Highways Department
Major Works Project Management Office

Agreement No. CE 82/96

Improvements to Island Eastern Corridor Section between North Point Interchange and Sai Wan Ho

Investigation Assignment

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

MAUNSELL CONSULTANTS ASIA LTD

In association with

MVA Asia Ltd
ENPAC Ltd
Hassell Ltd

Agreement No. CE 82/96 Document No. 93797

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1. INTRODUCTION

1.1 Background

It has been recognized for some time that there is a capacity problem at the Hong Kong side of the Eastern Harbour Crossing (EHC). As a result of inadequate capacity, traffic queues are often found on the eastbound carriageway of the Island Eastern Corridor (IEC) and its approach roads during the traffic peak hours. The traffic queues have caused severe merging and weaving problems.

It is also anticipated that traffic flows on the IEC are likely to increase in the next decade when the Central-Wan Chai Bypass and the new housing developments in Shau Kei Wan and Chai Wan are completed. The existing traffic lanes on the IEC near the EHC would not be able to accommodate the predicted traffic flows and the weaving and merging movements if no road improvement works are implemented.

A traffic impact assessment was conducted under Agreement No. CE47/94, "Traffic Impact Assessment for Four Residential Developments Study". The assessment established the need for improvements to the IEC section between North Point Interchange and Sai Wan Ho whereby two additional traffic lanes in the eastbound direction and one additional traffic lane in the westbound direction of the IEC between Man Hong Street and Tai Cheong Street are provided in order to accommodate the anticipated additional traffic demand and resolve the existing merging and weaving problems.

In 1997 Maunsell Consultants Asia Limited in association with MVA Asia Ltd., ENPAC Limited and Hassell Ltd. were commissioned by the Highways Department under Agreement No. CE82/96 to conduct an Investigation Assignment. As part of the Assignment, a detailed Environmental Impact Assessment has been carried out to assess the potential short- and long-term environmental impacts of the proposed road improvement works on both existing and planned sensitive developments. This report presents the findings, conclusions and recommendations of the assessment.

1.2 Study Objectives

In view of the close proximity of the existing and future receivers that are mainly sensitive to noise and air quality to the section of the IEC to be improved, an EIA Study has been carried out to provide information on the nature and extent of the potential environmental impacts arising from the construction and operation of the Project. The following itemises the key objectives:

- to identify any environmental impacts, e.g. noise, air quality, water quality, etc. that are likely to arise as a result of the construction and operation of the Project;

- to identify any ecological impacts, both aquatic and terrestrial that are likely to arise as a result of the construction and operation of the Project;

- to determine any conditions and requirements for the detailed design, construction, and operation of the Project including any necessary environmental mitigation measures;

- to determine the residual impacts after the proposed mitigation measures are implemented; and

- to ensure that the residual impacts are within the established standards.

The assessment results have been used as the basis for the evaluation of their respective impacts arising from the proposed Project works on both existing and planned sensitive developments, as well as for the identification of locations where the acceptable criteria limits are exceeded and appropriate mitigation measures are required.

1.3 Report Structure

This EIA Report consists of 9 sections, as follows:

(1) Introduction

(2) Project Characteristics

(3) Environmental Setting

(4) Construction Phase Impact Assessment and Mitigation

(5) Operation Phase Impact Assessment and Mitigation

(6) Landscape and Visual Impact Assessment and Mitigation

(7) Environmental Monitoring and Audit Requirements

(8) Conclusions

(9) Recommendations

2. PROJECT CHARACTERISTICS

2.1 Proposed Road Improvement Works

The section of the IEC under investigation in this study is approximately 2.5 km in length. For ease of reference, the Project is divided into three different sections as described below:

Section 1 Eastbound Flyover and realignment of Hoi Yu Street

Section 2 Westbound Flyover and Carriageway west of Tai Koo Shing Interchange

Section 3 Westbound Flyover and Carriageway from Tai Cheong Street to Tai Koo Shing Interchange

Figure 2-1 shows these three sections. Preliminary construction programmes for the three proposed sections are scheduled as shown in Figure 2-2. Construction of the proposed improvement works is scheduled to commence in 2000 for completion by 2003.

The proposed improvement works comprise the following major items:

(i) construction of a new elevated eastbound carriageway with two lanes along the Island Eastern Corridor from west of Man Hong Street to near the Eastern Harbour Crossing entrance;

(ii) construction of a new elevated westbound carriageway with one lane along the Island Eastern Corridor from east of the Tai Koo Shing Interchange to Man Hong Street;

(iii) realignment of the existing central divider of the Island Eastern Corridor between Man Hong Street and the Eastern Harbour Crossing to provide an additional westbound lane;

(iv) realignment of Hoi Yu Street to the north;

(v) reconstruction of the Tai Koo Shing on-ramp to the Island Eastern Corridor westbound;

(vi) realignment of the single lane slip road from the Island Eastern Corridor westbound to Tai Koo Shing;

(vii) construction of a single slip road from the Sai Wan Ho slip road to the Island Eastern Corridor westbound;

(viii) construction of a single slip road from the Island Eastern Corridor westbound near Tai Cheong Street to Tai Koo Shing;

(ix) realignment of the Sai Wan Ho slip road;

(x) extension of the existing footbridge across the Island Eastern Corridor near Tai Koo Shing Interchange;

(xi) construction of a new staircase for the existing footbridge across Tai Koo Shing Interchange;

(xii) construction of a single slip road from the existing Kornhill flyover to the Island Eastern Corridor westbound;

(xiii) reprovisioning of two existing marine piers;

(xiv) reprovisioning of the affected facilities and amenities in Quarry Bay Park; and

(xv) environmental impact abatement measures including noise barriers and extensive planting

Equipment requirements for each activity are provided in Tables 2.1 to 2.3, along with sound power levels (SWLs) for individual and groups of equipment. Equipment SWLs other than that for piling activity are based on those contained in Table 3 of *Technical Memorandum on Noise from Construction Work other than Percussive Piling* and Table 11 of BS 5228: Part 1: 1984. Percussive Piling will be needed for the reprovisions of piers and dolphins near Hoi Yu Street, and equipment SWL is obtained from Table 2 of *Technical Memorandum on Noise from Percussive Piling.*

Table 2.1 Typical Equipment Requirements (Section 1)

Construction Activity	Equipment and Quantity		Assessment Input		Total (1)
			Assumed on-time	SWL per piece dB(A)	
Utility Diversion	Excavator	1	40%	112	116
	Backhoe	1	60%	109	
	Pneumatic breaker	1	60%	110	
	Dumptruck	1	50%	117	
Bored Piles	Bored piling rig	2	100%	115	119
	Concrete mixer truck	1	50%	109	
	Concrete pump	1	100%	109	
	Water pump	1	100%	88	
Pile Cap	Excavator	1	40%	112	118
	Compressor	1	100%	100	
	Bar bender	1	40%	90	
	Concrete mixer truck	1	50%	109	
	Vibratory poker	2	80%	113	
	Mobile crane	1	100%	112	
Column and Crosshead Construction	Mobile crane	1	100%	112	118
	Compressor	1	100%	100	
	Bar bender	1	40%	90	
	Concrete mixer truck	1	50%	109	
	Vibratory poker	2	80%	113	
	Concrete pump truck	1	100%	109	
Precast Beams	Tower crane	1	60%	95	119
	Mobile crane	2	100%	112	
	Compressor	2	100%	100	
	Concrete mixer truck	2	50%	109	
	Concrete pump	1	100%	109	
	Vibratory poker	2	80%	113	
	Tractor	1	10%	118	
	Bar bender	1	40%	90	
Deck Slab Casting	Concrete mixer truck	1	50%	109	117
	Bar bender	1	40%	90	
	Compressor	1	100%	100	
	Vibratory poker	2	80%	113	
	Concrete pump truck	1	100%	109	
Breaking of Existing IEC	Pneumatic breaker (hand-held)	3	60%	117	122
	Excavator breaker	1	40%	122	
	Lorry	1	100%	112	
	Backhoe	1	60%	109	
Road Surfacing	Compressor	1	100%	100	111
	Asphalt paver	1	100%	109	
	Road roller	1	80%	108	
Piling of Pier and Dolphins	Pile driving machine	2	100%	130	133
Pier Demolition	Pneumatic breaker (excavator mounted)	2	60%	122	123

Note: (1) An adjustment for percentage on-time to the SWL has been allowed for according to Figure 4 of BS 5228: Part 1: 1984.

Table 2.2 Typical Equipment Requirements (Section 2)

Construction Activity	Equipment and Quantity		Assessment Input		Total (1)
			Assumed on-time	SWL per piece dB(A)	
Utility Diversion	Excavator	1	40%	112	116
	Backhoe	1	60%	109	
	Pneumatic breaker	1	60%	110	
	Dumptruck	1	50%	117	
Bored Piles	Bored piling rig	1	100%	115	116
	Concrete mixer truck	1	50%	109	
	Concrete pump	1	100%	109	
	Water pump	1	100%	88	
Pile Cap	Excavator	1	40%	112	125
	Backhoe	1	60%	109	
	Bar bender	1	40%	90	
	Concrete mixer truck	1	50%	109	
	Vibratory poker	2	80%	113	
	Mobile crane	1	100%	112	
	Sheetpiling machine	1	30%	129	
Column and Abutment	Mobile crane	1	100%	112	118
	Compressor	1	100%	100	
	Bar bender	1	40%	90	
	Concrete mixer truck	1	50%	109	
	Vibratory poker	2	80%	113	
	Concrete pump truck	1	100%	109	
Deck Casting	Concrete mixer truck	1	50%	109	117
	Bar bender	1	40%	90	
	Compressor	1	100%	100	
	Vibratory poker	2	80%	113	
	Concrete pump truck	1	100%	109	
Road Surfacing	Compressor	1	100%	100	111
	Asphalt paver	1	100%	109	
	Road roller	1	80%	108	
Demolition of Pump House	Pneumatic breaker	1	60%	112	120
	Pneumatic breaker (hand-held)	3	60%	117	
Construction of Pump House	Concrete mixer truck	1	50%	109	117
	Compressor	1	100%	100	
	Vibratory poker	2	80%	113	
	Concrete pump truck	1	100%	109	
Earthwork	Grader	1	100%	113	120
	Bulldozer	1	100%	115	
	Dumptruck	1	50%	117	
	Roller	1	80%	108	
	Compressor	1	100%	100	
	Asphalt paver	1	100%	109	
Open-cut Tunnel	Sheetpiling driving machine	1	30%	129	125
	Concrete mixer truck	1	50%	109	
	Concrete pump truck	1	100%	109	
	Vibratory poker	2	80%	113	

Note: (1) An adjustment for percentage on-time to the SWL has been allowed for according to Figure 4 of BS 5228: Part 1: 1984.

Table 2.3 Typical Equipment Requirements (Section 3)

Construction Activity	Equipment and Quantity		Assessment Input		Total (1)
			Assumed on-time	SWL per piece dB(A)	
Utility Diversion	Excavator	1	40%	112	116
	Backhoe	1	60%	109	
	Pneumatic breaker	1	60%	110	
	Dumptruck	1	50%	117	
Bored Piles	Bored piling rig	1	100%	115	116
	Concrete mixer truck	1	50%	109	
	Concrete pump	1	100%	109	
	Water pump	1	100%	88	
Pile Cap	Excavator	1	40%	112	125
	Backhoe	1	60%	109	
	Bar bender	1	40%	90	
	Concrete mixer truck	1	50%	109	
	Vibratory poker	2	80%	113	
	Mobile crane	1	100%	112	
	Sheetpiling machine	1	30%	129	
Column and Abutment	Mobile crane	1	100%	112	118
	Compressor	1	100%	100	
	Bar bender	1	40%	90	
	Concrete mixer truck	1	50%	109	
	Vibratory poker	2	80%	113	
	Concrete pump truck	1	100%	109	
Deck Casting	Concrete mixer truck	1	50%	109	117
	Bar bender	1	40%	90	
	Compressor	1	100%	100	
	Vibratory poker	2	80%	113	
	Concrete pump truck	1	100%	109	
Road Surfacing	Compressor	1	100%	100	111
	Asphalt paver	1	100%	109	
	Road roller	1	80%	108	
Earthwork	Grader	1	100%	113	120
	Bulldozer	1	100%	115	
	Dumptruck	1	50%	117	
	Roller	1	100%	108	
	Compressor	1	100%	100	
	Asphalt paver	1	100%	109	
Breaking of Existing IEC and Kornhill Flyover	Pneumatic breaker (hand-held)	3	60%	117	122
	Excavator breaker	1	40%	122	
	Lorry	1	100%	112	
	Backhoe	1	60%	109	
Extension of Footbridge	Pneumatic breaker (excavator mounted)	1	60%	122	122
	Lorry	1	100%	112	
	Backhoe	1	60%	109	
	Concrete mixer truck	1	50%	109	
	Concrete pump truck	1	100%	109	
	Vibratory poker	2	80%	113	
Extension of Subway	Pneumatic breaker (hand-held)	2	60%	117	120
	Concrete mixer truck	1	50%	109	
	Concrete pump truck	1	100%	109	
	Vibratory poker	2	80%	113	

Note: (1) An adjustment for percentage on-time to the SWL has been allowed for according to Figure 4 of BS 5228: Part 1: 1984.

3. ENVIRONMENTAL SETTING

3.1 Noise Sensitive Receivers

In accordance with the Study Brief, noise sensitive receivers (NSRs) within 300 metres of the proposed road alignment have been identified for noise impact assessment. Site survey reveals that the existing NSRs in the Study Area are mainly high-rise residential developments and educational institutions. Representative NSRs are identified within the Study Area and described below. The locations of representative NSRs are depicted in Figure 3-1.

Existing Receivers

- North Point Estate (NPE1 - NPE3)
  Contiguous blocks of low-rise residential towers of 10-storey high are located at the junction lot of Tin Chiu Street and Java Road. The sensitive facades facing the IEC are likely to be affected by the Project.

- Residential buildings along Java Road (KFB)
  A mix of buildings of various heights situate at the street block between Tin Chiu Street and Kam Hong Street along Java Road. The western half of the block is occupied by old buildings of 5-storey high; two blocks of high-rise residential buildings occupy the middle part of the block, and the North Point Hall and a basketball court occupy the rest of the street block.

- Madam Chan Wai Chow Memorial School (CWC1 and CWC2)
  A 6-storey high primary school is located at the corner lot surrounded by King's Road, Tin Chiu Street, and Marble Road. The school is currently provided with air-conditioners in all of the classrooms.

- Healthy Gardens (HG1 and HG2)
  Healthy Gardens is comprised of six blocks of 22-storey high residential blocks above a 4-storey commercial/carpark block. The front row of tower blocks facing King's Road is likely to be affected by the proposed road improvement.

- Residential buildings along No.614 - 632 King's Road (KR1 and KR2)
  Three blocks of medium-rise residential buildings ranging from 10-12 storey high along King's Road opposite to the Water Supplies Department office.

- Healthy Village Phase II (HV1 - HV4)
  Healthy Village Phase II is a Sandwich Class Housing Project made up of 7 high-rise buildings and is surrounded by King's Road, Healthy Street Central and Pak Fuk Road.

- Fire Services Department Staff Quarters (FSDSQ)
  A 11-storey high staff quarters building of Fire Services Department is located to the east of Kodak House and to the west of Police Station.

- Model Housing Estate (MHE)
  Model Housing Estate is comprised of a high-rise block of 20 storey and several other low-rise blocks of no more than 6-storey high. A small section of the high-rise block can be viewed from the IEC through the spacing between the industrial/office buildings in the front row.

- Residential buildings along Hoi Chak Street (HCS1 - HCS3)
  High-rise residential dwellings and industrial buildings along Hoi Chak Street; forming a continuous barrier for the other sensitive receivers in the rear. The residential buildings range in height from 12 to 28-storey high.

- Canossa College & Canossa School (HK) (CC1 - CC3)
  A 6-storey Canossa College located off Hoi Chak Street is comprised of a classroom block and an assembly hall. The orientation of the school is such that the noise sensitive windows of the classrooms are facing the IEC. Besides, a 6-storey Canossa School (HK) located south of Canossa College has its sensitive facades oriented away from the IEC.

- Residential buildings along Hoi Tai Street (TPM1, DVH1 and RM1)
  Low-rise and high-rise residential dwellings are situated along Hoi Tai Street which is a local road providing access to the nearby residential and office buildings.

- Taikoo Shing (TKS1 - TKS6)
  A large private housing development comprising both commercial and residential blocks is situated along the landward side of Quarry Bay Park. The residential tower blocks face the IEC at an angle, and some of them have carparks of 2-3 storey underneath. Therefore, the first-floor level may differ from block to block.

- Residential buildings along Hong Cheung Street (HC1 - HC3)
  Medium to high-rise residential towers along Hong Cheung Street, which runs in parallel to the IEC. Some of the buildings have sensitive facades facing Hong Cheung Street and the IEC while others have strategically placed blank walls facing the noise source.

- Felicity Garden (FG1 - FG3)
  Felicity Garden is another private housing development to the east of the Works limit. It comprises tower blocks of some 25-storey high with the Urban Council Sai Wan Ho Complex which is noise tolerant underneath. All dwellings of Blocks 3 and 4 on the seaward side are exposed to traffic noise from the IEC.

- Lei King Wan (LKW1 - LKW5)
  A private residential development comprising seventeen tower blocks with a single commercial floor underneath. Sitting-out areas and children playgrounds are also found within the development.

A number of NSRs at further distances behind the above are not included in the assessment although they are located within the Study Area because of shielding by the above buildings. These NSRs mainly include Taikoo Shing and low-rise residential buildings along Shau Kei Wan Road. The 5-storey Korean International School and Caritas Lok Yi School in Lei King Wan are also excluded from the assessment because the sensitive facades of both schools are oriented away from the IEC. The residential building at the 'R(A)' site near Lei King Wan is also excluded from the noise impact assessment as it has already incorporated self-protective building design and blank walls at the potentially affected facades. Furthermore, a noise-tolerant USD leisure centre is planned for at the adjacent site, acting as a noise screening structure for the 'R(A)' site.

Future and Planned Receivers

According to the Outline Zoning Plans for Quarry Bay and North Point (S/H21/9 and S/H8/7), the vacant lot north of Cannosa College is zoned 'Open Space' (O). As advised by Urban Services Department, the 'O' site falls within the proposed Quarry Bay Park Phase II (QBP II) which is scheduled to commence construction in December 1998 for completion by May 2000. As such, it is not considered as noise sensitive use and hence excluded from the noise impact assessment. Beside the QBP II, there are no other planned land uses identified within the study area.

3.2 Air Sensitive Receivers

Air Sensitive Receivers (ASRs) including domestic premises, industrial and commercial buildings, educational institutions, and recreational and leisure facilities, within 500 metres of the road improvement have been identified for air quality impact assessment. Representative ASRs identified within the Study Area are described in Table 3.1 and depicted in Figure 3-2.

Table 3.1 Description of Air Sensitive Receivers (ASRs)

ASR	Name of Building	No. of Storey		
		Residential	Educational/ Institutional	Commercial
NPE	North Point Estate	10		
KWC	K. Wah Centre			25
KH	Kodak House			27
FS	Fire Station	11		
PS	Police Station		17	
EHC	Eastern Harbour Centre			22
LKM	Lai King Mansion	11		
CC	Canossa College		6	
SH	Somerset House	24		
PM	Pine Mansion	26		
JM	Juniper Mansion	26		
CPZ	Cityplaza 4			30
PRM	Primrose Mansion	26		
THM	Tung Hoi Mansion	26		
KHM	Kwun Hoi Mansion	18		
PTM	Po Tong Mansion	27		
KIS	Korean International School		4	
OMM	On Ming Mansion	18		
TOB	Tai On Building	28		
QBP (1)	Quarry Bay Park			

Note: (1) The vacant lot north of Cannosa College earmarked for Quarry Bay Park Phase II is also taken into account for air quality impact assessment.

3.3 Water Quality

Within the vicinity of the Project, the main sensitive receivers are inshore waters of Victoria Harbour and a seawater intake point near Hoi Yu Street.

3.4 Visual Impact

Visually sensitive receivers are described in Section 6 of this Report.

