalized cross junction provides access to Sha Tin Town Centre. The Lion Road Tunnel Road runs in a perpendicular direction past the Sha Tin Central Park and over the Shing Mun River Channel. The road includes minimal amenity planting or visual screening and is therefore considered as a poor landscape area.

1.29 Scenery Court / Hilton Plaza (12) - OL

Scenery Court comprises two 23 storey high rise residential private sector podium blocks located immediately to the southeast of the existing Tai Po Road. Hilton Plaza is located behind Scenery Court with pedestrian access from Sha Tin Centre Street and vehicular access from Man Lam Road. It comprises four high-rise residential blocks of 23 storey each built on a three storey podium. Both complexes are designed from pre-cast concrete panels. Scenery Court has an attractive off-white finish with black rimmed windows and Hilton Plaza has a white tile finish. The podium includes retail units and small sitting-out areas. When viewing the development from a distance the skyline impression is that of a dense block of residential towers at the edge of Sha Tin Town Centre and is therefore considered as an ordinary landscape.

1.30 Residential Estates in Sha Tin Town Centre (13) - OL

The residential areas within the centre of Sha Tin New Town are composed of dense large public and private sector high rise estates. The tower blocks are constructed from a pre-cast concrete panelling system and are between 20 to 30 stories in height. Some of the blocks are free standing although most are built around and above the main New Town Plaza which incorporates car parking and shopping facilities.

Due to the density and height of the buildings, the area is considered as an ordinary landscape.

1.31 Residential Areas within Tai Wai Town Centre (Q) - GL

The urban structure of Tai Wai Town Centre, positioned at an average height of ~+6mPD, is characterized by medium rise mixed use commercial and residential blocks, located around a tight pattern of roads, between the Tai Po Road and the KCR line. It has been developed along the original layout of historical Tai Wai. Many of the ground and first floors are utilized for small retail outlets, chain stores and banks. Some of the higher levels are provided for restaurant activities. The upper levels are predominantly residential with the occasional small workshop and medical facilities. The building materials incorporate a wide spectrum and the facades are mostly in a fair to good condition depending on the maintenance. In respect to the commercial outlets there is a preponderance of neon signage. When viewing the Tai Wai Town Centre from a distance the skyline impression is that of a dense mixture of rooftops and small "temporary" hosing structures.

Though the area is in a downgraded condition the cultural and visual interest warrants the classification of a good landscape.

Appendix 11

Landscape Character Assessment
Landscape Quality Impact

Appendix 11: Landscape Character Assessment - Landscape Quality Impact

Description of the potential positive and negative impacts of the scheme and assessment of the significance of the impacts identified

1.1 In respect of those land uses within urban areas bordering Sha Tin Trunk Road T3 the following detailed assessment will describe the potential positive and negative effects of the road proposals and assessment of the significance of the impacts identified. The reference in brackets is for identification purposes in Figure 6.6 a-d. (Landscape Impact Within Landscape Bordering Sha Tin Trunk Road T3)

- Substantial Landscape Impact - SULI
- Moderate Landscape Impact - MOLI
- Slight Landscape Impact - SLLI

1.2 Route 16 / T3 Interface (A) - SULI

The Sha Tin Trunk Road T3 will have a substantial adverse landscape impact. The external link slip road will eliminate the wooded sitting-out area/lookout point. The slope and passive recreational area will be highly disturbed during the construction of the overhead sections, joining the lookout to the Tai Po Road across Mei Tin Road. Areas of the wooded area below Tai Po Road will be destroyed by the construction of the southbound carriageway and the slip road to Mei Tin Road.

1.3 Cheng Wing Gee College/Lau Pau Lok Secondary School (B) - SULI

The Route 16/Sha Tin Trunk Road T3 Interface will have a substantial adverse landscape impact due to the loss of the woodland planting which screens the existing Tai Po Road, and the impact of the road structure which slopes from ~+40mPD to ~+27mPD along the extent of the school boundary.