4. CONSTRUCTION PHASE IMPACT ASSESSMENT AND MITIGATION

4.1 Noise

4.1.1 Noise Standards and Regulations

(a) *Non-restricted Hours*

Under the existing provisions, there is no legal restriction on noise generated by construction activities (other than percussive piling) between the hours of 0700 and 1900 on normal weekdays. However, EPD's *Practice Note for Professional Persons ProPECC PN 2/93* recommends a non-statutory daytime construction noise limit of 75 dB(A) L_{eq}(30 min) at the facades of dwellings and 70 dB(A) L_{eq}(30 min) for the schools. This recommendation has been adopted for the assessment of construction noise during non-restricted hours.

(b) *Restricted Hours*

It is expected that night works will not be required and therefore the criteria stipulated in *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.

(c) *Percussive Piling*

As percussive piling is required for the reprovisions of FSD pier and Kodak pier during the construction phase and therefore the criteria stipulated in the *Technical Memorandum on Noise from Percussive Piling* issued under the NCO are applicable to this Project.

As observed on site, the existing NSRs do not seem to have central air conditioning systems. Acceptable Noise Level (ANL) applicable to the Project is therefore 85 dB(A) for the NSRs concerned.

4.1.2 Assessment Methodology

Based on the construction activities and programme described in Section 2, construction noise has been assessed in accordance with the procedures stipulated in *the Technical Memorandum on Noise from Construction Work other than Percussive Piling, BS 5228:Part 1:1984* and, where appropriate, *Technical Memorandum on Noise from Percussive Piling*. Adjustments for equipment on-time have been made according to Figure 4 of *BS 5228:Part I:1984*.

For the purpose of this EIA study, the construction noise impact has been assessed based on the following assumptions:

- Three sections of the Project will be carried out simultaneously for 7 time periods between September 2000 and August 2003 (see Figure 2.2).

- All items of powered mechanical equipment (PME) required for a particular construction activity are located at a notional source position of the segment where such activity is performed.

- A +3 dB(A) facade correction is added to the predicted noise levels in order to account for the facade effect at each NSR.

- The most affected and representative sensitive facades of the residential buildings to the notional source positions are examined.

4.1.3 Impact Assessment

The construction noise impacts on the representative NSRs have been assessed for different time periods as described below in accordance with the preliminary construction programme. Construction noise calculations for each scenario are shown in Table 4.1.

Scenario	Time Period
A	September 2000 - December 2000
B	January 2001 - June 2001
C	July 2001 - December 2001
D	January 2002 - June 2002
E	July 2002 - December 2002
F	January 2003 - June 2003
G	July 2003 - August 2003

As shown in Table 4.1, scenario B is likely to be the worst case scenario (i.e. January 2001 - June 2001) with the calculated noise levels in the range of 73 to 97 dB(A). Under scenario B, except for NSRs: HG1, HG2, KR1, KR2, HV2, HC2 and HC3, the rest of the representative NSRs are predicted to be exposed to unacceptable construction noise levels. Most of the identified NSRs are predicted to be adversely affected by the construction noise throughout the construction period, especially Taikoo Shing, Lei King Wan and residential buildings along Hong Cheung Street. With regard to educational institutions, Canossa College is likely to expose to noise levels in the range of 69 to 83 dB(A), exceeding the construction noise day-time limit by 13 dB(A). As such, the construction noise impact of the Project is considered to be significant and mitigation measures are likely to be required.

Table 4.1 Construction Noise Levels at Representative Groups of NSRs (Unmitigated)

NSR	SCENARIO						
	A	B	C	D	E	F	G
NPE1	75	77	73	70	73	74	67
NPE2	74	76	72	69	72	73	66
CWC2	72	74	70	68	70	71	64
HG1	71	73	69	66	69	70	63
HG2	72	74	70	67	70	71	64
KR1	73	74	70	68	71	71	64
KR2	73	75	71	68	71	72	65
HV2	73	75	71	68	71	72	65
FSDSQ	83	85	81	79	82	82	75
MHE	74	76	72	69	72	73	66
HCS1	76	78	74	71	74	75	68
HCS2	73	74	70	68	71	71	64
HCS3	71	73	69	66	69	70	63
CC1	75	79	78	77	77	69	69
CC2	80	83	83	81	81	75	74
RM1	75	77	75	74	75	72	67
TKS1	77	80	79	78	78	73	70
TKS2	83	86	86	84	84	78	77
TKS3	96	97	97	94	93	92	89
TKS4	90	91	91	88	88	86	83
TKS5	89	90	90	87	87	85	82
TKS6	95	96	96	93	92	91	88
HC1	96	97	97	94	93	92	89
HC2	84	85	85	82	82	80	77
FG3	76	77	77	74	74	72	69
LKW1	82	83	83	81	80	78	75
LKW2	77	78	78	75	74	73	70
LKW3	80	81	81	78	78	76	73
LKW4	85	86	86	84	83	81	78

Percussive piling will be carried out for the reprovisions of FSD pier and Kodak pier. Amongst the NSRs identified, NSRs KR2 and FSDSQ are the most affected residential dwellings and therefore have been selected for the worst-case scenario assessment. The predicted noise levels of percussive piling are shown in Table 4.2.

As shown in Table 4.2, the maximum exceedance over the ANL is 3 dB(A) and thus the permitted hours of operation on any day not being a general holiday are 0800 to 0930, 1200 to 1400, and 1630 to 1800 hours.

Table 4.2 Percussive Piling Noise Levels for the Worst Case Scenario

NSR Group	SWL dB(A)	Distance (m)	ANL dB(A)	Distance Correction dB(A)	Facade Correction dB(A)	CNL dB(A)
KR2	136	274	85	-62	+3	77
FSDSQ	136	94	85	-51	+3	88

4.1.4 Mitigation Measures

As discussed in Section 4.1.3, most of the existing NSRs are likely to be exposed to high construction noise if unmitigated. Suitable noise mitigation measures should be provided to protect the affected NSRs throughout the construction period.

While it is not feasible to dictate the methods and exact schedule of construction to be employed by the Contractor, noise control requirements can be incorporated in the Contract Documents, specifying the noise standards to be met and requirements of noise monitoring on the site. A set of recommended pollution control clauses is provided in Appendix A for incorporation into the Contract Documents. Also, details of the proposed environmental monitoring and audit (EM&A) requirements are contained in the EM&A Manual.

Potential noise control provisions to reduce noise levels from project activities include, but not be 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 the most quiet, but they may require longer periods of time.

- Noisy activities can be scheduled to minimise exposure of nearby NSRs to high levels of construction noise. For example, noisy activities can be scheduled for midday, or at times coinciding with periods of high background noise (such as during peak traffic hours). Prolonged operation of noisy equipment close to dwellings should be avoided.

- Idle equipment shall be turned off or throttled down. Noisy equipment should be properly maintained and used no more often than is necessary.

- Construction activities shall be planned so that parallel operation of several sets of equipment close to a given receiver is avoided.

- If possible, the number of operating powered mechanical equipment(s) 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 reduction measures such as curved or inverted-L acoustic barriers may be used to screen specific receivers. Enclosures for noisy activities such as concrete breaking should be provided where the noise impact is potentially severe.

- The use of drilling machines for the foundation construction should be minimised as much as practicable.

The most effective mitigation measure is to control the sound emissions from the powered mechanical equipment used on site. This involves either selecting silenced equipment, or reducing the transmission of noise using mufflers, silencers, or acoustic enclosures. In addition, construction noise along the noise path may be mitigated by erecting temporary noise screening structures. Given the high-rise nature of NSRs within the Study Area, the use of acoustic enclosures and curved/inverted-L noise barriers (located close to the noise source) are considered appropriate.

Appendix B presents one of many possible construction noise mitigation schemes to control noise at specific locations. Through proper implementation of the sample package of mitigation measures, the noise levels at the affected NSRs will meet the daytime construction noise criteria as indicated in section 4.1.1(a).

The establishment of good community relations can be of great assistance to both the Contractor and local communities. Residents should be notified in advance of planned operations and informed of progress. If necessary, a liaison body can be established to bring together representatives of the affected communities, including the Government and the Contractor. In addition, residents should be provided with a telephone number for the Engineer's office, where they may register complaints concerning excessive noise. If justified, the Engineer may authorise noisy operations to cease or to be conducted at non-restricted hours.

Table 4.3 Construction Noise Levels at Representative Groups of NSRs (Mitigated)

NSR	SCENARIO						
	A	B	C	D	E	F	G
NPE1	69	70	66	65	67	69	64
NPE2	68	69	65	64	66	67	63
CWC2	66	67	63	62	64	66	61
HG1	64	65	62	61	62	64	60
HG2	65	66	63	62	63	65	61
KR1	66	67	63	62	64	66	61
KR2	67	68	64	63	65	66	62
HV2	67	67	64	63	64	66	62
FSDSQ	62	63	59	58	60	62	57
MHE	68	69	65	64	66	67	63
HCS1	69	70	67	66	67	69	65
HCS2	66	67	63	62	64	66	61
HCS3	65	66	62	61	63	65	60
CC1	55	56	56	54	54	48	48
CC2	60	61	60	59	59	54	53
RM1	69	70	68	66	67	66	63
TKS1	72	73	72	70	71	67	65
TKS2	63	64	63	62	62	57	56
TKS3	73	75	75	73	72	70	67
TKS4	68	69	69	67	67	64	61
TKS5	67	69	68	67	66	64	60
TKS6	73	74	74	72	71	69	66
HC1	73	75	74	73	72	70	66
HC2	62	64	63	61	61	59	55
FG3	69	70	70	68	68	65	62
LKW1	60	62	61	60	59	57	53
LKW2	70	71	71	69	68	66	63
LKW3	73	74	74	72	72	69	66
LKW4	63	65	64	63	62	60	56

4.2 Dust Impact

4.2.1 Air Quality Standards and Guidelines

The main air quality issue during the construction of the Project is dust emissions from the construction site. Air pollutants come under the control of the Air Pollution Control Ordinance, which calls for compliance with a set of health-related air quality objectives (AQO) for seven pollutants, of which TSP is of prime concern in this project. Compliance with the concentration levels shown below in Table 4.4 is required.

The AQO contains no hourly criteria for concentrations of TSP and RSP. However, the Dust Suppression Guideline of EPD requires that the maximum acceptable concentration of TSP during construction works should be 500 $\mu g/m^3$ (hourly average), and this is used in the present assessment.

Table 4.4 Air Quality Objectives

Parameter	Maximum Permitted Average Concentration ($\mu g/m^3$)		
	1 hour	24 hours	Yearly
TSP	500	260	80

Notes: " All criteria are Hong Kong Air Quality Objectives except hourly TSP concentration, which is an EPD Dust Suppression Guideline.
" 24-hour criteria not to be exceeded more than once per year.
" Expressed at the reference condition of 298K and 101.325 KPa.

4.2.2 Assessment Methodology

Dust concentrations at the sensitive receivers arising from the construction of the proposed improvement works have been predicted using the Fugitive Dust Model (FDM). Emission factors have been determined in accordance with the US EPA's AP-42 publication. Receivers are assumed to be at ground level and 10m above ground level. In addition, one year's sequential meteorological data for the year 1993 from the Hong Kong Observatory's King's Park Station has been used to predict the 1-hr and 24-hr TSP concentrations in the proximity of the construction corridor.

According to AP-42, an approximate emission factor for heavy construction operation is:

1.2 tons per acre of construction per month of activity

This emission factor is considered to be the most appropriate emission factor available, since it deals with operations such as land clearance, ground excavation and the construction of the facilities, which are typical of the construction activities for the proposed project. In terms of 25 working days per month and 8 hours per working day, the above emission factor is translated to 1.16E-04 $g/m^2/s$ of TSP.

The annual average TSP concentration for the year 94 as measured at EPD's Central/Western monitoring station was 87 $\mu g/m^3$. For the purpose of this assessment, this value has been used as an indication of the future TSP background concentration.

4.2.3 Impact Assessment

Excavation, backfilling and other earthworks and the haulage of materials on-site and off-site are likely to give rise to considerable construction dust impacts on the adjacent sensitive receivers, which include all the residential dwellings, industrial buildings, schools, playgrounds and sitting-out areas which are located along the improved section of the IEC.

To provide a general picture on the construction dust impact of the Project on Quarry Bay Park, hourly and daily average TSP concentration contours at local ground level are shown in Figures 4-1 and 4-2. It should be noted that TSP background concentration of 87 $\mu g/m^3$ has been included. Impacts on representative discrete receivers are also assessed, and the hourly and daily concentrations at ground level and 10m above ground level are presented in Table 4.5.

As depicted in Figures 4-1 and 4-2, TSP hourly and daily average concentrations at ground level are likely to exceed the guideline (500 $\mu g/m^3$) and AQO (260 $\mu g/m^3$) respectively at certain areas of Quarry Bay Park, including Quarry Bay Park Phase II.

For the representative discrete receivers, as shown in Table 4.5, TSP hourly average concentrations would exceed the guideline of 500 $\mu g/m^3$ at ASRs PTM (Po Tong Mansion), TOB (Tai On Building) and CPZ (Cityplaza 4) at ground level. On the other hand, at 10m above local ground, TSP hourly and daily average concentrations at all the representative ASRs would comply with the AQO.

Table 4.5 Hourly and Daily TSP Concentrations at Various Levels

ASR	Ground Level TSP Concentrations ($\mu g/m^3$)		10m Above Ground Level TSP Concentrations ($\mu g/m^3$)	
	Hourly	*Daily*	*Hourly*	*Daily*
NPE	185.6	114.6	168.4	111.3
KWC	187.7	119.2	159.2	114.1
KH	206.4	130.5	179.1	122.1
PS	332.2	177.9	228.2	141.4
EHC	422.5	210.1	220.6	149.3
CC	201.5	147.1	172.8	120.6
SH	200.4	115.2	163.8	108.3
PM	229.5	117.8	169.4	109.9
JM	362.2	172.2	166.7	130.5
CPZ	**526.7**	140.3	261.5	111.8
PRM	359.9	126.0	228.6	105.6
THM	489.7	165.8	237.1	122.5
PTM	**535.0**	233.9	280.5	136.2
TOB	**539.9**	163.0	366.1	142.2
OMM	301.3	143.5	202.7	126.0
KIS	281.7	155.2	191.0	128.8
KHM	271.0	118.9	183.9	109.4
FS	228.8	139.0	197.4	129.9
LKM	226.2	127.4	161.3	116.4

4.2.4 Mitigation Measures

Section 4.2.3 has shown that dust impact can be anticipated from the construction of the proposed roadworks along the IEC and therefore dust suppression measures are required. Potential dust suppression measures which are cost effective include watering of the works site twice per day, maintaining good housekeeping of the site and the implementation of the control clauses as recommended in Appendix A.

According to US EPA's AP-42, 5th publication, watering the working area twice a day can reduce dust emissions by about 50 percent. The implementation of other dust suppression measures such as covering of materials on truck with tarpaulin sheeting can reduce the amount of dust considerably. As the effect of some of the measures cannot be quantified, it has been assumed that the dust levels can be reduced by 60% after the implementation of these measures. Table 4.6 shows the mitigated TSP hourly average concentrations at the discrete receivers, and Figures 4-3 and 4-4 show the ground level TSP concentrations at the air sensitive areas (i.e. Quarry Bay Park) after mitigation. They are all within the Dust Guidelines and AQO and therefore no significant dust impacts are anticipated.

Table 4.6 Hourly and Daily TSP Concentrations at Various Levels (Mitigated)

ASR	Ground Level Concentrations in mg/m^3		10m Above Local Ground Level Concentrations in mg/m^3	
	Hourly	*Daily*	*Hourly*	*Daily*
NPE	126.4	98.0	119.6	96.7
KWC	127.3	99.9	115.9	97.8
KH	134.7	104.4	123.8	101.0
PS	185.1	123.4	143.5	108.8
EHC	221.2	136.2	140.4	111.9
CC	132.8	111.0	121.3	100.4
SH	132.4	98.3	117.7	95.5
PM	144.0	99.3	119.9	96.2
JM	197.1	121.1	118.9	104.4
CPZ	262.9	108.3	156.8	96.9
PRM	196.1	102.6	143.6	94.4
THM	248.1	118.5	147.0	101.2
PTM	266.2	145.8	164.4	106.7
TOB	268.1	117.4	198.6	109.1
OMM	172.7	109.6	133.3	102.6
KIS	164.9	114.3	128.6	103.7
KHM	160.6	99.8	125.8	96.0
FS	143.7	107.8	131.2	104.1
LKM	142.7	103.1	116.7	98.7

4.3 Water Quality

4.3.1 Water Quality Objectives

The Water Pollution Control Ordinance (WPCO) Cap. 358 (1980) provides a framework for the designation of Water Control Zones (WCZs) throughout the Territory. The *Technical Memorandum on Effluent Standards* sets the standards for effluents in various groups of coastal water. The Study Area falls within the inshore water of Victoria Harbour Water Control Zone. The memorandum lists the standards for various determinand, of which suspended solids is of the prime concern during the construction phase of the Project due to marine dredging.

With reference to Table 9a of the memorandum, the standard for suspended solids is 30 mg/L.

4.3.2 Existing Water Quality

In the Water Control Zone of Victoria Harbour, there are eleven sewage outfalls with a total flow of over 1.2 million m^3 per day from screening plants on Hong Kong Island and Kowloon.

According to *Marine Water Quality in Hong Kong for 1995* published by Environmental Protection Department, there are eleven monitoring stations which monitor routinely the water quality throughout the Victoria Harbour Water Control Zone. Monitoring data at Station VM1, being close to where marine dredging may be carried out, has been adopted to represent the existing status of water quality in the Study Area. With reference to monitoring results for 1995, the depth-average suspended solids at VM1 is 10.6 mg/L.

4.3.3 Impact Assessment

During the construction phase, possible impacts on marine water quality 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 has the potential to cause water pollution. In addition, marine works will be carried out for Section 1 of the Project (i.e. from Man Hong Street to Hoi Yu Street). Marine works will involve extracting marine sediments during the installation of marine bored piles for the elevated structure.

The works would involve removing about 8000m3 of marine sediments extracted from marine bored piles by means of a grab. The duration for extracting marine sediments is estimated to be about 2 months. Since the extraction of marine sediments will be carried out inside contained bored piles, no adverse water quality impact is anticipated. Notwithstanding this, silt screen should be installed in the vicinity of salt water intake point as far as practicable during the construction.

4.3.4 Mitigation Measures

The following mitigation measures are recommended *in ProPECC PN1/94 - Construction Site Drainage* to minimize 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 be discharged into the nearby receiving waters, and the water quality of all discharges must not be allowed to cause exceedances of the WQOs in the receiving Victoria Harbour Water Control Zone;

- all stockpiled areas should be covered (e.g. 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.

Effluent generated by the on-site workforce would require appropriate treatment and disposal. Chemical toilets should be used to dispose of the sewage generated by the on-site workforce of the proposed project. 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.

Given the use of marine bored piles during the dredging activity, coupled with the recommended mitigation measures, no adverse water quality impact is anticipated.

4.4 Waste Disposal

4.4.1 Legislation

The following are the relevant legislation that covers the handling, treatment and disposal of solid wastes in Hong Kong.

- Waste Disposal Ordinance (Cap. 354);
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354);
- Crown Land Ordinance;
- Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-Laws (Cap. 132); and
- Dumping at Sea Ordinance (Cap. 466).

4.4.2 Impact Assessment and Mitigation Measures

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

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

Construction Waste

Waste will arise from a number of activities to be 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. Due to the inert nature of most construction waste, disposal is not likely to raise long term environmental concerns.

Construction waste should be sorted on site into non-inert (construction and demolition waste) and inert (public fill) fraction for reuse and recycling as far as practical. About 5000m^3 of non-inert waste and 25000m^3 of inert waste have been estimated to be generated from this project. Non-inert fraction containing no more than 20% by volume of inert content can be disposed of at landfills, whilst the inert fraction (such as soil, rock, asphalt, concrete, brick building debris, etc.) should be delivered to public fills or other reclamation sites.

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 present, 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.

Chemical Waste

Chemical waste includes any substances being scrap material, or unwanted substances specified under Schedule 1 of the Waste Disposal Ordinance. A complete list of such substances is provided under the Ordinance, but 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. 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.

General Refuse

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 a 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. Waste disposal is not considered to be a key issue, provided all waste is disposed of in an appropriate manner.

As long as sorting and disposal procedures are properly followed, construction waste, chemical waste and general refuse to be generated for this Project will not constitute any adverse impact.

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; and
- 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.

4.5 Ecology

4.5.1 Relevant Hong Kong Legislations

The Hong Kong regulations relevant to the proposed project are as follows:

- The Forests and Countryside Ordinance (Cap. 96), which protects both natural and planted forests and open countryside from human-caused disturbances including fire and cutting or removal of vegetation.

- The Forestry Regulations (Cap. 96), which protect specified local wild plant species.

- The Wild Animals Protection Ordinance (Cap. 170), which provides for protection of listed species of wild animals by prohibiting the disturbance, taking or removal of animals and/or their nests or eggs.

4.5.2 Impact Assessment

Terrestrial Ecology

A preliminary ecological survey was carried out in July 1997 to provide an overview of the plants and animals within the Project for the evaluation of ecological impacts of the proposed road works. In order to provide further information about the existing flora within the development site, another survey was conducted in November 1997.

A total of 31 species were recorded during the two surveys. A species list of the recorded flora is given in Table 4.7. No protected or rare plant species are recorded. All of the recorded plant species are common and widespread in Hong Kong territory. The majority of the them are common urban plantation such as *Eucalyptus citriodora, Eucalyptus tereticornis, Macaranga tanarius, Livistona chinensis, Melaleuca leucadendron* and *Nerium indicum.* They are mainly planted for landscape and amenity purposes.

During the course of the survey, no signs of large mammals were found. Few signs of birds were found in the Study Area and all of them are common urban bird species such as *Acridotheres cristalellus* and *Garrulax perspicillatus*.

The most ecological concern of the proposed road works will be the loss of plants in the development site. However, all of these plants are not uncommon and protected species and therefore have no unique ecological value. Furthermore, no mature trees are required to be felled because of the project works, and thus a loss of roadside plantation would not induce a significant impact on ecological resources. Few signs of birds were observed within the site, and they are of common urban bird species and widespread throughout similar habitats in Hong Kong. The proposed road works are unlikely to cause a local loss of bird species. Moreover, no signs of large mammals were found during the survey period. In short, no adverse ecological impact arising from the development is anticipated.

A tree survey has been conducted and effort has been made to retain and transplant the existing trees wherever possible. A total of 234 existing trees in the existing Quarry Bay Park area likely to be affected by the project have been examined and it is recommended that 204 of them be retained or transplanted, leaving only 30 trees required to be felled. In the roadside amenity areas, a total of 532 trees have also been studied and 241 of them can be retained or transplanted, with the remaining 291 required to be felled. Notwithstanding this, no mature tree will be felled as mentioned before. As a mitigation measure, extensive compensatory planting comprising 475 trees on the roadside amenity areas and 160 additional trees within Quarry Bay Park will be carried out in conjunction with the road improvement works to compensate for the loss of vegetation and reduce the visual and landscape impacts of the proposed road works.

Table 4.7 List of Flora Species

Species	Habitat
Eucalyptus citriodora	T
Eucalyptus tereticornis	T
Macaranga tanarius	T
Acacia confusa	T
Archontophoenix alexandrae	T
Caryota ochlandra	T
Cassia surattensis	T
Chrysalidocarpus lutescens	T
Cycas revoluta	T
Livistona chinensis	T
Melaleuca leucadendron	T
Sapium sebriferum	T
Aglaia odorata	T
Bauhinia blakeana	T
Nerium indicum	S
Duranta repens	S
Lantana camara	S
Cordyline fruticosa	S
Dracaena fragrans	S
Asparagus lucidus	C
Monstera deliciosa	C
Crinum asiaticum	H
Typhonium divaricatum	H
Wedelia chinensis	H
Alocasia odora	H
Miscanthus floridulus	G
Phynchelytrum repens	G
Axonopus compressus	G
Chloris barbata	G
Neyraudia reynaudiana	G
Capillipedium parviflorum	G

T = tree, S = shrub, C = climber, H = herb, G = grass

5. *OPERATION PHASE IMPACT ASSESSMENT AND MITIGATION*

Based on a preliminary review, it is confirmed that water quality, waste and ecology will not generate any environmental concern during the operation phase of this Project. Water quality, for instance, as the proposed piers for the new eastbound elevated structure will be located at the positions presently occupied by the protective dolphins, and thus, the local water flow and circulation will not be affected. As a result, traffic noise and vehicle emission would be the major issues for this Project during the operation phase impact assessment, and mitigation measures will be proposed and evaluated where necessary.

5.1 Noise

5.1.1 Noise Standards and Regulations

The Hong Kong Planning Standards and Guidelines (HKPSG) stipulate that the maximum road traffic noise level at sensitive facades shall not exceed 70 dB(A) L10 (1-hr) for domestic premises and 65 dB(A) L10 (1-hr) for schools.

In case where no practical direct technical remedies can be applied, reference has been made to the Exco' directive *Equitable Redress for Persons Exposed to Increased Noise Resulting from the Use of New Roads*. The eligibility criteria to be tested for consideration of providing existing NSRs with indirect technical remedies in the form of acoustic insulation and air conditioning are :

(i) the predicted overall noise level from the new road together with other traffic noise in the vicinity must be above the specified noise level, i.e. L10(1-hr.) 70 dB(A) and 65 dB(A) for residential dwellings and education institutions respectively.

(ii) the predicted overall noise level is at least 1.0 dB(A) more than the prevailing traffic noise level, i.e. the total traffic noise level existing before the works to construct the road are commenced; and

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

Definition of 'New' Roads

The road section to be improved is a part of the existing IEC between North Point Interchange and Sai Wan Ho. According to the Study Brief, when an existing road section undergoes major modification which will directly result in 25% increase in lanes or substantial changes in alignment or character (e.g. change into a high speed road) of the existing road, it should be regarded as a new road for the purpose of the eligibility assessment of Indirect Technical Remedies (ITR). As a result, section 1 of the IEC (as referred to in Section 2.1) and Hoi Yu Street are considered new roads due to an increase of more than 25% in lane capacity on the IEC and the substantial change in road alignment of Hoi Yu Street. The remaining portions of the IEC outside the works limits are not considered new roads as there is no increase in lane capacity or substantial change of character.

5.1.2 Assessment Methodology

Noise Model

Road traffic noise levels have been predicted using ENPAC's in-house noise model which is a computerised model developed on the basis of the UK's Department of the Transport procedures described in "Calculation of Road Traffic Noise" published by the Welsh Office, HMSO 1988 (CRTN). The effect of Low Noise Road Surface (LNRS) along the IEC has been included in all subsequent calculations.

Traffic Figures

In order to establish the baseline conditions prior to the proposed improvement works, morning peak traffic flows for year 2000, being the commencing year of the construction works, have been used to calculate the prevailing road traffic noise levels. The worst noise impact within 15 years after the completion of the proposed improvement works in 2003 have been assessed based on the projected traffic flows for the morning peak hours in 2018, being the year with the highest traffic flows. Figures 5-1 and 5-2 show the traffic flows for 2000 and 2018, respectively.

5.1.3 Prevailing Noise Environment

The prevailing road traffic noise levels at the NSRs in year 2000 are shown in Appendix C. Apart from a few NSRs which are well screened, the prevailing traffic noise levels at almost all of the representative NSRs, including about 4890 dwellings and 60 classrooms, along the IEC exceed the HKPSG maxima. High noise levels in excess of 80 dB(A) are predicted to occur at the lower floors of HG1, HG2, KR1, MHE, FG1 and FG2. These high noise levels are predominately contributed by local roads (i.e. King's Road, Man Hong Street and Java Road) with the exception of FG1 and FG2 which are affected by the existing IEC. Noise levels at other existing NSRs along the IEC are expected to be in the order of 71-79 dB(A), which exceed the HKPSG noise criteria by 1-9 dB(A). Clearly, these NSRs are adversely impacted by road traffic noise.

5.1.4 Future Noise Environment

The predicted noise levels in 2018 are shown in Table 5.1, and Appendix D gives a breakdown of the noise contributions from existing and new roads. According to these results, all of the representative NSRs are to be exposed to noise levels exceeding the HKPSG noise limits in the year 2018, and such high noise levels at most of these NSRs are dominated by the existing road traffic. The predicted L_{10} noise levels range from 66 to 86 dB(A), representing a maximum noise exceedance of 16 dB(A) and 10 dB(A) for residential developments and schools respectively. Therefore, mitigation schemes where feasible should be provided.

As compared with the prevailing noise levels in 2000, the number of dwellings exceeding 80 dB(A) in 2018 are estimated to triple. In general, the unmitigated noise levels at the NSRs along King's Road, Java Road and Hoi Chak Street in 2018 increase from the prevailing noise levels by 1-6 dB(A) while a 1-2 dB(A) increase is predicted at NSRs near Taikoo Shing and Lei King Wan.

Table 5.1 Predicted (2018) Road Traffic Noise Levels - Unmitigated

NSR	Facade Noise Levels L_{10}(1-hr) dB(A)							Top Floor
	1/F	5/F	10/F	15/F	20/F	25/F	T/F	Level
NPE1	74	80	-	-	-	-	80	10
NPE2	79	78	-	-	-	-	78	10
NPE3	72	82	-	-	-	-	82	10
KFB	82	79	78	78	78	-	78	21
HG1	83	81	80	79	79	-	79	22
HG2	84	82	81	80	79	-	79	22
KR1	83	83	81	-	-	-	81	11
KR2	81	81	80	-	-	-	80	11
HV1	82	81	80	79	78	77	77	27
HV2	79	79	78	78	77	77	77	27
HV3	73	73	74	74	74	75	75	27
HV4	70	69	69	71	71	71	72	27
FSDSQ	71	76	80	-	-	-	80	11
MHE	86	83	81	80	-	-	79	19
HCS1	73	74	74	-	-	-	74	11
HCS2	72	73	74	74	74	-	74	24
HCS3	72	71	72	74	74	-	74	24
TPM1	73	71	-	-	-	-	72	8
DVH1	72	72	74	75	75	-	75	25
RM1	74	76	76	77	76	-	76	25
TKS1	75	76	76	76	76	76	76	26
TKS2	76	77	77	76	76	76	76	26
TKS3	82	81	81	80	79	79	78	26
TKS4	79	79	79	78	78	78	78	26
TKS5	78	78	78	77	77	77	77	27
TKS6	80	80	80	79	78	78	77	27
HC1	69	78	77	-	-	-	77	11
HC2	73	80	79	79	78	78	77	28
HC3	72	79	79	78	78	77	77	28
FG1	84	82	81	79	78	-	78	23
FG2	84	82	81	79	79	-	78	23
FG3	80	79	78	77	77	-	76	23
LKW1	77	78	77	77	-	-	77	18
LKW2	72	73	74	74	-	-	74	18
LKW3	70	72	74	74	-	-	75	18
LKW4	76	78	78	77	-	-	77	18
LKW5	74	74	74	74	-	-	75	18

NSR	Facade Noise Levels L_{10}(1-hr) dB(A)		
	1/F	3/F	5/F
CWC1	74	74	74
CWC2	72	72	72
CC1	71	72	72
CC2	73	74	75
CC3	71	72	74

5.1.5 Feasibility of Providing Noise Barriers/Enclosures

As presented in Table 5.1, noise sensitive receivers located within the Study Area are likely to be exposed to excessive noise from the IEC as well as from other local existing roads. In order to mitigate the adverse road traffic noise impacts, all practicable and effective direct technical remedies within the works limit have been considered in this study.

The feasibility of providing direct noise mitigation measures, i.e. noise enclosures, partial enclosures, or noise barriers on the roads within the Project Limits has been examined in terms of engineering, traffic sightline and other non-acoustical factors for each of the three sections described in section 2.1 and is described below :

Section 1 - Eastbound Flyover and Realignment of Hoi Yu Street

The existing IEC mainline in Section 1 is an elevated structure built at about 15m above sea level. As there was no allowance in the design of the structure for additional loading from the use of enclosure, partial enclosure, or noise barrier, any structural noise mitigation measures on the existing IEC mainline structure are not considered feasible.

The proposed eastbound flyover will be built north of the existing IEC mainline in the form of an elevated structure at the same level as the existing IEC mainline structure. The eastbound flyover will be designed to connect onto the existing IEC mainline structure, and thus, any enclosure, semi-enclosure or vertical barrier on this eastbound flyover would result in wind loading being transferred to the existing IEC mainline structure, which was not designed to resist such additional wind load.

The proposed eastbound flyover will accommodate two eastbound traffic lanes, which will eventually merge with the traffic on the IEC mainline near Hoi Yu Street. Adequate sight distance should be provided for the merging traffic on the IEC. Any enclosure, semi-enclosure, or vertical barrier erected between the proposed flyover and the existing IEC mainline structure would block the sightline of the merging traffic and hence not acceptable from safety consideration.

Hoi Yu Street, east of section 1, will be realigned in conjunction with the IEC improvement works. The traffic flow on Hoi Yu Street is expected to be very low and constitutes only a small fraction of the traffic flows on the IEC. The benefit of erecting noise barriers along Hoi Yu Street would be negligible at the sensitive receivers.

Section 2 - Westbound Flyover/Carriageway West of Taikoo Shing Interchange

A one lane westbound carriageway will be built along this section to bypass Taikoo Shing Interchange and span over the approach roads to Eastern Harbour Crossing. Near Taikoo Shing Interchange, the carriageway is in the form of a depressed road and then an underpass. Further west of the carriageway will be an elevated structure approximately 200m in length at about the same level as the existing IEC mainline. The depressed road section and the underpass section are self-screened from the nearby sensitive receivers. For the elevated structure, erecting vertical noise barrier or partial enclosure up to 5m high is considered feasible. Any barrier or enclosure higher than 5m on the elevated structure would result in instability of the structure and therefore not considered feasible.

Section 3 - Westbound Flyover and Carriageway from Tai Cheong Street to Taikoo Shing Interchange

Taikoo Shing Interchange is composed of several slip roads on a curved alignment. The visibility requirement for safe driving dictates that no obstruction including any form of noise barriers should be erected in close proximity to the road. The same consideration also applies to the sharp curve at the section of the IEC to the northeast of Taikoo Shing unless sufficient setback (minimum of 3m) can be provided. Two sections of the carriageway which could permit construction of an enclosure are between Taikoo Shing Interchange and the footbridge across the IEC and on the slip road connecting to the Kornhill Flyover. However, the acoustic effectiveness of these enclosures will be examined in the subsequent sections.

Roadside vertical barrier, or Inverted L-shaped barrier with a 2m inclined overhang is feasible on the westbound lane between Taikoo Shing Interchange and Kornhill Flyover. The height of the noise barriers considered is 5m as the foundations of noise barriers higher than 5m would encroach onto Quarry Bay Park to result in too excessive alienation of UC's land. Higher noise barrier is also considered undesirable from visual impact consideration.

A plain barrier of 2m in height is also feasible on the westbound lane between Kornhill Flyover and the eastern end of the works limit. This barrier will be partially built on elevated structure and any height more than 2m would result in instability of the structural element.

No noise barrier is feasible along the initial section of the slip road from Kornhill Flyover to the IEC westbound carriageway as it would also result in the instability of the structural element of the slip road.

5.1.6 Mitigation Measures

Having considered the environmental setting of the site, the source-receiver configuration and engineering feasibility, five barrier/enclosure segments as shown in Figure 5-3 have been examined for effectiveness and are described below :

- 110m of 5m Inverted L-shaped barrier adjoining 560m of 5m high plain barrier on the westbound lane between Hoi Yu Street exit and Taikoo Shing Interchange;
- 120m of partial enclosure on the westbound lane between Cityplaza 4 and Marigold Mansion/Begonia Mansion;
- 540m of 5m high Inverted L-Shaped barrier on the westbound lane between Taikoo Shing Interchange and Kornhill flyover;
- 115m of 5m high plain barrier or a partial enclosure on the westbound lane of the slip road connecting Kornhill flyover and IEC; and
- 100m of 2m high plain barrier on the westbound lane between Kornhill flyover and the eastern end of the Works Limit.

5.1.6.1 Evaluation of Effectiveness

The effectiveness of the 5m adjoining barriers between Hoi Yu Street exit and Taikoo Shing Interchange to protect the sensitive receivers along Hoi Chak Street and the western end of Taikoo Shing has been examined. The barrier reduces the noise levels by 1-6 dB(A) at HCS1, HCS2, HCS3, DVH1, RM1, TKS1, CC1 and CC2. As shown in Table 5.2, the predicted noise levels at around the 5/F level of HCS1, HCS2 and HCS3 meet the noise criteria stipulated in HKPSG while the overall noise levels at the other sensitive receivers in the vicinity still exceed the noise criteria.

The effectiveness of the 5m inverted L-shaped barrier between the Taikoo Shing Interchange and the Kornhill flyover to protect the sensitive dwellings at the eastern end of Taikoo Shing has also been examined. The barrier is more effective for those NSRs located in close proximity to the IEC. For example, the first floor of TKS4 which is about 20m away from the IEC receives a noise reduction of about 13 dB(A). The lower- and middle-floor receivers at other NSRs (i.e. TKS2, TKS3 and TKS5) in the vicinity receive noise reductions of between 2-6 dB(A). Although the barrier provides good noise reduction for many of the NSRs, it is not sufficient to reduce the noise levels at all the NSRs to the HKPSG criteria.

In addition to the two barriers already examined, the additive effect of a third barrier has been assessed. The result can be referred to in Table E1 of Appendix E. The inclusion of a 5m high plain barrier on the westbound lane of the slip road connecting the Kornhill flyover and the IEC could only reduce the noise levels further at a few NSRs by no more than 1 dB(A). Therefore, this barrier is not considered effective.

Partial enclosures have also been considered for effectiveness. Two possible locations for partial enclosures have been tested: one located between Cityplaza 4 and Marigold Mansion/Begonia Mansion and the other along the slip road connecting the Kornhill flyover and the IEC. As compared with using plain barriers of 5m high, the improvement in noise levels at the sensitive facades is no more than 1 dB(A). The noise calculations are included in Table E2 of Appendix E. In view of this, partial enclosures are not considered effective and practical in this study.

Due to engineering constraints, a 2m barrier between the Kornhill flyover and the eastern end of the Works Limit is considered to protect the lower floors of the sensitive receivers along Hong Cheung Street. As the results in Table E3 of Appendix E indicate, the barrier is [2]only effective in reducing the noise levels at the first floor of HC1 by barely 1 dB(A) while the noise levels at other receivers remain unaffected. Therefore, this barrier is not considered effective.

Based on the above effectiveness analysis, two of the four barriers examined are considered effective and therefore are recommended for implementation. The recommended barrier configuration is shown in Figure 5-4[2].

[2] A segment of partial enclosure has been proposed and recommended for mitigating the air quality at the Quarry Bay Park Sports Ground. As a side benefit, this enclosure can further reduce the noise levels at the nearby sensitive receivers. A more detailed assessment is given in the Operation Air Quality section.

Table 5.2 Predicted (2018) Road Traffic Noise Levels - Mitigated

NSR	Facade Noise Levels L_{10}(1-hr) dB(A)							Top Floor Level
	1/F	5/F	10/F	15/F	20/F	25/F	T/F	
NPE1	74	80	-	-	-	-	80	10
NPE2	79	78	-	-	-	-	78	10
NPE3	72	82	-	-	-	-	82	10
KFB	82	79	78	78	78	-	78	21
HG1	83	81	80	79	79	-	79	22
HG2	84	82	81	80	79	-	79	22
KR1	83	83	81	-	-	-	81	11
KR2	81	81	80	-	-	-	80	11
HV1	82	81	80	79	78	77	77	27
HV2	79	78	78	78	77	77	77	27
HV3	73	73	74	74	74	75	75	27
HV4	70	69	69	71	71	71	72	27
FSDSQ	71	76	80	-	-	-	80	11
MHE	86	83	81	80	-	-	79	19
HCS1	71	70	71	-	-	-	71	11
HCS2	71	70	71	72	72	-	73	24
HCS3	72	70	72	72	73	-	73	24
TPM1	73	71	-	-	-	-	72	8
DVH1	72	72	73	73	74	-	74	25
RM1	74	75	76	76	76	-	76	25
TKS1	75	75	75	76	75	75	75	26
TKS2	71	74	75	76	76	75	75	26
TKS3	76	78	80	80	79	78	78	26
TKS4	66	75	77	77	77	77	77	26
TKS5	74	75	77	77	76	76	76	27
TKS6	79	80	80	79	78	78	77	27
HC1	68	78	77	-	-	-	77	11
HC2	73	80	79	79	78	78	77	28
HC3	72	79	79	78	78	77	77	28
FG1	84	82	80	79	78	-	78	23
FG2	84	82	81	79	78	-	78	23
FG3	80	79	78	77	76	-	76	23
LKW1	77	77	77	77	-	-	77	18
LKW2	71	72	73	73	-	-	73	18
LKW3	70	72	74	74	-	-	75	18
LKW4	76	78	78	77	-	-	77	18
LKW5	74	74	74	74	-	-	75	18

NSR	Facade Noise Levels L_{10}(1-hr) dB(A)		
	1/F	3/F	5/F
CWC1	74	74	74
CWC2	72	72	72
CC1	69	69	68
CC2	70	69	69
CC3	71	72	74

5.1.6.2 Residual Impact

As discussed above and further elaborated in Appendix F, the noise impacts at many of the NSRs along the IEC arise mainly from traffic on the existing IEC and other local roads. Taking into account the proposed noise mitigation measures on the new roads, noise levels are unlikely to meet the HKPSG criteria. In view of this, considerations have been given to indirect mitigation at the affected NSRs. Appendix G presents a detailed assessment of eligibility according to the EPD's criteria as described in Section 5.1.1. The assessment results show that the Fire Services Department Staff Quarter (FSDSQ) (a total of 9 dwelling units) is eligible for consideration for indirect measures. As for all the other NSRs, since the new roads do not contribute more than 1.0 dB(A) to the overall noise levels at these receivers, they are not eligible for consideration for indirect technical remedies.