1.4 Holford Garden / Tai Po Road - Tai Wai (C) - MOLI

The adverse landscape impact in respect of Holford Garden will be moderate as only the northern aspects of the blocks will be directly affected by the proposed road scheme. The existing Tai Po Road will be widened, but maintained at the existing height of ~+21mPD, and two slip road connections provided between Route 16 and the Mei Tin Road. During the construction period, areas of the woodland will be destroyed, however adequate compensatory planting will be included in the new scheme.

1.5 Tai Wai New Village (D) - MOLI

The Sha Tin Trunk Road T3 will have a slight adverse landscape impact on the spatial environment of Tai Wai New Village. Only the third storey and roof areas of the units in the higher areas, which rise in two terraces to ~+47mPD, are currently affected by the Tai Po Road and many are effectively screened by existing vegetation. All of the units with exposed southern facades are high sensitive receivers. The Sha Tin Trunk Road T3 road scheme will widen the existing road by ~7m, although the existing road level of ~+21mPD will be maintained. Through widening, the construction will have a moderate impact on the Village, although the environment and aesthetics have already been modified by the heavy traffic and the non-existence of mitigation measures on the existing road. A roundabout will be provided at the junction of Lower Shing Mun Road and Tai Po Road with a spur leading to a new car park in place of the existing grassed open space.

1.6 Mei Tin Road (E) - MOLI/SULI

The proposals for Sha Tin Trunk Road T3 will only create a slight landscape impact as it is only proposed to widen the existing Tai Po Road in this location. Although during construction, the small sitting-out area will be destroyed, however it is considered possible to reprovision this area at the end of the contract. Discussions with District Lands Office (DLO) and Regional Council (RC) will be conducted at detailed stage.

1.7 Sha Tin Public School / Tai Po Road - Tai Wai (F) - SULI

The design of the Sha Tin Trunk Road T3, which is immediately adjacent to the land use, will have a substantial adverse effect on the educational facilities. The road scheme will require that the existing Tai Po Road, which is built on an elevated structure, is significantly widened immediately adjacent to the school grounds. Although, it should be noted that the orientation of the buildings are in a perpendicular direction to the road scheme.

1.8 Glamour Garden / Grandeur Garden (G) - SLLI/MOLI

The Sha Tin Trunk Road T3 would only have a slight adverse impact as it is proposed only to widen the existing Tai Po Road. It will affect the residential units within Glamour Garden / Grandeur Garden only with a clear northern aspect. However for these units the impact is minimal due to the distance factor and the existing intermediate structures and vegetation.

1.9 Kam Shan Building (H) - MOLI

The residential blocks are orientated perpendicular to the Sha Tin Trunk Road T3 and therefore the landscape impact will only be moderate for the units with a facade directly facing the proposed road. For the majority of units the angle of view will be oblique, and the landscape impact will be slight due to the small wooded area between the building block and the carriageway which provides an effective landscape barrier within the visual target area.

1.10 Chik Chuen Street / Shing Ho Road (I) - SULI

The elevation of the Trunk Road T3 above these receivers will be approximately 6m above ground level. Therefore, the alignment will create a substantial adverse landscape impact, especially during the construction stages. Although, in many respects the elevated structure will effectively fit into the urban landscape character due to the nature of the existing townscape. The existing Tai Po Road defines the northern periphery of the typical urban structure of Tai Wai, ie. medium rise tenement blocks with ground level retail units. To the north of the existing "circulation corridor" are the high rise blocks and open spaces of Mei Lam Estate. Therefore, it can be stated that the environment has been modified by the existing Tai Po Road and the elevated structures, which form the junction with Shing Mun Tunnel Road.

1.11 Mei Lam Estate (J) - MOLI

The landscape impact of the Sha Tin Trunk Road T3, which comprises of an elevated structure, within the vicinity of the Mei Lam Estate will be moderate. This is essentially due to the urban form of the residential blocks which are surrounded by extensive open space areas. Throughout Hong Kong such estates have been designed to enable the provision of high density residential areas in the vicinity of major road infrastructure.

1.12 Wong Wan Tin College (K) - SULI

The substantial adverse impact of the road will be due to the requirement to provide an elevated structure ~20m above ground level. Although, the impact will be reduced, as the buildings are orientated in a perpendicular direction to the Sha Tin Trunk Road T3 and there is already existing screen planting around the boundary of the establishment.