The total number of dwellings where the predicted noise levels exceed 70 dB(A) is estimated to be 4920 **in 2018 as compared with 4890 in 2000**, and the total number of classrooms where the noise levels exceed 65 dB(A) is estimated to be 60, if no mitigation measures are provided. The proposed direct technical remedies on the new roads are to minimise the noise impact on the NSRs and reduce the total number of dwellings exceeding the HKPSG by about 100. In addition to the 100 dwellings being in full compliance with the stipulated noise criteria of 70 dB(A), a total of about 2000 dwellings are estimated to benefit from the proposed noise barriers by 1-13 dB(A) noise reduction. Table 5.3 shows the number of dwellings protected and/or benefited from the proposed mitigation measures.

Table 5.3 Number of Sensitive Units Benefiting from Mitigation Measures

Sensitive Development	Number of Noise Sensitive Receivers Exceeding the HKPSG in 2000 and 2018			Number of Noise Sensitive Receivers Benefiting from Mitigation Measures (i.e. ≥1 dB(A) Reduction)
	Prevailing (2000)	Unmitigated (2018)	Mitigated (2018)	
Residential Dwellings	4890	4920	4820	2000
Classrooms	60	60	60	25

5.2 Air Quality

5.2.1 Air Quality Standards

The main air quality issue in the operation phase of the improvement works is vehicle emissions from the operation of the improved road. Air pollutants come under the control of the Air Pollution Control Ordinance, which calls for compliance with a set of health-related air quality objectives (AQO) for seven pollutants. 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 which convert carbon monoxide to carbon dioxide. In view of the lower emission rates and the high statutory limit for carbon monoxide, the key air quality issue is considered to be nitrogen dioxide and restorable suspended particulate. Compliance with the concentration levels shown below in Table 5.4 is required. For the purpose of this assessment, compliance with the hourly NO_2 standard is sufficient to indicate compliance with the 24-hour RSP standard.

Table 5.4 Air Quality Objectives

Pollutant	Maximum Permitted Average Concentration ($\mu g/m^3$)		
	1 hour	24 hours	Yearly
RSP	--	180	55
NO_2	300	150	80

Notes:
- " All criteria are Hong Kong Air Quality Objectives.
- " Hourly criterion for NO_2 not to be exceeded more than three times per year.
- " 24-hour criteria not to be exceeded more than once per year.
- " Expressed at the reference condition of 298K and 101.325 KPa.

5.2.2 Assessment Methodology

Modelling of Vehicle Emissions from the Road

The US EPA *California Line Source Dispersion Model* - CALINE4 was used to simulate the dispersion of NO_x/NO_2 from the IEC and to predict the maximum hourly average NO_2 concentrations at representative air sensitive receivers along the road alignment using the NO_2 option. The improved road is represented in the model as a series of short links, each emitting NOx at a rate which is proportional jointly to a composite emission factor of the air pollutant and the vehicle flow on the road link. Surface roughness of the road was assumed to be 100 cm which is typical of that for a freeway. In order to account for the effect of the noise structure on the dispersion of air pollutants, the positions of these source lines have been shifted vertically and horizontally relative to the centreline of the road.

Vehicle Emissions

Emission factors for NO_X for the year 2011 were taken from the *Fleet Average Emission Factors - EURO2 Model* provided by EPD. These are considered to provide a conservative estimate of the future vehicle emissions in view of the emission control programme currently enforced by the EPD.

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. Details on the calculation of emission factors are shown in Appendix F. No speed correction or other adjustments were made.

Traffic Flows

As the worst-case scenario for this air quality assessment, the peak hour traffic flow in 2018 which is the maximum traffic projection within 15 years upon commencement of operation of the improved road was adopted in the modelling. Traffic mix includes petrol cars, taxi, PLB and passenger vans, light goods and heavy goods vehicles, and double-decker buses.

Preliminary calculations show that the combination of higher traffic flows in 2018 with emission factors in 2011 represent the worst and long-term scenario in terms of air pollution from the road.

Meteorological Conditions

In order to simulate the dispersion of air pollutants from the road which is mainly wind driven under a coastal environment, one year of meteorological data from the weather station of Hong Kong Observatory at Hong Kong International Airport was used to calculate the distribution of air pollutants at off-road locations during the day-time hours between 08:00 and 18:00 hours. As the worst-case scenario, it has been assumed that the traffic flows remain unchanged over these hours. The following summarises the meteorological conditions adopted in the air quality modelling using the CALINE4 model :

Wind Speed & direction	Hourly (between 8am and 6pm) meteorological data observed at Kai Tak Airport in 1996
Wind Direction Variation	18 degrees
Mixing Height	500 m

Vent Shaft of Eastern Harbour Crossing

The potential impact of vehicular emissions through the vent shaft of Eastern Harbour Crossing on adjacent ASRs was predicted using the ISCST model. The source was modelled as a point source emitting NO_2 at a limiting concentration of 1 ppm based on the tunnel air quality guideline of the EPD and a design flow of 405 m^3/s and the vent shaft configuration supplied by the tunnel operator. The concentrations of the air pollutant at receiver points were calculated using as input the above one-year meteorological conditions and these were subsequently added to the concentrations due to the road links.

Portal Emissions from Eastern Harbour Crossing

Based on the design data of the vent shaft from the tunnel operator, it was assumed that 142 m^3/s of air at a limiting NO_2 concentration of 1ppm was exhausted from the portal at the Quarry Bay end. This volume of air was assumed to eject from the portal as a portal jet such that 2/3 of the total emissions is dispersed within the first 50m of the portal and 1/3 of the total emissions within the second 50m, in accordance with the recommendation of PIARC 91. The subsequent dispersion of portal emissions within the 100m length of road links is calculated using the CALINE4 model.

Ambient Pollutant Concentrations

The background pollutant concentrations have been derived from the EPD's Air Quality Monitoring Station at Central/Western. According to the "Air Quality in Hong Kong, 1996" published by the EPD, the annual average concentrations of NO_2 and O_3 are 47 $\mu g/m^3$ and 62 $\mu g/m^3$ respectively.

In the absence of in-situ monitoring data, the above figure has been used as the background concentration for the impact assessment.

5.2.3 Impact Assessment

In order to provide a clear indication of the air quality impact of the Project, contours of the maximum 1-hour average NO_2 concentrations at local ground level (i.e. 1.5m above ground) at Quarry Bay Park are plotted in Figure 5-5. It should be noted that NO_2 background concentration of 47 $\mu g/m^3$ as well as the emissions from the tunnel portal and vent shaft have been included to obtain the cumulative impact. The contours indicate that there would be marginal exceedance of the hourly criterion of 300 $\mu g/m^3$ along the outer perimeter of Quarry Bay Park due to its close proximity to the road source. A setback of 15m from the road edge of the IEC is required for active recreational uses along the road alignment whilst larger setback distance is required in the area between the Eastern Harbour Crossing Tunnel portal and Taikoo Shing Interchange.

Air quality impact on representative discrete receivers are also assessed, and the hourly concentrations at these ASRs are presented in Table 5.5. Assessed against the NO_2 1-hour average objective of 300 $\mu g/m^3$, the modelling results indicate full compliance with the AQO at all receivers at local ground as well as 10m above local ground levels, though a few of the predicted concentrations are close to the AQO.

Table 5.5 Hourly NO_2 Concentrations at Various Levels

ASR	Hourly NO_2 Concentrations in $\mu g/m^3$	
	Ground Level	10m Above Ground Level
NPE	165	146
KWC	147	127
KH	127	127
PS	196	192
EHC	244	225
CC	156	146
PM	221	214
JM	152	146
CPZ	250	193
PRM	221	181
THM	202	184
PTM	278	240
TOB	202	202
OMM	171	171
KIS	209	171
KHM	271	233
FS	127	127
LKM	174	174

5.2.4 Mitigation Measures

As shown in the previous section, unacceptable air quality (i.e. in excess of the AQO) is predicted along both sides of the IEC and thus mitigation measures should be provided for all the affected air-sensitive areas. One of the worst-affected areas is a tennis court in Quarry Bay Park located between the Eastern Harbour Crossing Tunnel portal and Taikoo Shing Interchange. Various alternatives such as converting the tennis courts into an indoor squash court, relocating, eliminating or elevating the tennis courts have been explored. But none of these alternatives is considered feasible and acceptable to Urban Services Department.

The only feasible option is to modify 130m stretch of the 5m plain barrier in front of the Quarry Bay Park Sports Ground to form a semi-enclosure with adequate headroom of 5.5m. The effectiveness of this measure in mitigating the adverse air quality impact at the tennis courts has been examined. Figure 5-6 shows the predicted 300 $\mu g/m^3$ contour lines, together with the buffer distance from the road edge, as a result of the semi-enclosure and the recommended noise barriers as described in Section 5.1. The air quality at all active recreational uses, including tennis courts, football field and basketball court, is predicted to comply with the AQO. Within the predicted 300 $\mu g/m^3$ contour lines, some sitting-out areas of the Quarry Bay Park are located at some 10-15m from the IEC. According to the HKPSG, sitting-out areas are classified as passive recreational uses for which a setback of 3-20m from a trunk road is tolerated in terms of air quality.

As for the future Quarry Bay Park Phase II (QBP II) Development, a minimum buffer zone of 10m for active recreational uses should be reserved along the alignment of the IEC and near the Eastern Harbour Crossing Tunnel portal. The design of QBP II should be made such that no active recreation uses are planned within the 300 $\mu g/m^3$ contour.

5.2.5 Side Benefits

In addition to improving the local air quality at the Quarry Bay Park Sports Ground, the semi-enclosure is expected to provide also some noise reduction for the nearby receivers (i.e. TKS1 and TKS2). In general, the new road contributions at TKS1 and TKS2 are predicted to be further reduced by 1-5 dB(A), but the overall noise levels remain mostly unchanged. The mitigated noise levels as a result of including the semi-enclosure are shown in Appendix I.

6. LANDSCAPE AND VISUAL IMPACTS ASSESSMENT AND MITIGATION

6.1 Introduction

The Eastern Island Corridor is a dual carriageway running as a continuation of Victoria Park Road, adjacent Victoria Park itself, to Chai Wan, adjacent to the MTR station. It follows the coastline between Victoria Park and Quarry Bay being elevated over the water along its course. From Quarry Bay to Chai Wan it is further inland. The section of road covered by this study runs from North Point Vehicular Ferry Piers, at the North Point Estate, east to the partly reclaimed Aldrich Bay.

The study area is located in the eastern parts of the urban areas of north Hong Kong Island and includes parts of North Point, Quarry Bay and Sai Wan Ho. To the north is Victoria Harbour, beyond which is Kowloon Bay, Kai Tak Airport and the urban areas of East Kowloon. To the east is the partly reclaimed Aldrich Bay and Shau Kei Wan. To the south are further urban areas, recent developments in Quarry Bay and the naturally wooded slopes of Braemar Hill. To the west is the high-rise urban development of Causeway Bay.

6.2 Methodology

The Landscape and Visual Impacts are considered separately where:

- landscape impact assessment shall assess the source and magnitude of developmental effects on the existing landscape elements, character and quality in the context of the site and its environs, and;
- visual impact assessment shall assess the source and magnitude of effects caused by the proposed development on the existing views, visual amenity, character and quality of the visually sensitive receivers within the context of the site and its environs.

6.3 Landscape Impacts

The assessment of the potential impacts of a proposed scheme on the existing landscape comprises two distinct sections:

- baseline survey, and;
- potential landscape impacts assessment.

Baseline Survey

A baseline survey of the existing landscape character and quality will be undertaken from site and desk-top surveys. Landscape elements considered include:

- local topography,
- woodland extent and type,
- other vegetation types,
- built form,
- patterns of settlement,

- land use,
- details of local materials, styles, streetscapes, etc.,
- prominent watercourses,
- cultural and religious identity.

Proposed developments either within the study area or adjacent to it are also considered. The baseline survey will form the basis of the landscape context by describing broadly homogenous units of character. The landscape is rated into **low**, **medium** or **high** depending not only on the quality of elements present but also their sensitivity to change and local or regional importance.

Landscape Assessment

The assessment of the potential landscape impacts of the proposals will result from:

- identification of the sources of impact, and their magnitude, that would be generated during construction and operation of the scheme,
- identification of the principal landscape impacts, primarily in consideration of the degree of change to the baseline conditions. The impacts are considered systematically in terms of the landscape elements, the site and the its context.

The overall landscape impact is a product of the following factors:

- the landscape character and its quality,
- source, nature and magnitude of potential impacts,
- the degree of change caused by each of the impacts to the existing landscape,
- tolerance of the landscape to absorb the change,
- significance of this change in consideration of the local and regional areas and other developments,
- cumulative effects on the landscape of this and neighbouring proposals, and;
- identification of plant species of significant value which should be conserved.

The degree of landscape impact is rated into **significant**, **moderate**, **slight** and **insignificant**. The impacts may be **beneficial** or **adverse**.

6.4 Visual Impacts

The assessment of the potential visual impact of the scheme comprises two distinct parts:

- baseline survey, and;
- visual impact assessment.

Baseline Survey

The baseline survey of all views towards the proposals is undertaken by identifying:

- the visual envelope or visual zone within which the proposed development may be contained either wholly or partially with in views. This must also include indirect effects such as offsite construction activities, and;

- the visually sensitive receivers within the visual envelope whose views will be affected by the scheme. The potential receivers are considered as three groups:
- views from residences - the most sensitive of receivers due to the high potential of intrusion on the visual amenity and quality of life,
- view from workplaces - less sensitive than above due to visual amenity being less important within the work environment, and;
- views from public areas - including all areas apart from the above, e.g., public parks, recreation grounds, footpaths, roads, etc. Sensitivity of this group depends on the transitory nature of the receiver, e.g. sitting in a park or travelling on a highway. Also considered is the degree of view or glimpsed views.

The sensitivity of each group is also influenced by its location and direction of view relative to the scheme. Both present and future visually sensitive receivers will be considered.

Visual Impact Assessment

The baseline survey will form of the basis of the visual character and quality of the site. The assessment of the potential visual impacts will result from:

- identification of the sources of visual impacts, and their magnitude, that would be generated during construction and operation of the scheme,
- identification of the principal visual impacts primarily in consideration of the degree of change to the baseline conditions.

The impact assessment will relate to the visual receiver group and their existing and potential views subsequent to the scheme development. The visual impact will result from consideration of the following:

- character of existing view,
- quality of existing view,
- context and location of the visually sensitive receiver,
- visual receiver group sensitivity,
- degree of change to existing views,
- other views available to visual receiver group, and;
- the cumulative effects on views of this and other neighbouring developments.

The degree of visual impact is rated as **significant**, **moderate**, **slight** and **insignificant**. The impacts may be **beneficial** or **adverse**.

6.5 Mitigation Measures

The identification of the visual and landscape impacts will highlight those sources of conflict requiring landscape design solutions to reduce the impacts, and, if possible, blend the development and associated activities, in with the surrounding landscape. These mitigation measures should take into account factors including:

- woodland, tree and shrub planting of new or disturbed slopes, amenity strips and areas central reservations and adjacent to any new structures,
- earth mounding and screening, structural or vegetated,
- highlighting unacceptable impacts and considering alternative scheme proposals,
- treatment of structural forms,

- hard landscape, furniture and other landscape,
- significant landscape elements.

This will result in the formation of landscape mitigation measure proposals which will alleviate the previously identified landscape and visual impacts as far as possible.

6.6 Existing Landscape Context (Refer to Figures 6.1 to 6.4)

The study area for the landscape assessment is 500m from each side of the proposals. This results in the much of the northern half of the study area comprising Victoria Harbour. The general character of the southern part of the study area is of medium to high rise urban character, containing areas of industrial and commercial centres, public open space and parts of Braemar Hill. The infrastructure is dominated by two major east-west routes, namely King's Road and Island Eastern Corridor, together with the Eastern Harbour Crossing Entrance and three major interchanges.

The landscape of the study area can be classified into the following character units:

- *Urban Residential Districts*

  This area dominates much of the southern part of the study area, and is present from east to west. The housing is urban in nature and typifies urban residential areas on Hong Kong Island. In general the buildings are between 6-25 storeys high, with a number being higher than this. The area comprises a mix of two general types of housing. These are:

  - older medium to high rise buildings, generally between 6-15 storeys, of concrete construction and simple block design. They are located primarily in North Point and Sai Wan Ho ends of the study area. Many have a dilapidated or run-down appearance. The ground floor units generally contain slopes, stores or light industrial units. Buildings are directly on the pavement and street. There is no private residential open space associated with these blocks, however, public recreational spaces. These comprise a mix of ball courts and sitting areas. The sitting areas in particular provide relief to the hard urban nature of the area by containing tree and shrub vegetation, also containing seating, concrete shade structures, and children's play equipment. The general streetscape is hard comprising concrete footpaths, metal tubular handrails and street furniture typical of Hong Kong urban areas. The mainly residential area also contains the occasional medium rise warehouse of concrete construction and utilities design. There are also a few areas of open carparking. The overall landscape value of these areas is **low**. However the public recreational areas are local points of **high** landscape value due to the important relief that they provide.

- new tower blocks, up to 30 storeys. They are of concrete construction, simple design and reflect the modern high rise residential blocks of Hong Kong. They are present over the whole of the study area, particularly in Quarry Bay, Sai Wan Ho and Taikoo Shing. Being more modern developments the tower blocks are laid out into individual estates with semi-private access roads. Many have residential open space associated integrally within them. These recreational areas comprise ball courts and sitting areas and generally contain shade structures and amenity tree and shrub planting providing relief to the dominating buildings. The streetscape around these estates is generally good containing street trees and shrub planting. The landscape value of these areas is **medium**.

° *Industrial and Commercial District*

There are two areas of industrial and commercial character. One is located to the west adjacent to the waterfront, while the other is centrally located adjacent to the Eastern Harbour Tunnel Crossing. Both areas comprise on integral mix of warehouses and commercial buildings, together with areas of open space storage, particularly along the waterfront. The warehouses are of both old and modern concrete construction and utilitarian design, medium and high rise. The commercial buildings are of modern design and glass fronted, high rise towers.

A number of ball courts and seating areas are within these areas. The ball courts are generally of concrete surfacing but a number have tree and shrub boundary treatments softening the generally hard areas. The seating areas comprise concrete shade structures, seating and tree and shrub planting.

The general streetscape of the area is hard with concrete pavements, tubular metal handrails and street furniture typical of Hong Kong urban areas. Overall the landscape value is **low**. However, a number of the public open spaces are considered to be local points of **high** landscape value because of the relief that they provide to the hard urban nature of the area.

° *Open Space / Storage Areas*

There is one area of open space and storage north of and adjacent to, the Eastern Harbour Crossing Entrance, along the waterfront. It comprises substantial areas of open space which is used for a number of purposes, namely; open storage, car parking, or is derelict. There are also a number of utilities buildings including a sub-station and venting for the tunnel. Docking facilities are present for inshore service vessels. Vegetation is present comprising rough grass, shrub and vines. The landscape value is **low**.

° *Quarry Bay Park*

Quarry Bay Park is located to the east of the site between Tai Koo Shing and Victoria Harbour. It is bisected by the Island Eastern Corridor. The area enclosed by the Eastern Harbour Crossing Entrance will be developed as Phase II of the Park prior to Island Eastern Corridor and has been considered. The Park is of modern design and comprises both sports facilities and other recreation facilities such as seating areas, shade structures, tai chi garden and children's play areas. The sports facilities contain areas for football, tennis and basketball and include a large spectators terrace. The other recreational facilities are located to the east of the Park and includes a section north of the study road along the waterfront providing a promenade area.

The Island Eastern Corridor and Eastern Harbour Crossing Entrance are major elements within the Park dividing it into a number of separated sections. Along the roadside is dense young tree planting providing a vegetated buffer zone between the Park and transport corridor. The part design is simple and linear with use of small unit materials metal shade structures, shrub and tree planting.

The species within the park are primarily amenity in nature and include:

Acacia confusa	*Leucaena leucocephala*
Acacia auriculiformis	*Eucalyptus citriodora*
Caryota ochlandra	*Macaranga tanarius*
Bombax malabricum	*Nerium indium*
Juniperus chinensis	*Euphoria longan*
Ailanthus fordii	*Schefflera octophylla*
Cassia surranentis	*Archontophoenix alexandrae*
Hibiscus tiliaceus	*Bauhinia blakeana*
Bauhinia variegata	*Eucalyptus tereticornis*
Pongamia pinnata	*Terminalia catappa*
Casuarina equisetifolia	*Lagerstroemia speciosa*
Araucaria heterophylla	*Chrysalidocarpus lutescens*
Livistonia chinensis	*Ficus microcarpa*
Cupressus funebris	*Cassia siamea*
Melaleuca leucadendron	*Ficus religiosa*
Ravenea rivularis	*Cinnamomum camphora*

In the context that this park provides a number of facilities, such as for sports, seating children's play, tai chi, waterfront promenade, and tree planting as a buffer zone, and despite the fact that the infrastructure is a dominant feature the landscape value is **high**.

The existing Quarry Bay Park is proposed to be extended further to the west. Quarry Bay Park Phase II will provide additional recreational facilities within the areas contained by the Eastern Harbour Tunnel Crossing Tunnel entrance (refer to Figure 6.1). In the context that this will be providing relief to the surrounding harsh environment and will be integral with the existing Quarry Bay Park the landscape value is **high**.

- *Braemar Hill*

  There are two relatively small areas of the lower slopes of Braemar Hill included within the study area. One is located towards the west of the study are while the other is more southern. The larger area contains the naturally vegetated hillside, of which the lower parts have been cut to form new shotcrete slopes to allow for King's Road. It also contains a low rise development. The smaller area has been much cleared to allow for a local service reservoir. The landscape quality of these is **medium**.

6.7 Scheme Proposals

The scheme proposals can be summarised as follows:

- an additional elevated two lane carriageway from west of Man Hong Street to the MTR Quarry Bay Ventilation Building. It will be located adjacent to, and north of, the existing road. It will be at the level as the existing and supported on columns over Victoria Harbour,
- a new elevated carriageway arising adjacent to the Eastern Harbour Crossing Entrance to the Taikoo Shing interchange. It will be located south of the existing study road,
- realignment of west bound access on slip road from Taikoo Wan Road to the study road to the south of the existing. It will be elevated similar to the existing road,
- realignment of the westbound off slip road slightly south of the existing road,
- widening of the eastbound carriageway northwards as it runs past the north east comer of Taikoo Shing, and;
- realignment of westbound carriageway and on-ramp from Hong On Street.

6.8 Landscape Impact Assessment (Refer to Figures 6.5 to 6.8)

For ease of reference within this study the Eastern Island Corridor Improvements will be considered as three sections, namely:

- Section A — Eastbound flyover and realignment of Hoi Yu Street.
- Section B — Westbound flyover / carriageway west of Taikoo Shing interchange.
- Section C — Westbound flyover and both carriageways from Tai Koo Shing interchange to Tai Cheong Street.

The impact assessment will be considered within each of these sections.

The scheme proposes a number of improvements to the Island Eastern Corridor, which result in the following landscape impacts:

Section A

The scheme proposals for this section include:

- the additional elevated carriageway, north of the existing from Man Hong Street to the MTR Quarry Bay Ventilation Building,
- the slight realignment of Hoi Yu Street to the north,
- the west end of the new elevated westbound carriageway, south of the existing road.

The additional elevated carriageway will extend the existing transport corridor over the water of Victoria Harbour, together with a section over Hoi Yu Street as it rejoins the main road. In the context that the new and will be an extension of the existing transport corridor, which is already a dominating feature, and that the local landscape character is harbour front and open stage, the landscape impact is only **slight adverse**.

The slight realignment of Hoi Yu Street to the north will require the loss of concrete paramount, metal crash barrier and rough vegetation, together with some sections of wire fence. In the context that much of this area is derelict, open storage, or poor vegetation and in of low landscape value the landscape impact is **insignificant**.

The construction of the additional elevated westbound carriageway will extend the existing infrastructure to the south of the existing road over a truck parking and storage area. It will not cause any intrusion to the local landscape character. However at this point the road is separated from the local area by a 2m embankment and buffer planting of amenity trees and scrub vegetation. Approximately 48 trees will be lost. These trees are semi-mature *Acacia auriculiformis* in fair condition. Their loss will result in a removal of the only landscape buffer zone adjacent to the road. The landscape impact is **significant adverse**.

In the context that Quarry Bay Park Phase II will be completed prior to the IEC Improvements, the proposed elevated carriageway will result in the loss of the roadside buffer tree planting along the northern edge of Phase II. The carriageway and noise barrier will be a prominent elevated landscape feature in the north east of the park. This together with the reduction of the available landscape buffer zone will cause **significant adverse** landscape impact.

Section B

The scheme proposals for this section include:

- continuation of the additional elevated carriageway, which drops to run at grade, then as a short Tunnel under the interchange before rising and continuing at grade rejoining the main existing road,
- realignment of the westbound on slip access from Taikoo Wan Road south of the eastbound slip access as an elevated carriageway, and;
- realignment of the westbound off slip access to Tai Wan Road south.

The proposed road and realignments are closely associated and their impacts are considered together.

The additional carriageway will be an extension to the existing road within the vicinity of the Eastern Harbour Crossing access road and as such in the context of the nature of the area, it would only cause a low level of intrusion. However it will require the loss of a number amenity trees. They are generally of fair condition and the species include *Bombax malabricum, Araucaria sp., Acacia auriculiformis, Roystonia regia* and *Cassia surratensis*. This is a substantial loss of the buffer planting with a predominantly harsh local landscape environment resulting in a **significant** adverse landscape impact.

The proposals will extend the transport corridor south into Quarry Bay Park. They will be severely detrimental to the northern edge of the park as impose on both the path system and the landscape buffer planting along this boundary. Currently, sections of this planting, particularly adjacent to the tennis courts, is dense tree and shrub, vegetation and acts as an effective buffer. The loss of tree planting will result in much of the park being exposed to the road, particularly between the road and the tennis courts, basket ball courts and open areas and children play area to the east. Additionally tree planting will be lost adjacent to the service area and interchange. Approximately 300 nos. trees will be lost comprising a mix of ornamental species.

In general the trees are of a condition, although a substantial number of the them are poor suffering due to the harsh condition and, in some cases, severe pruning.

The proposals will also disrupt the path system by closing off the access that runs between the elevated walkway and the ball courts. This will be relocated via an extension of the walkway towards the park entrance adjacent to Cityplaza 3.

The overall landscape impact on Quarry Bay Park is **significant adverse**. This impact is caused by the loss of buffer zone along the northern edge of the park, encroachment into the park by the new carriageway, loss of trees and disruption to the path system.

Section C

The scheme proposals for this section include:

- realignment of the eastbound carriageway to the north,
- a new westbound carriageway, partially elevated constructed to the west of the existing road,
- a new westbound on ramp from Hing On Street constructed west of the existing road, and;
- slight realignment of the existing westbound carriageway to the west.

These improvements will cause a number of impacts, primarily to Quarry Bay Park. The realignment of the eastbound carriageway northwards will encroach into the park itself requiring the loss of a substantial amount of the buffer zone to the road. This buffer zone comprises two or three rows of trees. The roadside trees are primarily semi-mature *Acacia auriculiformis* while on the park side of these are rows of young *Hibiscus* and *Casuarina*.

The proposals require the loss of the larger Acacia trees resulting in the buffer zone comprising only the young trees and essentially being lost. This will cause severe intrusion of the road within the landscape character of the park resulting in **significant adverse** landscape impact to this part of the park.

6.9 Existing Visual Context (Refer to Figure 6.9)

To the north, north-west and north-east the visual envelope extends over Kowloon Bay to eastern Kowloon, Kai Tak Airport, and Lei Yue Mun. It is contained on this side by Hung Hom, To Kwa Wan, Ma Tau Kok, Kowloon Bay, Kwun Tong, Lam Tin and Devil's Peak. To the east, some oblique views are experienced from Lei Yue Mun Gap and then across the channel to Aldrich bay Typhoon Shelter. To the south the envelope is contained by the high rise developments of Sai Wan Ho, Taikoo Shing, Quarry Bay and North Point. To the west it extends across Victoria Harbour to Hung Hom.

6.10 Existing Visually Sensitive Receivers (Refer to Figures 6.10 to 6.10b)

The views currently experienced by the existing VSRs can be considered as follows:

Section A

° *Primary VSRs* (VSR nos 1-23)

The Primary High Rise VSR in close proximity and with open views over the site include:

North Point Estate (part)	Eastern Harbour Centre	Tor Po Building
Ka Wah Centre	The HK & China Gas Co.	Dragon View House
Kodak Centre	Lai King Mansion	Riviera Mansion
Fire Station	Grandview Court	Canossa College
Police Station	Showboat Mansion	Canossa School
Wing Wah Industrial Building	King's View Court	Chinachem Exchange Square
Somerset House	DCH Motor	
SCMP	Oceanic Building	Tai Koo Shing (part)

North facing upper level apartments have open views over Victoria Harbour towards east Kowloon. At the lower levels views are dominated by elevated study road itself which partially or fully screens the views over the Harbour. The road is a dominating element within these views. The views of the eastern part of this section are over open strong of pipes and truck parking in the foreground. Beyond these is the study road and then Victoria Harbour. Roadside tree planting along the westbound carriageway screens the road from the lower levels and partially screens it from the upper levels.

The visual quality of these views varies. Those from the upper levels with views across Victoria Harbour are of high visual quality. Those at lower levels are dominated by the study road or open urban areas and are of **low** visual quality.

° *Secondary VSRs*

Views towards the site form this group of VSRs are partially screened by intermediate buildings and are therefore, less sensitive to the proposals. This group includes:

Views are primarily dominated by the high rise buildings of the intermediate urban development. Between the buildings views contain the study road with Victoria Harbour in the background. Views towards the east of the section have additional screening of the study rod afforded by roadside tree planting.

The visual quality of these views is **low**.

° *Pedestrians (including users of adjacent recreational facilities)*

Pedestrian views containing the study road are generally confined to short sections at the end of roads such as Healthy Street East. These views are primarily urban being dominated by the local buildings and roads. The Island Eastern Corridor is a major element within these views. Users of recreational facilities, including seating areas and ball courts, adjacent to the study road are dominated by the elevated road itself together with the built environment.

The visual quality of these views is **low**.

° *Vehicular Passenger VSRs*

Views from vehicular passengers primarily arise from those on the Island Eastern Corridor itself. These view are dominated by the road and associated structures with the high-rise developments to the south. There is also occasional road side tree planting. VSRs within the build up areas are generally screened from the site.

The visual quality of these views in low.

° *Victoria Harbour Boat Traffic*

Views towards this section of the site from the Victoria Harbour Boat Traffic are dominated by the waterfront comprising the elevated road itself and a number of open derelict or open storage areas. The generally high rise residential and commercial developments are in the background and restrict the views to close to the waterfront.

The visual quality of these view is **low**.

<u>Section B</u>

° *Primary VSRs* (VSR nos 9 to 28)

Views of VSRs within this group arise from
Lai King Mansion
Showboat Mansion
King's View Court
Oceanic Building
Tor Po Building
Dragon View House
Riviera Mansion
Canossa College
China Chem Exchange Square
SCMP
Somerset House
DCH Motor
Taikoo Shing (part)
City Plaza 3 and 4

Those views to the west of this section are dominated by the Eastern Harbour Tunnel Crossing Entrance and the study road, with Victoria Harbour and Kowloon in the background. At the lower levels, however, much of the infrastructure is screened by roadside and amenity planting. To the east of this section the views are over recreational sport facilities in Quarry Bay Park. Beyond this is the study road, including the Taikoo Shing Wan interchange, and then Victoria Harbour. The elevated nature of many sections of the interchange and study road make it a major element within the views from the mid-levels. The lower level views benefit from the Park planting, particularly the dense roadside planting on northern edge. The proposed Quarry Bay Park Phase II within the Tunnel entrance area would provide additional screening and visual relief when complete.

The visual quality of these view is **medium**.

° *Secondary VSR*

Views towards the site are partially screened by the intermediate high-rise buildings. This group includes:

Their views are dominated primarily by the intermediate high rise buildings. The study road is only partially visible between the tower blocks. Additional screening of the road is given by the roadside tree planting. The visual quality of these views is **low**.

° *Pedestrian VSRs*

The views arising from pedestrians are confined to short sections of the study road arising primarily from Tai Koo Wan Road and the passageways adjacent to Eastern Harbour Crossing Entrance. At these lower levels the road is particularly screened by the Park facilities and the boundary tree planting. The Taikoo Wan Road interchange, being elevated, is a major feature within these views. The visual quality of these views is **medium**.

° *Quarry Bay Park VSRs*

Views towards the site from the western part of the park comprise football, tennis and basketball pitches in a modern designed park with a good quality of detail. The dense tree and shrub planting along the roadside boundary provides screening to much of the road apart from the Taikoo Wan interchange. The views are enclosed and do not go beyond the road. In the eastern part of park views from south of the road are not so well screened by the park boundary planting as it comprises only rows of young trees which provide some screening although the road is a dominant feature, particularly the interchange. Views from the northern part of the park to the site have similar views but also contain the high rise developments in the background. In the context that these views provide relief to the urban development, their waterfront context and their degree of sensitivity to change the visual quality of these views is **high**.

- *Victoria Harbour Boat Traffic*

Views from Victoria Harbour towards the site comprise partly the waterfront section of Quarry Bay Park and the open storage areas further to the west. The elevated sections of the road and interchange are dominate features within these views with the high rise development areas in the background. The visual quality is **low**.

Section C

- *Primary VSRs* (VSR nos 27 to 31)

Included within this group are:

Tai Koo Shing (part)
Tsiu Wo Terrace
Lei King Wan

In general the study road bisects the VSR group resulting in views that, for most of the VSRs are dominated by the side study road in the foreground and restricted in the background by the high rise development on the opposite side. View from the lower levels are partially screened by a mix of dense tree planting and buildings. The views at the north of this section are more open allowing views across Quarry Bay Park, Victoria Harbour and over to Kowloon. The overall visual quality of these group is **medium**.

- *Secondary VSRs*

These views are partially screened by the intermediate buildings and arise from:

They are primarily urban in nature and dominated by the adjacent high rise tower blocks. The study road is a minor constituent within those views and in some sections is additionally screened by the roadside planting. The visual quality is **low**.

- *Boat Traffic*

Views from Victoria Harbour towards this section of the site are limited. Much of this study section is obscured by high rise development. The only part visible is that though Quarry bay Park. Dense screen planting along the roadside provides screening to much of the road. Visual quality is medium.

- *Pedestrian VSRs*

Views towards the site from pedestrians arise primarily from below the study road itself. They are, therefore, enclosed by the road overhead and the adjacent buildings. There is substantial amenity planting adjacent to roads which alleviates the harsh nature of the visual environment. However the study road, structures and buildings are dominating elements resulting in a visual quality which is **low**.

- *Vehicular VSRs*

The views from Vehicular VSRs arise from both on and under the Island Eastern Corridor. They are dominated the road and supporting structures. Many of the views on the study road are confined by dense roadside tree planting, which those under the road are restricted by the adjacent high rise developments. The visual quality of these views is **low**.

° *Quarry Bay Park VSRs*

In general the views from Section 3 are similar to those experienced by VSRs in Section 2. However, in much of the road is screened by dense roadside tree planting, benefiting from it greatly in the context of the narrowness of the Park. The visual quality, due to it providing visual relief to the local harsh urban environment, is **high**.

6.11 Visual Impact Assessment (Refer to Figures 6.11 to 6.13)

The scheme proposals will cause a number of effects to the existing visual context experienced by the visually sensitive receivers. These are:

Section A

The proposals within this section will require an additional lane to the northern side of the existing road. This will cause only a small intrusion to views from the south. The most affected VSRs will be those at the middle to upper levels of the high rise buildings, who will experience a slight extension of the existing infrastructure. VSRs on the water are generally remote from the proposals and, in the context that the additional lane will be of the same level as the existing road it will not be too severe.

The Kowloon based VSRs are remote and will not experience intrusion caused by the new lane. Vehicular VSRs will have the same views as existing, except that the road will be a little more dominate.

The visual impact will be **slight adverse**.

The additional lane and 5m noise barrier to the south of the existing road will cause more severe intrusion overall. It is move clearly visible to all of the southern VSRs, particularly the Primary and Secondary VSRs. However in the context that the additional elevated lane will be an extension of the existing Island Eastern Corridor it will not dominate the existing views. The lane will however cause intrusion to he Vehicular VSRs on it will enclose the views to the south, particularly as it will be elevated above the Corridor.

The visual impact caused by the additional lane to the north of the existing road is slight adverse as it does not affect the current views to any great extent. It will be a detrimental intrusion to views from Primary, Secondary and Vehicular VSRs. The visual impact is **moderate adverse**.

Section B

The additional lane and 5m noise barrier to the south of the existing road will cause intrusion to all views from the south. The visual effects of the proposals will be both detrimental and beneficial. The Primary VSRs will suffer visually due to the extension of the infrastructure into the Quarry Bay Park which currently provides visual relief from the dominance of the road. Additionally the proposals require the removal of the extensive dense screen planting in the eastern part of the park. This will result in the road being visually exposed and dominating all views towards the north. Quarry Bay Park VSRs will suffer similarly but move severely as they are door and move sensitive. The elevated lane will be visually exposed and delineate the northern boundary of the Park dominating views in that direction. Views from vehicles will suffer from the loss of the roadside planting resulting in open views across to the high-rise developments.

The widening of the westbound off slip road will not cause any great visual intrusion to existing views. However, the requirement for removal of the boundary planting along the whole of this northern edge of the park will leave the road open and exposed in views from the south, particularly Quarry Bay VSRs and Primary VSRs. Vehicular VSRs will also suffer with the loss of the roadside planting leaning views open across to the high-rise residential developments. The visual impacts of the proposals within this section of the park will be **significant adverse**.

The scheme also proposes a tall noise barrier along this northern boundary along the roadside. This will be a major visual element obscuring all views to the north for Quarry Bay VSRs. It will from a visual barrier enclosing the park to the north, the south side already being enclosed by the high rise developments. However, this can also be considered as beneficial as it screens the road surface and the road, thus changing the visual character of the Park.

Overall a number of VSRs will be subject to **significant adverse** visual impact, namely those in Quarry Bay Park. The loss of planting will result in **moderate adverse** impacts for the Primary VSRs and the Harbour VSRs.

Section C

The final section of this scheme proposes to realign the main part of the study road together with building an additional elevated carriageway west of the westbound carriageway. This will extend the existing transport corridor further west into the narrow part of Quarry Bay Park. As such it requires removal of extensive screen tree planting along the eastern boundary of the Park, together with an amount of the planting between the two main carriageways. This will be a severe intrusion to both the Primary and Quarry Bay Park VSRs by introducing a major structural hard element without the benefit of screening within their views. The addition of 5m tall noise barriers along the western roadside will increase the intrusion caused by further introducing dominant visual elements along the eastern side of the Park. These will result in **significant adverse** visual impacts to Quarry Bay Park and the Primary VSRs.

The loss of the tree planting along the park boundary will also detrimentally affect the views from the east of the Park, including Vehicular VSRs and the Primary VSRs from Sai Wan Ho. Their views will lose the relief afforded by this planting resulting in views being dominated by the road and high rise blocks of Tai Koo Shing. However, in the context that these views are partially screened by planting remaining between the carriageways the visual impact is **moderate adverse**.