1.13 Shing Chuen Road (L) - SLLI

The proposed Sha Tin Trunk Road T3 will have a slight landscape impact in respect to the two flatted factories which are located at the beginning of Shing Chuen Road. They are in close proximity to the westbound carriageway but due to their building design they do not have a direct facade affected by the proposed road. In respect to the remaining 6 factory units positioned along the Shing Wan Road and Shing Hing Road the landscape impact will only be in respect to access and the occasional views from within the buildings.

1.14 Tung Lo Wan Village / Harmony Lodge (M) - MOLI

The road will create a substantial adverse impact in respect to the units that are located directly adjacent to the transport corridor. However there is a modified landscape impact overall to these land use, as the localized environment has been significantly modified by the existing elevated road structure which is at ~+15mPD. Sha Tin Trunk Road T3 will require a widening of the existing Tai Po Road and the provision of an additional elevated structure to link the Tai Po - Tai Wai Road above the Shing Mun Tunnel Road (Route 5). From many positions within the residential area the distance factor and intermediate structures/vegetation would reduce the effect of the proposed elevated structure.

1.15 Villa Maria / Villa Augustan (N) - SULI

The proposed Sha Tin Trunk Road T3, which requires a widening of the existing Tai Po Road, will create a substantial impact in the vicinity of these villas estates, although this will be reduced by the extensive existing tree and understorey planting around the periphery of the grounds.

1.16 Caritas School / Telephone Exchange / Sha Tin Clinic (O) - MOLI

The proposed Sha Tin Trunk Road T3 which will include a significant widening and building of elevated structures from 10 to 20m above ground level, will have a moderate adverse landscape impact, as the immediate landscape has been already significantly modified by the existing transport corridor.

1.17 Villa Le Parc (P) - MOLI

The Sha Tin Trunk Road T3 will have a moderate adverse landscape impact due to the residential development location. The extensive vegetation on the surrounding hillslopes is the vital factor in reducing the impact of the Sha Tin Trunk Road T3.

1.18 Residential Areas within Tai Wai Town Centre (Q) - SLLI

The proposed road as it is being constructed along an existing transport corridor, will have only a slight adverse landscape impact. This is also due to the fact that this area is self-contained and the residential areas adjacent to T3, provide a buffer.

1.19 Shing Mun River Channel: North-South (R) - MOLI

The Shing Mun River Channel is already impacted significantly upon by the Shing Mun Tunnel Road viaducts and the Tai Po Road - Tai Wai Road bridge. However the additional structure will create further disturbance to the existing landscape character of the area.

Appendix 12

Visual Impact Assessment
Proposed Mitigation Measures

Appendix 12: Visual Impact Assessment - Proposed Mitigation Measures

Description of the scope of the proposed mitigation measures for the sensitive receivers

1.1 In respect of those land uses within urban areas bordering Sha Tin Trunk Road T3, the following detailed outline will describe the specific mitigation measures for each sensitive receiver. The reference in brackets is for identification purposes in Figures 6.9 a-e. (Landscape Impact Within Landscape Bordering Sha Tin Trunk Road T3)

- High Sensitive Receiver - (HSR)
- Medium Sensitive Receiver - (MSR)
- Low Sensitive Receiver - (LSR)

1.2 Route 16 / T3 Interface (A) - HSR

The detailed mitigation proposals for the Route 16 Interface will be carefully planned in association with the Project Manager of Route 16. A detailed Tree Survey will be undertaken to enable the formulation of a Tree Felling and Compensatory Planting Proposal. The new planting will concentrate on the use of fast growing species which thrive within the urban environment incorporating both indigenous and exotic species to provide successful establishment of a woodland environment. These species include:-

Exotic species	*Indigenous species*
Acacia confusa	*Cinnamonum camphora*
Aleurites molucana	*Litsea glutinosa*
Cassia siamea	*Litsea monopetala*
Casuarina equisetifolia	*Machilus breviflora*
Chukrasia tabularis	*Mallotus paniculatus*
Ficus benjamina	*Sapium discolor*
Melaleuca leucadendron	*Schefflera octophylla*
Peltophorum pterocarpum	
Syzgium jambos	

In respect to this sensitive receiver, the design of the elevated structures will be designed to reflect the contextual setting. This will be achieved through the use of form, line and texture of the relevant structures. Due to the significant effect on the two existing sitting out areas, there will be a fundamental reassessment of the townscape to reprovision the relevant spaces, within an appropriate location.

1.3 Cheng Wing Gee College / Lau Pau Kok Secondary School (B) - HSR

Though the proposed vertical barrier required for controlling noise quality creates visual impact, it will be carefully designed to relate to the contextual setting, so as to provide an additional landscape component with high quality design values. The barrier will be constructed of transparent panels and absorptive steel coloured panels. Fast growing indigenous tree species will also be planted along the school boundary to provide additional mitigation measure.

1.4 Holford Garden / Tai Po Road - Tai Wai (C) - MSR

Areas of the woodland will be affected by the realignment of the carriage way but compensatory planting of woodland species will conserve the main elements of the existing woodland planting. In respect of the residual impact of the slip road adjacent to the sensitive receiver, additional screen planting along the boundaries of Holford Garden will be provided. The location of barriers and semi-enclosures adjacent to Holford Garden will create visual impact. The vertical barrier and semi-enclosure will both be constructed of framing with absorptive coloured steel panels and transparent panels, and will be sensitively designed to reflect the contextual setting. When viewed from Holford Garden, the vertical barrier will have a finish colour to provide a natural 'background' behind the proposed woodland planting. When viewed from positions along the carriageway, the noise mitigation measures will be clad with attractive repetitive design steel panels.

For the existing Tai Po Road - Tai Wai the character will be changed and it is proposed to have amenity planting; open-space where applicable and practical and townscape revitalization such as signage and lighting to ensure the area is enhanced and not downgraded.

1.5 Tai Wai New Village (D) - HSR

The substantial impact for the Tai Wai New Village will be increased by the provision of a vertical noise barrier. It will be constructed of absorptive coloured steel panels and transparent panels and will be sensitively designed to a human scale to reflect the contextual nature of the townscape. In respect to the views from the village it is proposed to create a series of themes utilizing the various colour. Where feasible, planting will be proposed in planters, built into the footing of the barrier. New planting around the car park will improve the aesthetics and provide a naturalistic screen. From positions on the carriageway, the noise barrier will incorporate a repetitive pattern utilizing mainly colour.

1.6 Mei Tin Road (E) - LSR

The existing road viaduct will be significantly widened and the provision of noise barriers on both sides of the road scheme will slightly increase the visual and landscape impact that is created at present for the road users of Mei Tin Road. The steel framed/ transparent panels barriers will have a low-key colour finish to reduce their visual impact for the road users on the Mei Tin Road. From positions on the road, the concrete barriers will incorporate a repetitive pattern utilizing colour panels. The small grassed open space and wooded slopes of the viaduct will be replanted after the construction phase and therefore the visual impact will be residual. The potential of upgrading this area with additional passive recreational facilities will be examined.

1.7 Sha Tin Public School / Tai Po Road - Tai Wai (F) - MSR

The impact will be significantly reduced by the provision of fast growing tall trees planted along the school boundary. The additional planting along the boundary will utilize species to provide full canopy cover and create an effective visual screen. The visual impact of the adjacent semi-enclosure will be mitigated by ensuring that the form and finishes provide an attractive urban element. From positions on the carriageway, the design of the semi-enclosure will be the same as the proposals for the Mei Tin Road, to provide a continuum between the mitigation measures.

For the existing Tai Po Road - Tai Wai the character will be changed and it is proposed to have amenity planting; open-space where applicable and practical, and townscape revitalization such as signage and lighting to ensure the area is enhanced and not downgraded.

1.8 Glamour Garden / Grandeur Garden (G) - LSR

The visual impact will be increased slightly, by the provision of Semi-enclosures within the visual target area of the sensitive receiver. The steel framed structures clad with absorptive steel panels and transparent panels will have a low-key colour finish to reduce the visual impact when viewed from Glamour or Grandeur Garden, however the distance factor and oblique angle of the residential estate will decrease the impact significantly. From positions on the carriageway, the semi-enclosures will incorporate a repetitive pattern utilizing colour panels.