Pedestrians outside of the Park have views that are enclosed and dominated by the roads at grade and overhead. The proposals will remove the visual relief of the trees, which soften the harsh environment. However, in the context that these views are generally screened by built form and structures the visual impact is **moderate adverse**.

6.12 *Visual Impacts Mitigation Measures (Refer to Figures 6.14 to 6.15 and Viewpoints 1 to 5 following Figure 6.15)*

The Landscape and Visual Impact Assessment has identified those issues of a detrimental and beneficial nature and their magnitude of the proposals on the existing landscape and visual amenity of the and study area. A number of measures have been described to alleviate the detrimental effects and enhance the beneficial areas. These are:

- consideration and design of the structure and hard materials finishes to the additional lanes north of the eastbound carriageway. This will ensure that the minor visual impacts that are caused by this proposal are maintained at a minimum,
- consideration and design of the elevated section of the additional lane south of the westbound carriageway. Reprovisioning of roadside tree and shrub planting, where possible, to replace any lost landscape buffer zone, including Quarry Bay Park Phase II, and provide visual screening from the south.

Additional measure required for Section B and C

Section B

- consideration of the design and finishes of the elevated road section south of the westbound carriageway,
- consideration of the design of the noise barriers to integrate them within the local landscape and visual context, while enhancing the benefit they provide of screening the traffic,
- reprovisioning of the path system within the Park, south of the study road, to ensure adequate access is maintained,
- consideration of the design of the new extension to the elevated walkway at the Taikoo Shing Interchange,
- consideration of the design of any semi-enclosure noise mitigation with the possible use of transparent materials,
- consideration of transplanting affected trees and shrubs, and;
- reprovisioning of landscape buffer and visual screen planting along the westbound carriageway within the Park to soften the visual and landscape effects caused by the tall noise barriers and help to integrate them into the Park.

Section C

- reprovisioning of the screen and buffer tree and shrub planting removed during realignment of the eastbound carriageway to replace the landscape buffer zone and visual screen,
- reprovisioning of the screen and buffer tree and shrub planting west of the westbound carriageway will provide a buffer zone and visual screen to the road and noise barriers,
- consideration of the design of any road structures to integrate them noise with the local landscape and visual context,
- consideration of the design of the noise barriers to integrate them within the local environment, particularly the Park while enhancing the benefit they provide of screening the traffic,
- possible use of opaque, or mixed opaque / transparent, noise barriers at the lower level to create a landscape feature along the boundary of the park,
- possible use of transparent noise barriers at elevated road sections to avoid excessive enclosure,
- consideration of transplanting affected trees and shrubs,
- reprovisioning of the Park facilities that have been disturbed, namely; shade structures, seating areas, paths, tree / shrub planting and entrance feature, and;
- consideration of any additional requirements needed to ensure that the existing subway can still function fully.

7. ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS

7.1 General

An environmental monitoring and audit (EM&A) programme performs three functions. It ensures that noise from the construction of the project is kept within acceptable levels; it establishes procedures for checking the application and effectiveness of mitigation measures; and it provides the means by which compliance can be checked, exceedances documented, and corrective action recorded.

In view of the close proximity of the Improvement works to the identified sensitive receivers, an EM&A programme monitoring air, noise, water quality and waste disposal is considered necessary during the construction period.

Detailed monitoring schedules and audit requirements should be incorporated into the construction contract for the proposed Engineering Works on the IEC. The clauses containing these schedules and requirements should be formulated in consultation with EPD.

It is a further requirement of the EPD that the environmental monitoring programme should be subject to environmental audit. The aim is to determine whether satisfactory compliance with the legislative requirements have been met, and to ensure that no annoyance is caused to sensitive receivers or else the remedial action plan will be initiated, if required.

7.2 Air Quality

1-hour and 24-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The proposed air quality monitoring locations are shown in Figure 7-1.

7.3 Noise

The construction noise level should be measured in terms of the A-weighted equivalent continuous sound pressure level (Leq). The proposed noise monitoring locations are shown in Figure 7-1

7.4 Waste Management

The contractor is responsible for waste control within the construction site, removal of the waste materials produced from the site and to implement any mitigation measures to minimise waste or redress problems arising from the on-site waste.

7.5 Monitoring and Audit Manual

An Environmental Monitoring and Audit Manual detailing the monitoring schedules and requirements is included in a separate document. This will be the basis for carrying out relevant monitoring and auditing procedures during the construction period.

8. CONCLUSIONS

8.1 Introduction

This EIA study has focused on the potential short- and long-term environmental impacts of the proposed improvements to the IEC section between North Point Interchange and Sai Wan Ho on existing and future sensitive receivers and identification of measures to reduce these impacts to acceptable limits. The findings of the EIA are summarised in the following sections.

8.2 Construction Noise

Construction of the proposed infrastructure works is likely to produce high noise levels, exceeding 75 dB(A) Leq(30-min.s), at the existing NSRs along the IEC, if unmitigated. The potential impacts are amendable through the implementation of suitable noise control measures, including the use of silenced equipment, siting of equipment, use of noise mufflers and temporary noise barriers. It is anticipated that if mitigated using the above measures, the impacts from the construction works could meet the daytime construction noise criteria.

Percussive piling is also anticipated for the reprovisions of FSD pier and Kodak pier. Based upon the maximum exceedance of the Acceptable Noise Level (ANL), the permitted hours of operation on any day not being a general holiday are 0800 to 0930, 1200 to 1400, and 1630 to 1800 hours.

8.3 Construction Dust

Construction of the Project will give rise to considerable amount of dust from the roadworks, and the haulage of construction materials on unpaved surfaces. Model calculations have shown that dust concentrations at the nearby existing receivers are expected to exceed Dust Guideline and the Air Quality Objectives in respect of TSP. Dust suppression measures in the form of good housekeeping, frequent watering of the dust areas and covering of materials on truck with tarpaulin sheeting are necessary to reduce the impacts. It is anticipated that the Dust Guideline and Air Quality Objectives can be achieved by the implementation of these dust suppression measures.

8.4 Water Quality

During the construction phase, possible impacts on marine water quality would arise from site runoff, sewage effluent arising from the on-site construction workforce and marine dredging at the sea wall rubble mount near Hoi Yu Street. These will lead to an increase in suspended solids and worsen the marine water pollution of the Victoria Harbour. However, in view of the marine dredging to be undertaken inside bored piles and the implementation of appropriate mitigation measures such as the use of oil/grit separators and/or sediment basins/traps as detailed *in ProPECC PN1/94 - Construction Site Drainage*, the impacts will not be adverse.

8.5 Construction Waste

During construction activities, three types of waste are generated and they are construction waste, chemical waste and general refuse.

- 110m of 5m Inverted L-shaped barrier adjoining 560m of 5m high plain barrier on the westbound lane between the Hoi Yu Street exit and the Taikoo Shing Interchange; and
- 540m of 5m high Inverted L-Shaped barrier on the westbound lane between the Taikoo Shing Interchange and the Kornhill flyover.

The noise impacts at many of the NSRs along the IEC arise mainly from traffic on the existing IEC and other local roads, and therefore, even taking into account the proposed noise mitigation measures on the new roads, noise levels are unlikely to meet the HKPSG criteria. Hence, consideration should be given to indirect mitigation at the affected NSRs. However, the assessment for eligibility of sound insulation shows that only the Fire Services Department Staff Quarters building (FSDSQ) (a total of 9 dwelling units) is eligible for consideration for indirect measures. As for all the other NSRs, since the new roads do not contribute more than 1.0 dB(A) to the overall noise levels at these receivers, they are not eligible for consideration of indirect technical remedies.

The total number of dwellings where the predicted noise levels exceed 70 dB(A) is estimated to be 4920, and the total number of classrooms where the noise levels exceed 65 dB(A) is estimated to be 60, if no mitigation measures are provided. While the HKPSG noise criteria cannot be met, the proposed direct technical remedies on the new roads serve to some extent to minimise the noise impact on the NSRs and to reduce the total number of affected dwellings by about 100. In addition to the 100 dwellings being in full compliance with the stipulated noise criteria of 70 dB(A), a total of about 2000 dwellings are estimated to benefit from the proposed noise barriers by 1-13 dB(A) noise reduction.

8.8 Vehicle Emissions

Model calculations using the worst traffic scenario in terms of vehicle emissions have shown that there would be marginal exceedance of the hourly criterion of 300 $\mu g/m^3$ along the outer perimeter of Quarry Bay Park due to its close proximity to the road source. The calculations have taken into account emissions from the vent shaft of Eastern Harbour Crossing, the tunnel portal and vehicles on the IEC. A setback of 15m from the road edge of the IEC is required for active recreational uses along the road alignment whilst larger setback distance is required in the area between the Eastern Harbour Crossing Tunnel portal and Taikoo Shing Interchange. The predicted air pollutant concentrations at discrete air-sensitive receivers at first-floor receiver level would comply with the hourly criterion of NO_2.

One of the worst affected areas is the tennis courts in Quarry Bay Park Sports Ground located between the Eastern Harbour Crossing Tunnel portal and Taikoo Shing Interchange. Various alternatives such as converting the tennis courts into an indoor squash court, relocating, eliminating or elevating the tennis courts have been explored. But none of these alternatives is considered feasible. With the provision of a cover to the 130 long noise barrier forming a semi-enclosure in front of the Quarry Bay Park Sports Ground, the air quality at all active recreational uses, including tennis courts, football field and basketball court, is predicted to comply with the AQO as shown in Figure 5-6. Within the predicted 300 $\mu g/m^3$ contour lines, some sitting-out areas of the Quarry Bay Park are located at some 10-15m from the IEC. According to the HKPSG, sitting-out areas are classified as passive recreational uses for which a setback of 3-20m from a trunk road is tolerated in terms of air quality.

9. RECOMMENDATIONS

9.1 Construction Noise

- Incorporation of Environmental Pollution and Control Conditions in Contract Documentation for construction noise control;
- Implementation of EM&A programme to control construction noise.

9.2 Construction Dust

- Incorporation of Environmental Pollution and Control Conditions in Contract Documentation for construction dust control;
- Implementation of EM&A programme to control construction dust.

9.3 Water Quality

- Implementation of the mitigation measures such as the use of oil/grit separators and/or sediments basins/traps as detailed in ProPECC PN1/94 - Construction Site Drainage to minimize water quality impacts during construction.
- Installation of silt screen near the water pumping station.
- Disposing and treating all effluent generated by the on-site workforce and ensure all sewage discharges from the study area meet the TM standards.

9.4 Construction Waste

- Separation of waste into various categories for proper disposal;
- Minimisation of on-site impacts through good site practice.

9.5 Ecological Assessment

- Revegetation of plants which will comprise planting 475 trees in the roadside amenity areas and 160 additional trees within Quarry Bay Park in order to compensate for the loss of plants due to the proposed works.

9.6 Road Traffic Noise

- Installation of the following barriers :
  (a) 110m of 5m inverted L-shaped noise barrier adjoining 560m of 5m high plain barrier on the westbound lane between the Hoi Yu Street exit and the Taikoo Shing Interchange; and
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- Provision of indirect technical remedies to the dwelling units at the Fire Services Department Staff Quarter.

8. CONCLUSIONS

8.1 Introduction

This EIA study has focused on the potential short- and long-term environmental impacts of the proposed improvements to the IEC section between North Point Interchange and Sai Wan Ho on existing and future sensitive receivers and identification of measures to reduce these impacts to acceptable limits. The findings of the EIA are summarised in the following sections.

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8.5 Construction Waste

During construction activities, three types of waste are generated and they are construction waste, chemical waste and general refuse.

Construction Waste arises from a number of activities carried out by the contractor during construction and maintenance activities, including wood from formwork, equipment and vehicle maintenance parts, materials and equipment wrappings, and substandard or unused concrete.

Chemical waste includes any substance being scrap material, or unwanted substances specified under Schedule 1 of the Waste Disposal Ordinance. It may pose serious environmental and health and safety hazards if not stored and disposed of in an appropriate manner.

General refuse may include food wastes and packaging, waste paper, etc and will ultimately be disposed of at a landfill. The storage of general refuse has the potential to give rise to adverse environmental impacts including odour, presence of pests and vermin and litter with consequent visual impact.

As long as sorting and disposal procedures are properly followed, construction waste, chemical waste and general refuse to be generated for this Project will not constitute and adverse impact.

8.6 Ecological Assessment

Terrestrial Ecology

The main ecological impact of the proposed road works will be the loss of plants. 30 trees in Quarry Bay Park and 291 trees in the roadside amenity areas need to be felled but none of them is mature tree. Results of the preliminary ecological survey have shown that all the plant species recorded in the study area are common and widespread urban plantation. The recommended compensatory tree planting proposal will comprise 475 trees on the roadside amenity areas and 160 additional trees in Quarry Bay Park. Furthermore, no signs of large mammals were found during the survey period. Few signs of birds were found in the study area and all of them fall into the category of common urban bird species. Therefore, no adverse ecological impacts are anticipated in this Project.

Marine Ecology

Victoria Harbour has been heavily polluted, and the sea bed is not expected to support high diversity of both benthic fauna and epifauna. Furthermore, the shore of the Victoria Harbour has been covered by artificial seawall which cannot support high diversity of shore fauna owing to low local microhabitat variation. Therefore, the proposed marin dredging inside bored piles will not create an adverse impact on the marine ecology near the shore.

8.7 Road Traffic Noise

Road traffic noise is a key environmental issue during the operation phase. It has been predicted that the majority of the noise sensitive facades along IEC will be exposed to noise levels exceeding the HKPSG noise criteria based on the highest traffic flows within 15 years after opening of the roads to traffic. Due to engineering constraints, traffic sightline and height restriction problems, segments of barriers and partial enclosures have been examined for effectiveness. Two of the examined barriers are considered effective and thus recommended for implementation as follows :

- 110m of 5m Inverted L-shaped barrier adjoining 560m of 5m high plain barrier on the westbound lane between the Hoi Yu Street exit and the Taikoo Shing Interchange; and
- 540m of 5m high Inverted L-Shaped barrier on the westbound lane between the Taikoo Shing Interchange and the Kornhill flyover.

The noise impacts at many of the NSRs along the IEC arise mainly from traffic on the existing IEC and other local roads, and therefore, even taking into account the proposed noise mitigation measures on the new roads, noise levels are unlikely to meet the HKPSG criteria. Hence, consideration should be given to indirect mitigation at the affected NSRs. However, the assessment for eligibility of sound insulation shows that only the Fire Services Department Staff Quarters building (FSDSQ) (a total of 9 dwelling units) is eligible for consideration for indirect measures. As for all the other NSRs, since the new roads do not contribute more than 1.0 dB(A) to the overall noise levels at these receivers, they are not eligible for consideration of indirect technical remedies.

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8.8 Vehicle Emissions

Model calculations using the worst traffic scenario in terms of vehicle emissions have shown that there would be marginal exceedance of the hourly criterion of 300 $\mu g/m^3$ along the outer perimeter of Quarry Bay Park due to its close proximity to the road source. The calculations have taken into account emissions from the vent shaft of Eastern Harbour Crossing, the tunnel portal and vehicles on the IEC. A setback of 15m from the road edge of the IEC is required for active recreational uses along the road alignment whilst larger setback distance is required in the area between the Eastern Harbour Crossing Tunnel portal and Taikoo Shing Interchange. The predicted air pollutant concentrations at discrete air-sensitive receivers at first-floor receiver level would comply with the hourly criterion of NO_2.

One of the worst affected areas is the tennis courts in Quarry Bay Park Sports Ground located between the Eastern Harbour Crossing Tunnel portal and Taikoo Shing Interchange. Various alternatives such as converting the tennis courts into an indoor squash court, relocating, eliminating or elevating the tennis courts have been explored. But none of these alternatives is considered feasible. With the provision of a cover to the 130 long noise barrier forming a semi-enclosure in front of the Quarry Bay Park Sports Ground, the air quality at all active recreational uses, including tennis courts, football field and basketball court, is predicted to comply with the AQO as shown in Figure 5-6. Within the predicted 300 $\mu g/m^3$ contour lines, some sitting-out areas of the Quarry Bay Park are located at some 10-15m from the IEC. According to the HKPSG, sitting-out areas are classified as passive recreational uses for which a setback of 3-20m from a trunk road is tolerated in terms of air quality.

As for the future Quarry Bay Park Phase II (QBP II) Development, a minimum buffer zone of 10m for active recreational uses should be reserved along the alignment of the IEC and near the Eastern Harbour Crossing Tunnel portal. The design of QBP II should be made such that no active recreation uses are planned within the 300 $\mu g/m^3$ contour.

8.9 Landscape and Visual Impacts

It is recognized that owing to existing site constraints the proposed road improvement roads will unavoidably require removal of the existing vegetation and encroachment onto part of the existing Quarry Bay Park, resulting in landscape and visual impacts to various degrees. Mitigation measures including careful consideration and design of the highway structures to blend in with the environment and minimize visual impacts, extensive planting not just to compensate for the loss of vegetation but also to additionally soften the impacts of the works should be considered.

8.10 Environmental Monitoring and Audit

In view of the close proximity of the Improvement works to the identified sensitive receivers, an Environmental Monitoring and Audit (EM&A) programme moniroting air, noise and waste disposal is considered necessary during the construction period.

An Environmental Monitoring and Audit Manual detailing the monitoring schedules and requirements is included in a separate document. This will be the basis for carrying out relevant monitoring and auditing procedures during the construction period.

9. RECOMMENDATIONS

9.1 Construction Noise

- Incorporation of Environmental Pollution and Control Conditions in Contract Documentation for construction noise control;
- Implementation of EM&A programme to control construction noise.

9.2 Construction Dust

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- Provision of indirect technical remedies to the dwelling units at the Fire Services Department Staff Quarter.

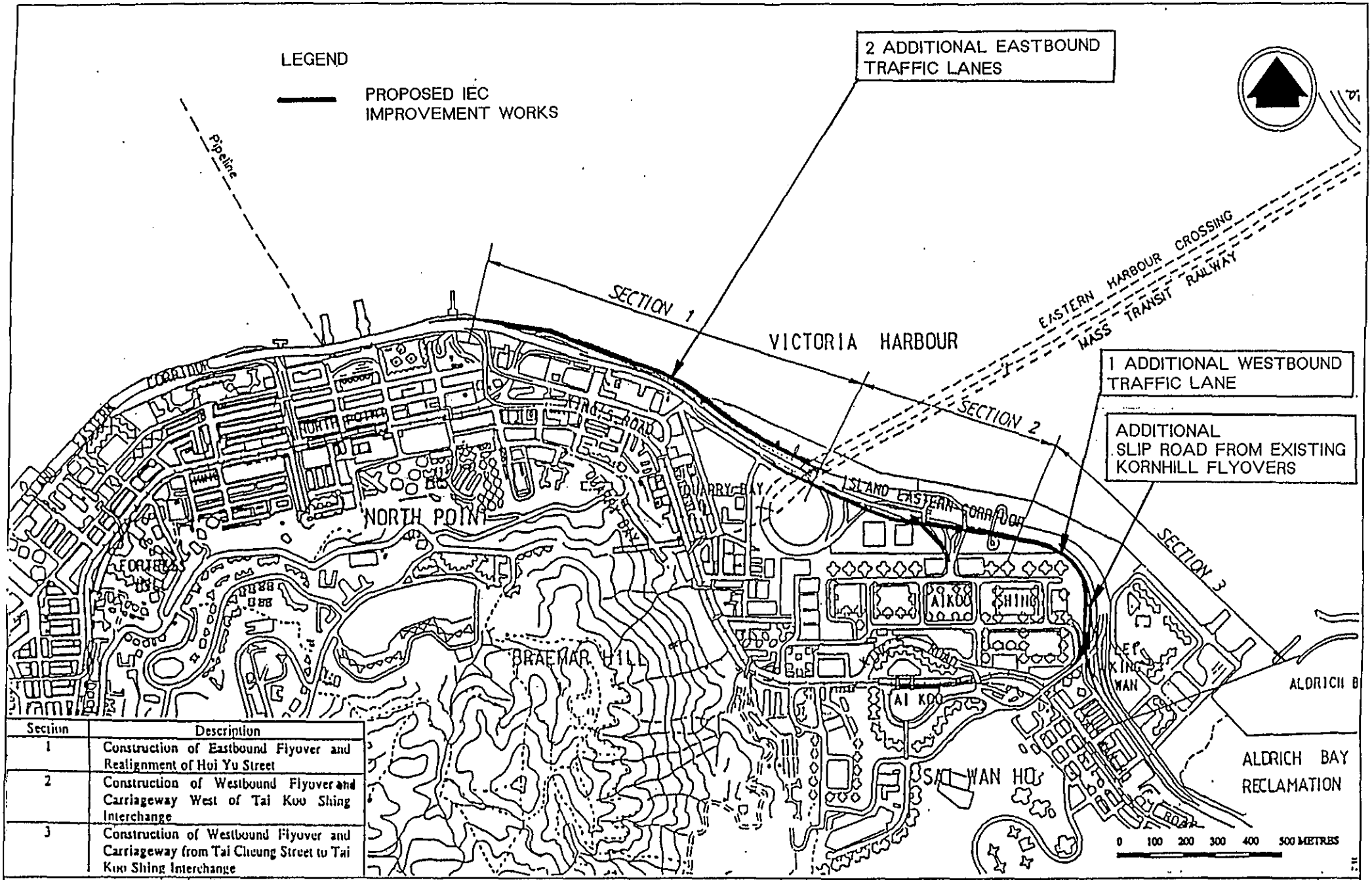
9.7 Vehicle Emissions

- Modification of the 5m plain barrier to form a semi-enclsoure along the 130m stretch of the proposed westbound additional carriageway fronting the Quarry Bay Park Sports Ground;
- Reserve a buffer zone of 10m along the alignment of the IEC at the future Quarry Bay Park Phase II Development.