1.9 Kam Sham Building (H) - LSR

The adjacent full-enclosure will be constructed as a steel framed structure clad with absorptive steel panels and transparent panels to provide a low-key approach which is has a 'light' appearance. When viewing the full-enclosure from positions on the carriageway, the design of the full-enclosure will incorporate a repetitive pattern utilizing colour panels. The proposed landscape treatment of the mitigation measures in the vicinity of the sensitive receiver will be the same as for Sha Tin Public School and Mei Tin Road, to provide a continuum in respect of design approaches. Where required, the intermediate wooded area will be strengthened with additional planting of native species. The strengthening of the existing planting will be carried out by identifying locations or clearings within the existing wooded area. The native species to be planted in denser areas will be installed as a whip size so that the tree can adapt to the given situation. In area which space allows standard size nursery stock should be planted.

1.10 Chik Cheun Street / Shing Ho Road (I) - HSR

Vertical barriers and a full-enclosure will be provided adjacent along in the vicinity of the sensitive receiver the westbound alignment. At the eastbound alignment, due to the high visibility of the barriers/ enclosures, the detailed design treatment will be critical so as to integrate them as permanent landscape components within the townscape. They will be constructed with steel framing and clad with coloured absorptive steel panels and transparent panels. When viewing the semi-enclosure from positions on the carriageway, the design will be the same as for Kam Shan Building, to provide a continuum in landscape treatment. In respect to this sensitive receiver, the design of the elevated structures will be carefully considered to reflect the contextual setting. This will be achieved through the use of form, line and texture. The elevated structure will create the potential for the development of land for passive recreational purposes, both underneath and in adjacent areas. The opportunity to revitalize the townscape should be given a high priority to reduce the substantial visual and landscape impact.

1.11 Mei Lam Estate (J) - MSR

It is advised that the existing screen planting will reduce the visual impact of the road scheme at the lower levels and this will be further strengthened by additional planting. The adjacent semi-enclosure will be constructed with steel framing and clad with coloured absorptive steel panels and transparent panels and sensitively designed to reflect the contextual setting in order to reduce the visual impact. When viewed from positions within the residential units the enclosure will be finished with a low-key natural colour. Along the length of the semi-enclosures, the existing screen planting at ground level, will be strengthened to create a 'green wall'. From positions on the road, the architectural design will be designed to create an attractive geometric repetitive pattern.

1.12 Wong Wan Tin College (K) - HSR

The mitigation proposals to support the reduction of the visual impact of the proposed alignment, will be the extension of screen planting. The additional planting around the perimeter of the school grounds will utilize native species to provide full canopy cover to further reduce the substantial effect of the road scheme. In order to provide a continuum in design, the mitigation measure will be the same as the proposals for the Mei Lam Estate. The adjacent semi-enclosure with steel framing and clad with coloured absorptive steel panels and transparent panels.

1.13 Shing Chuen Road (L) - LSR

The road scheme provides the opportunity to revitalize the townscape. This will be in relation to the area of land which has been gazetted for road widening. The area adjacent to the Shing Wan Road and the Shing Mun Channel will be developed as a small open space for passive recreational uses with portions of the open space under the elevated structure of the road scheme. The landscape design will be given a high priority to enable the creation of an attractive recreational facility for local residents and employees.

1.14 Tung Lo Wan Village / Harmony Lodge (M) - MSR

The strengthening of the tall existing roadside trees will effectively reduce the visual impact from the majority of viewpoints. The reprovision of Tung Lo Wan Playground and associated sitting areas will be undertaken. In respect to this sensitive receiver, the design of the elevated structures will be carefully considered to reflect the contextual setting.

1.15 Villa Maria/ Villa Augustan (N) - LSR

Opportunities will be available to provide buffer/ screen planting. Further elements in respect to town revitalization will be undertaken.

1.16 Caritas School / Telephone Exchange / Sha Tin Clinic (O) - MSR

In respect to the sensitive receiver there are no specific mitigation measures required. The significant visual impact of the road scheme will be reduced by the consolidation and strengthening of the existing vegetation around the periphery of the sensitive receiver, with additional planting.