9.8 Landscape and Visual Impacts

- Consideration of the design of the elevated road sections.
- Consideration of the design of the noise barriers to integrate them within the local landscape and visual context, while enhancing the benefit they provide of screening the traffic.
- Reprovisioning of the affected facilities and planting within Quarry Bay Park.
- Extensive planting as described in section 9.5 above to not just compensate for the loss of vegetation but also to provide additional softening effects to impacts of the proposed works.

Figures



Section	Description
1	Construction of Eastbound Flyover and Realignment of Hoi Yu Street
2	Construction of Westbound Flyover and Carriageway West of Tai Koo Shing Interchange
3	Construction of Westbound Flyover and Carriageway from Tai Cheung Street to Tai Koo Shing Interchange

AGREEMENT NO. CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PROPOSED SECTIONS OF IEC IMPROVEMENTS

FIGURE NO. 2-1

SCALE: AS SHOWN

DATE: JANUARY 98

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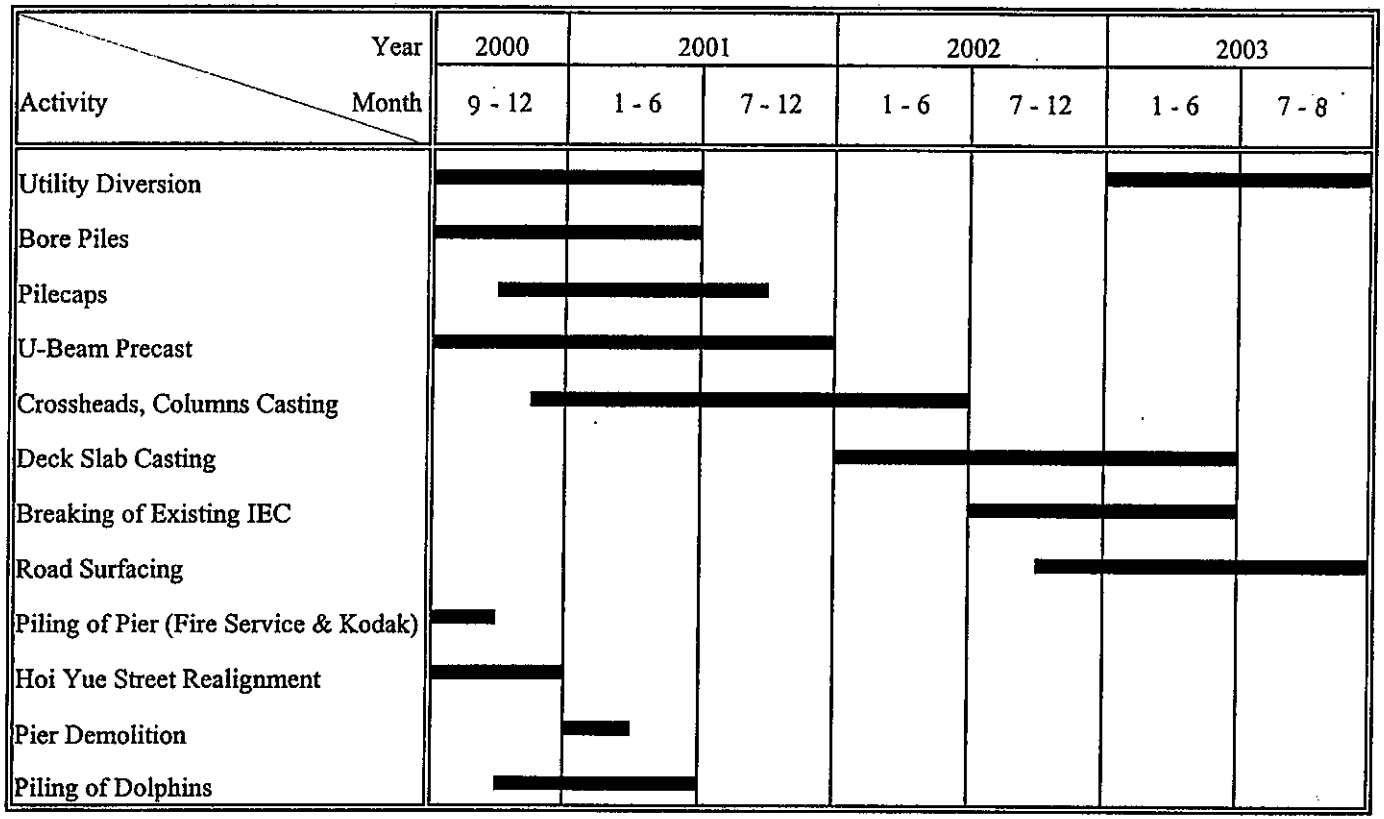

AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PRELIMINARY CONSTRUCTION PROGRAMME (SECTION 1)

FIGURE NO. 2-2

SCALE:

DATE: JANUARY 98

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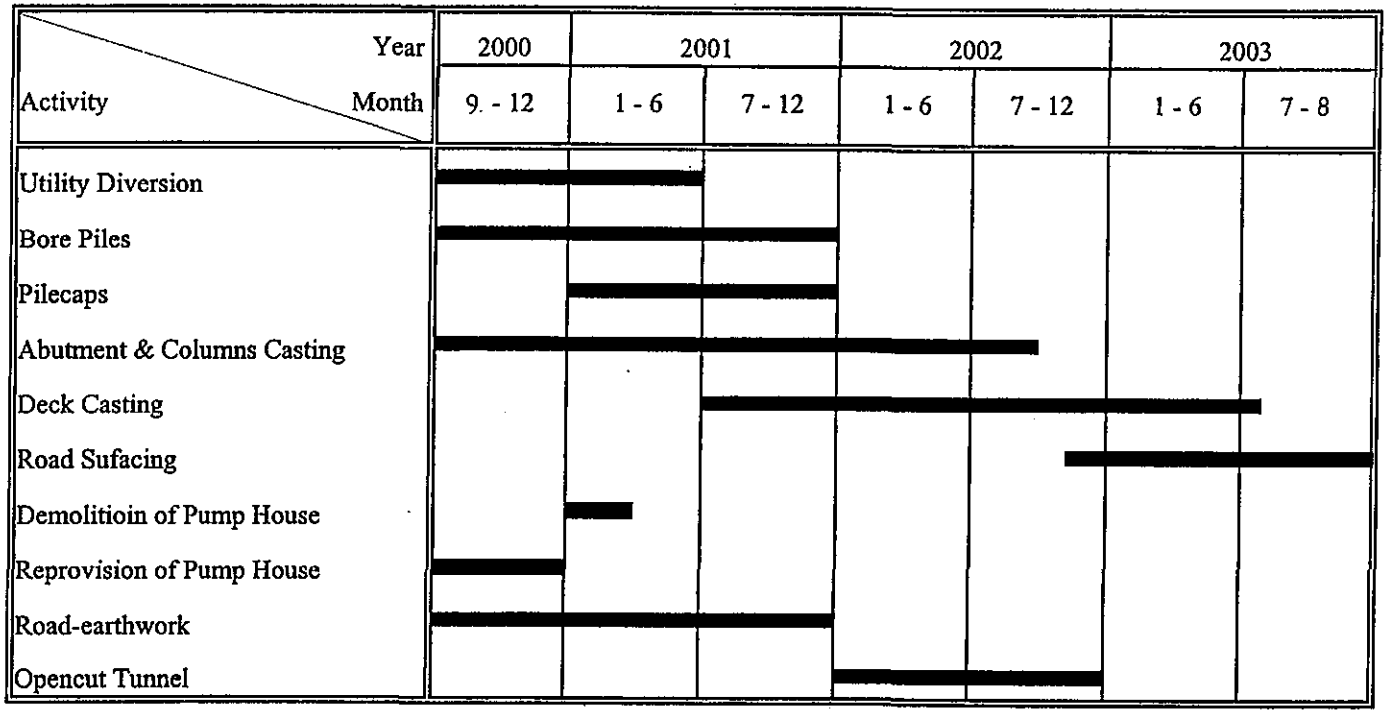

AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PRELIMINARY CONSTRUCTION PROGRAMME (SECTION 2)

FIGURE NO. 2-2

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DATE: JANUARY 98

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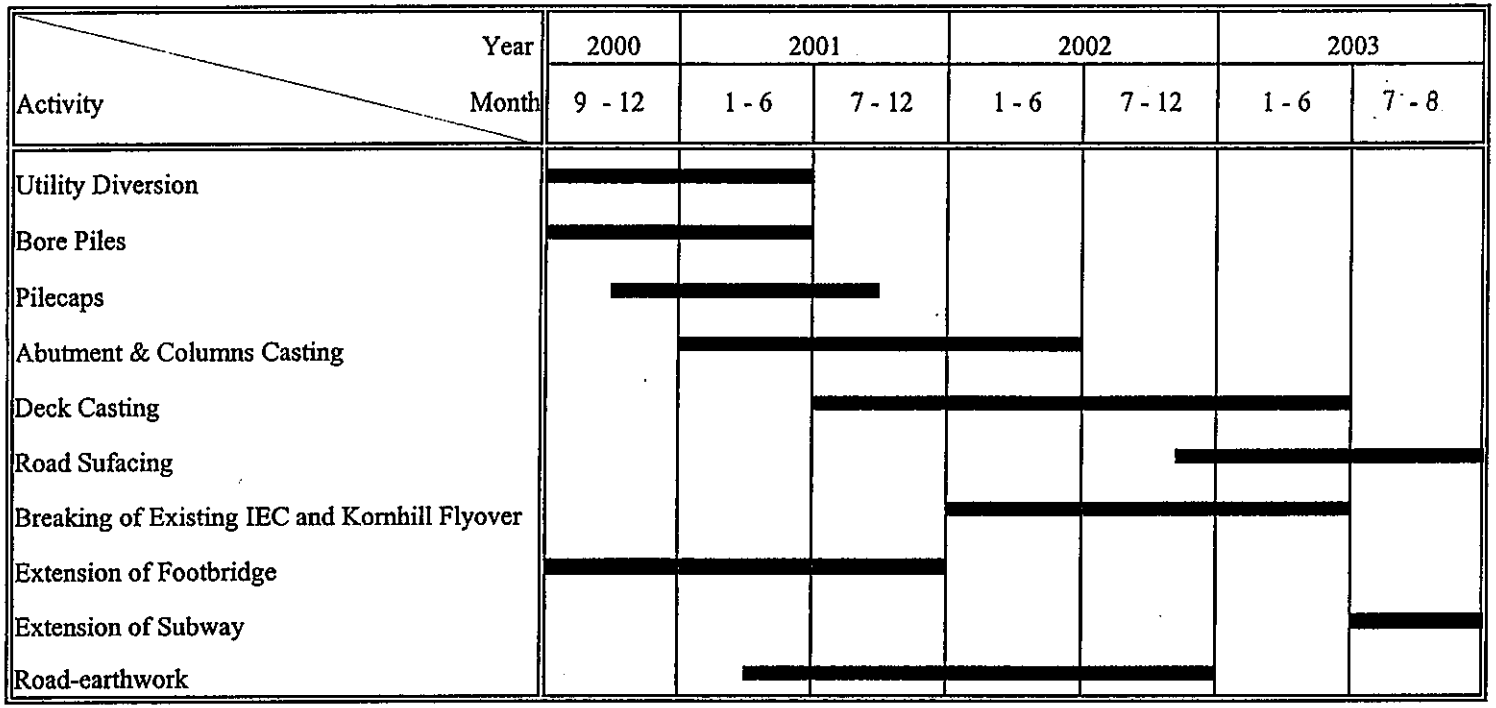

AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PRELIMINARY CONSTRUCTION PROGRAMME (SECTION 3)

FIGURE NO. 2-2

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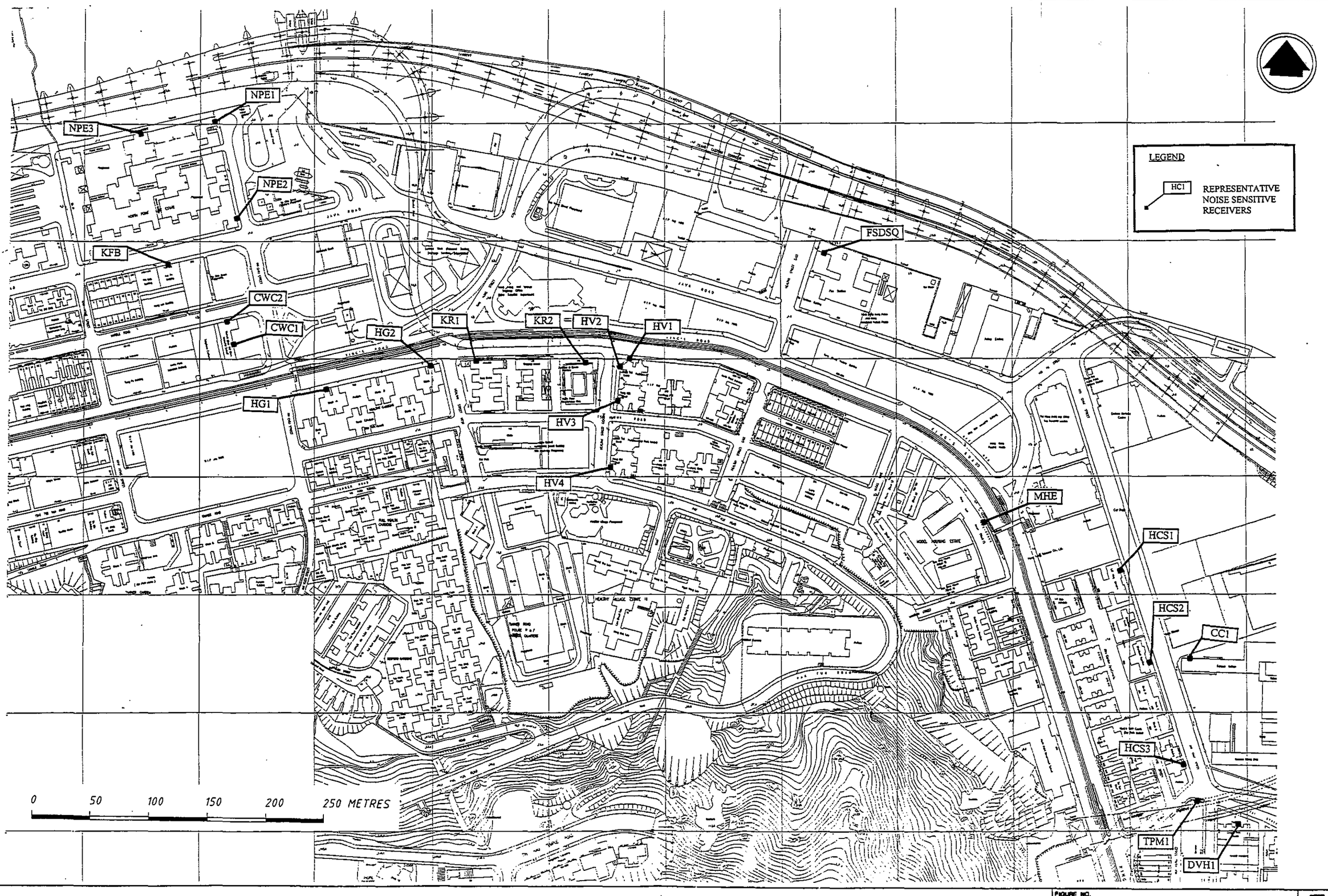

AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

LOCATIONS OF REPRESENTATIVE NOISE SENSITIVE RECEIVERS (SHEET 1 OF 3)

FIGURE NO. 3-1

SCALE: AS SHOWN

DATE: JANUARY 98

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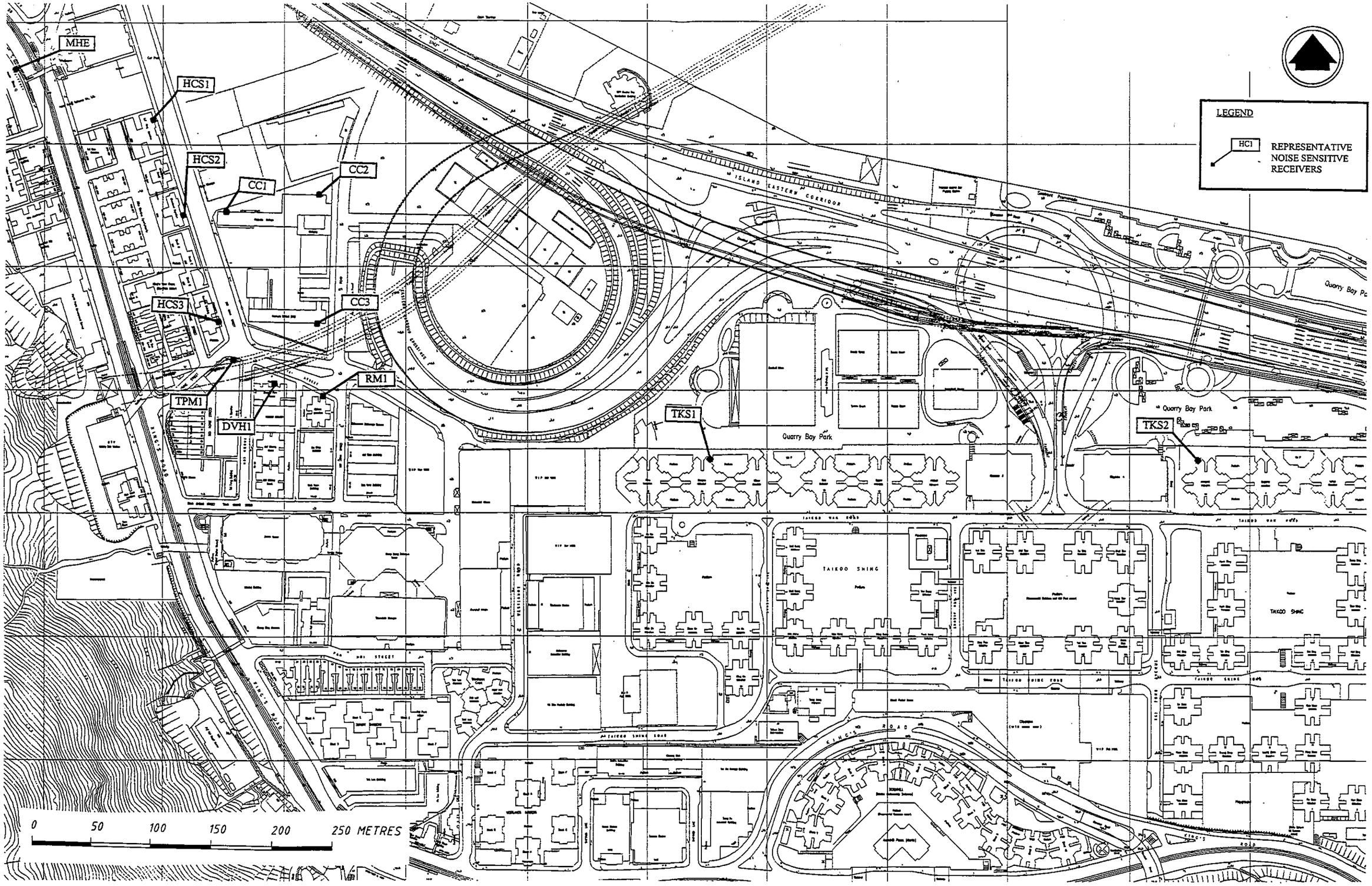