1.17 Villa Le Parc (P) - MSR

Accent and screen planting will be provided as appropriate. The treatment will reflect the high quality residential environment of Villa Le Parc.

1.18 Residential Areas within Tai Wai Town Centre (Q) - LSR

Due to the main orientation of the building layouts the predominant sightlines are east-west, which is parallel to the T3 Trunk road. Therefore the main visual impact is upon the north-south orientated streets. Views to the structure will be ameliorated by amenity planting at ground level beside the structure and the barriers/semi-enclosures will be designed to provide visual interest and enhance the townscape character.

1.19 Shing Mun River Channel: North - South (R) - MSR

The main visual impact on this area is created by the vertical barrier partially spanning the channel at the southern edge of the structure. Careful design will be carried out to incorporate this barrier into the overall form of the T3 structure, particularly as at this location it will be viewed as a bridge and a main townscape feature. Additional enhancement works will be carried out to the channel edge on either side, including passive recreational facilities and planting.

圖例
LEGEND

行車線
TRAFFIC LANE

路平水
PROPOSED ROADD LEVEL

Territory Development Department 拓展署
NT EAST DEVELOPMENT OFFICE
新界東拓展處

SHA TIN NEW TOWN, STAGE II

UPDATED HIGHWAY LAYOUT

MAUNSELL CONSULTANTS ASIA LTD.
茂盛(亞洲)工程顧問有限公司

DRG.NO. 圖紙編號 FIGURE 1.1

SCALE 比例 1 : 4000
DIMENSIONS ARE IN METRES

Maunsell

LEGEND

- VERTICAL BARRIER
- INVERTED-L BARRIER
- PARTIAL ENCLOSURE
- FULL ENCLOSURE
- WWC7 NOISE QUALITY SENSITIVE RECEIVER

REV	DESCRIPTION	DATE
A	STREET NAMES ADDED	13/10/97

Territory Development Department 拓展署

NT EAST DEVELOPMENT OFFICE

SHA TIN NEW TOWN, STAGE II

SHA TIN TRUNK ROAD T3 - TAI WAI SECTION

LOCATION OF NOISE SENSITIVE RECEIVERS

MAUNSELL CONSULTANTS ASIA LTD.

DRG.NO. FIGURE 2.1

DATE SEPT 1997

SCALE 1 : 2500

DIMENSIONS ARE IN METRES

Maunsell

LEGEND

VERTICAL BARRIER

INVERTED-L BARRIER

PARTIAL ENCLOSURE

FULL ENCLOSURE

NOTES :

FOR DETAILS OF SECTIONS 1-1 TO 5-5 REFER TO FIGURES 2.5 TO 2.9

REV	DESCRIPTION	DATE
A	STREET NAMES ADDED	13/10/97

Territory Development Department 拓展署

NT EAST DEVELOPMENT OFFICE 新界東拓展處

SHA TIN NEW TOWN, STAGE II

SHA TIN TRUNK ROAD T3 - TAI WAI SECTION

PROPOSED NOISE BARRIERS

MAUNSELL CONSULTANTS ASIA LTD.
茂盛(亞洲)工程顧問有限公司

DRG.NO. 圖紙編號 FIGURE 2.4

DATE MAR 1998

SCALE 比例 1 : 2500

DIMENSIONS ARE IN 尺寸單位 METRES

Maunsell

LEGEND

VERTICAL BARRIER

INVERTED-L BARRIER

PARTIAL ENCLOSURE

FULL ENCLOSURE

WWC7 — AIR QUALITY SENSITIVE RECEIVER

REV	DESCRIPTION	DATE
A	STREET NAMES ADDED	13/10/97

Territory Development Department 拓展署
NT EAST DEVELOPMENT OFFICE

SHA TIN NEW TOWN, STAGE II

SHA TIN TRUNK ROAD T3 - TAI WAI SECTION

AIR QUALITY SENSITIVE RECEIVER LOCATIONS

MAUNSELL CONSULTANTS ASIA LTD.

DRG.NO. FIGURE 3.1

DATE MAR 1998

SCALE 1 : 2500

DIMENSIONS ARE IN METRES

Maunsell

FF Q:\PROJECTS\SHATIN\634964\100\FIG3-1.DWG