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LOCATIONS OF REPRESENTATIVE NOISE SENSITIVE RECEIVERS (SHEET 2 OF 3)

FIGURE NO.	
3-1	
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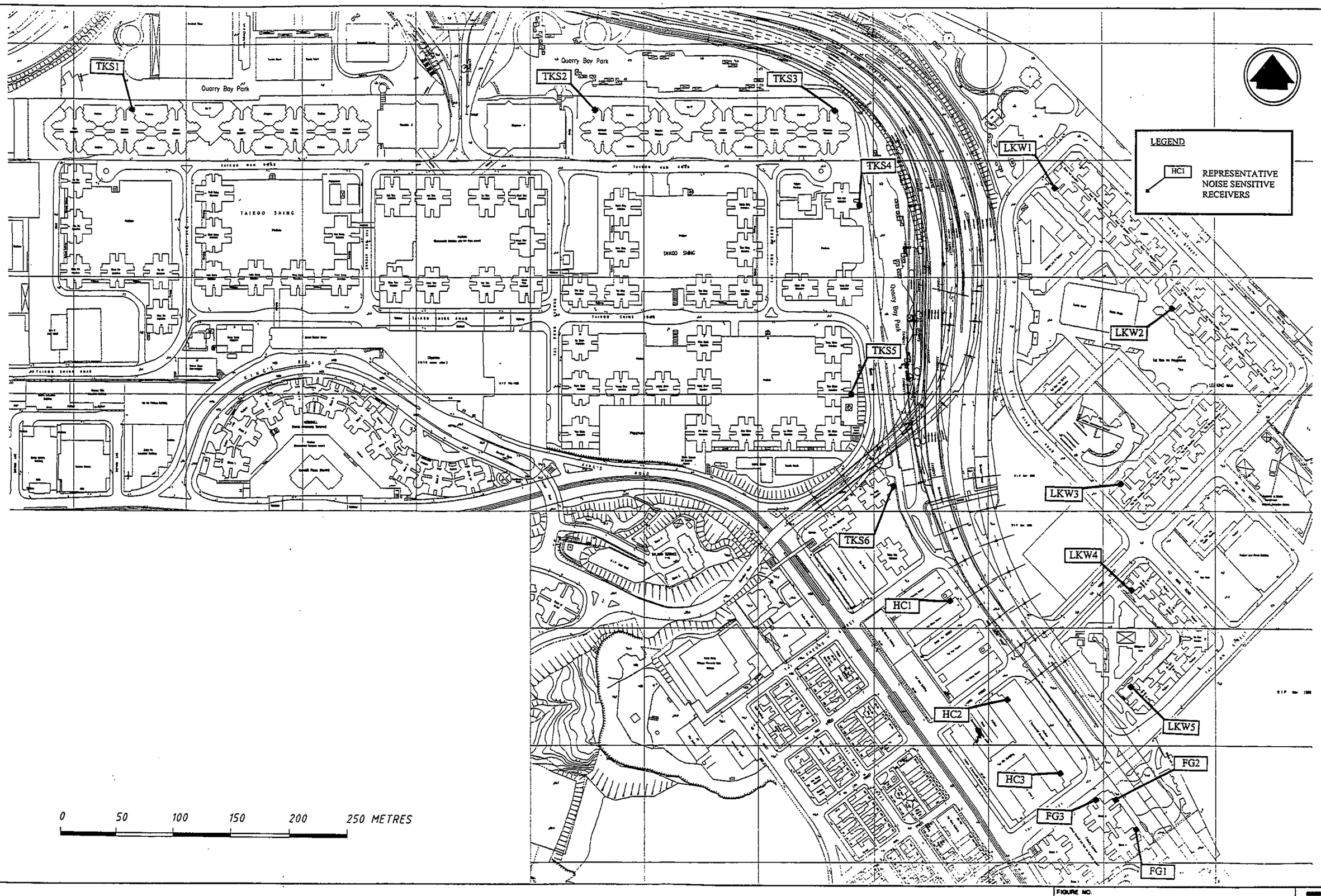

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LOCATIONS OF REPRESENTATIVE NOISE SENSITIVE RECEIVERS (SHEET 3 OF 3)

FIGURE NO.	
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SCALE: AS SHOWN	DATE: JANUARY 98

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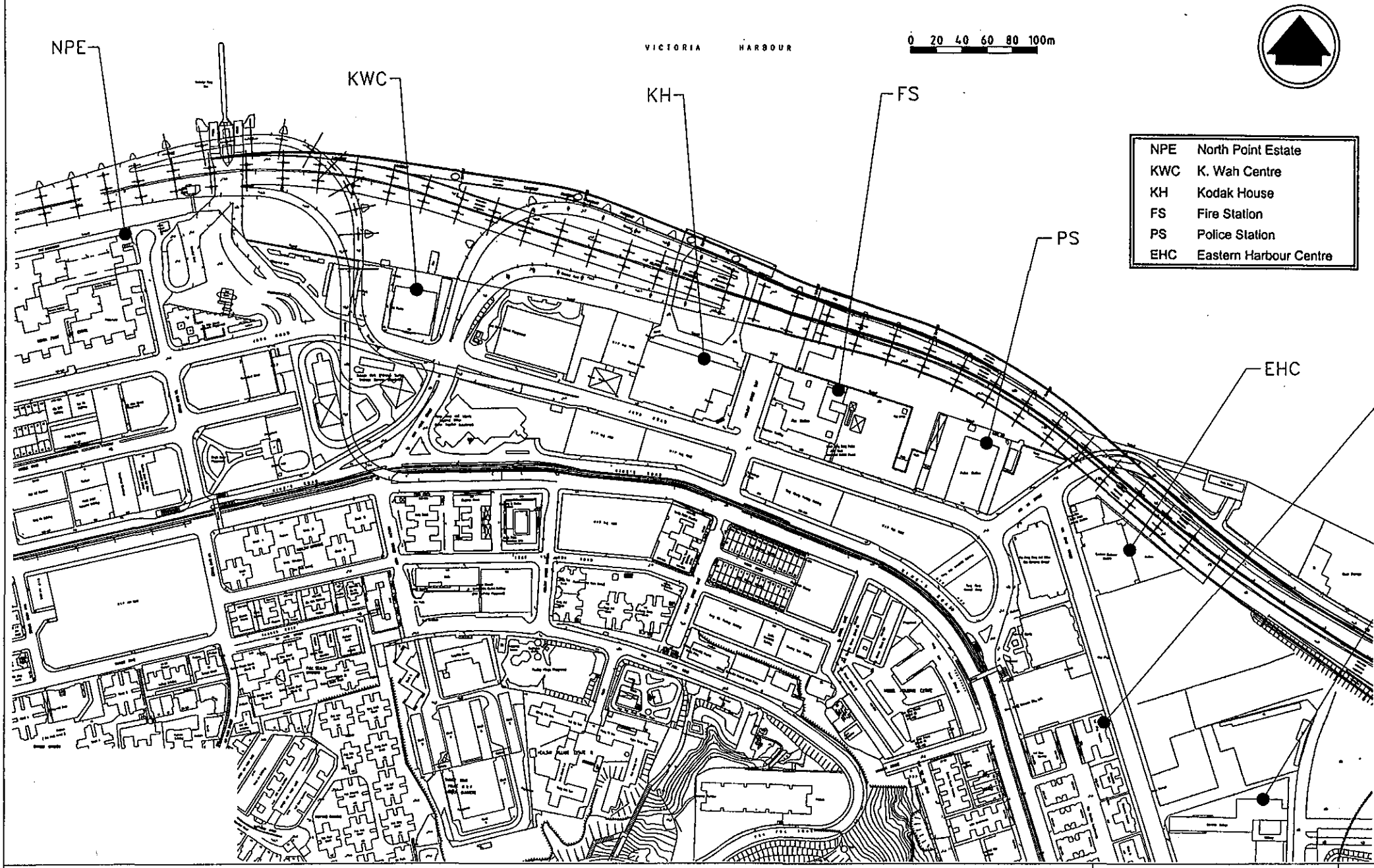

AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

LOCATIONS OF REPRESENTATIVE AIR SENSITIVE RECEIVERS (SHEET 1 OF 3)

FIGURE NO.	
3-2	
SCALE: AS SHOWN	DATE: JANUARY 98

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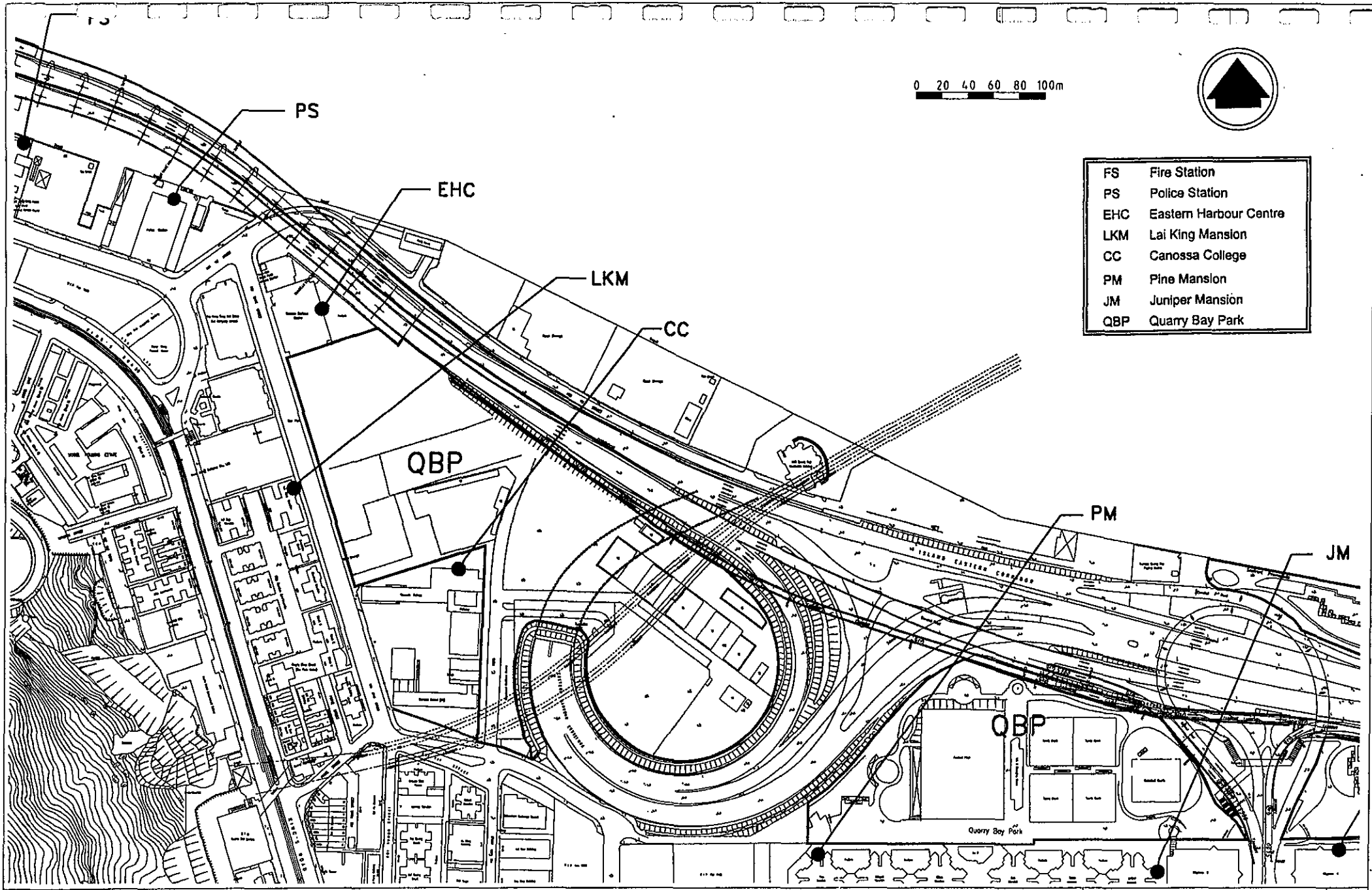

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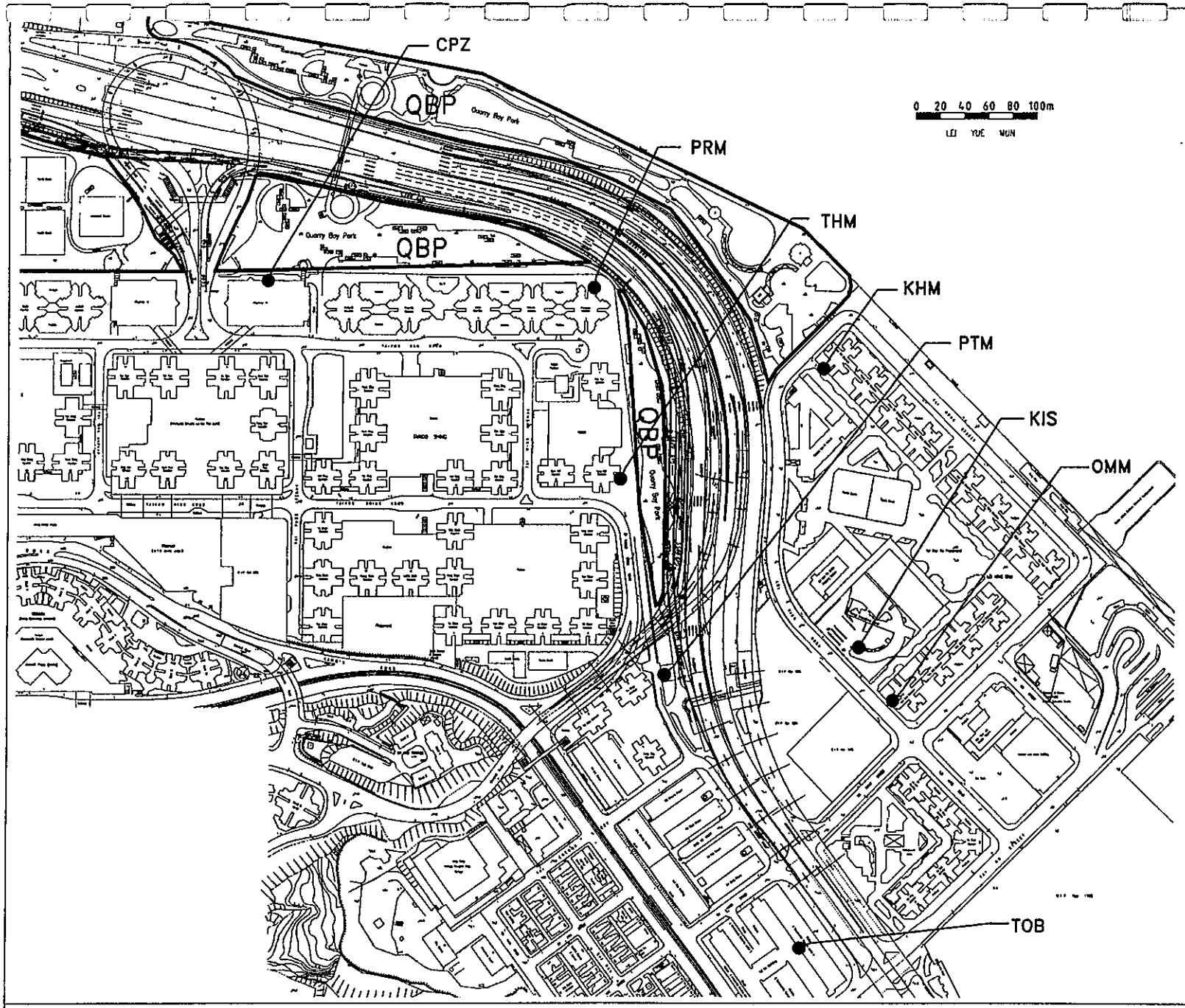

CPZ	Cityplaza 4
PRM	Primrose Mansion
THM	Tung Hoi Mansion
KHM	Kwun Hoi Mansion
PTM	Po Tong Mansion
KIS	Korean International School
OMM	On Ming Mansion
TOB	Tai On Building
QBP	Quarry Bay Park

AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

LOCATIONS OF REPRESENTATIVE AIR SENSITIVE RECEIVERS (SHEET 3 OF 3)

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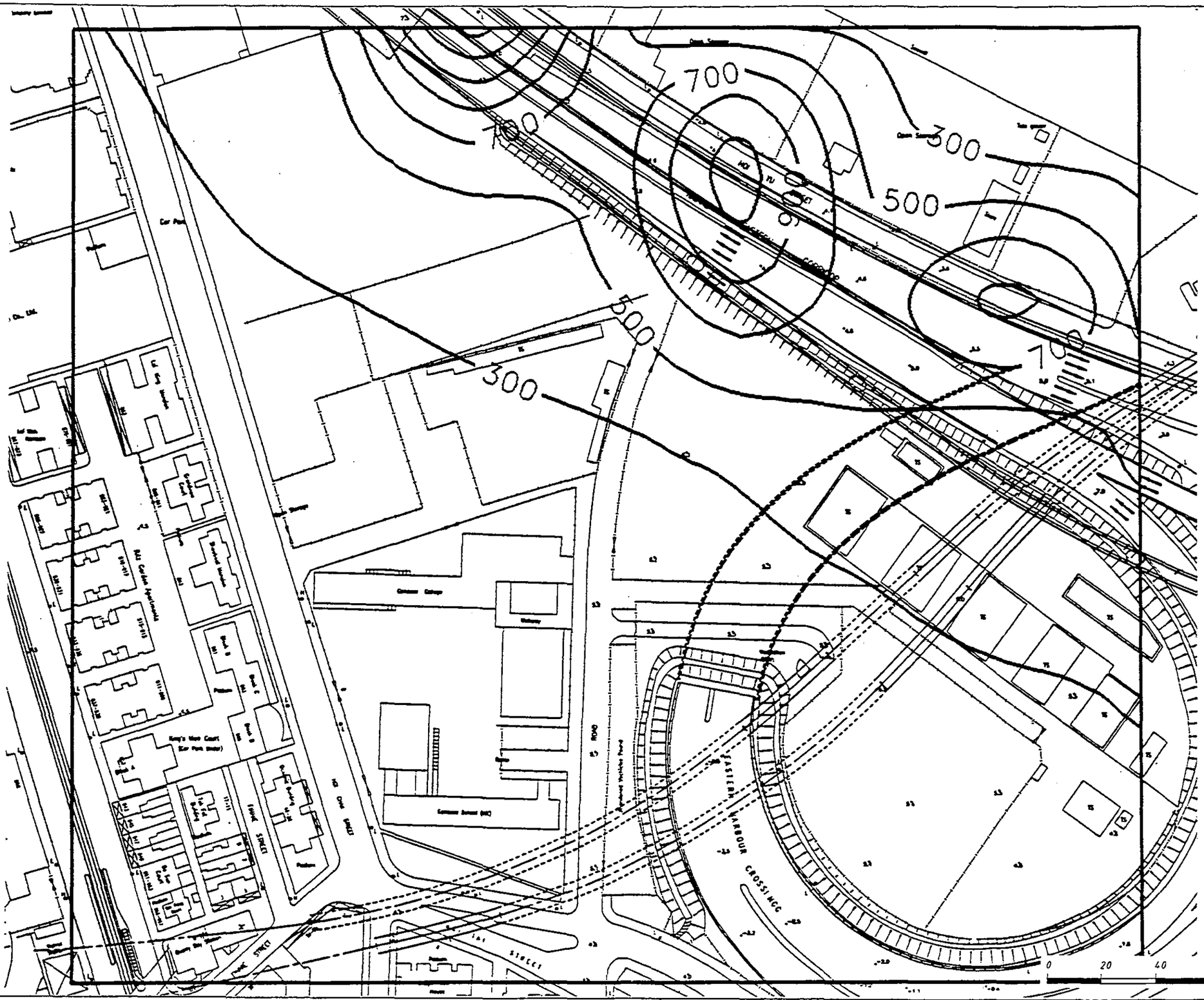

AGREEMENT NO. CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - UNMITIGATED (SHEET 1 OF 4)

FIGURE NO.	
4-1	
SCALE: AS SHOWN	DATE: JANUARY 98

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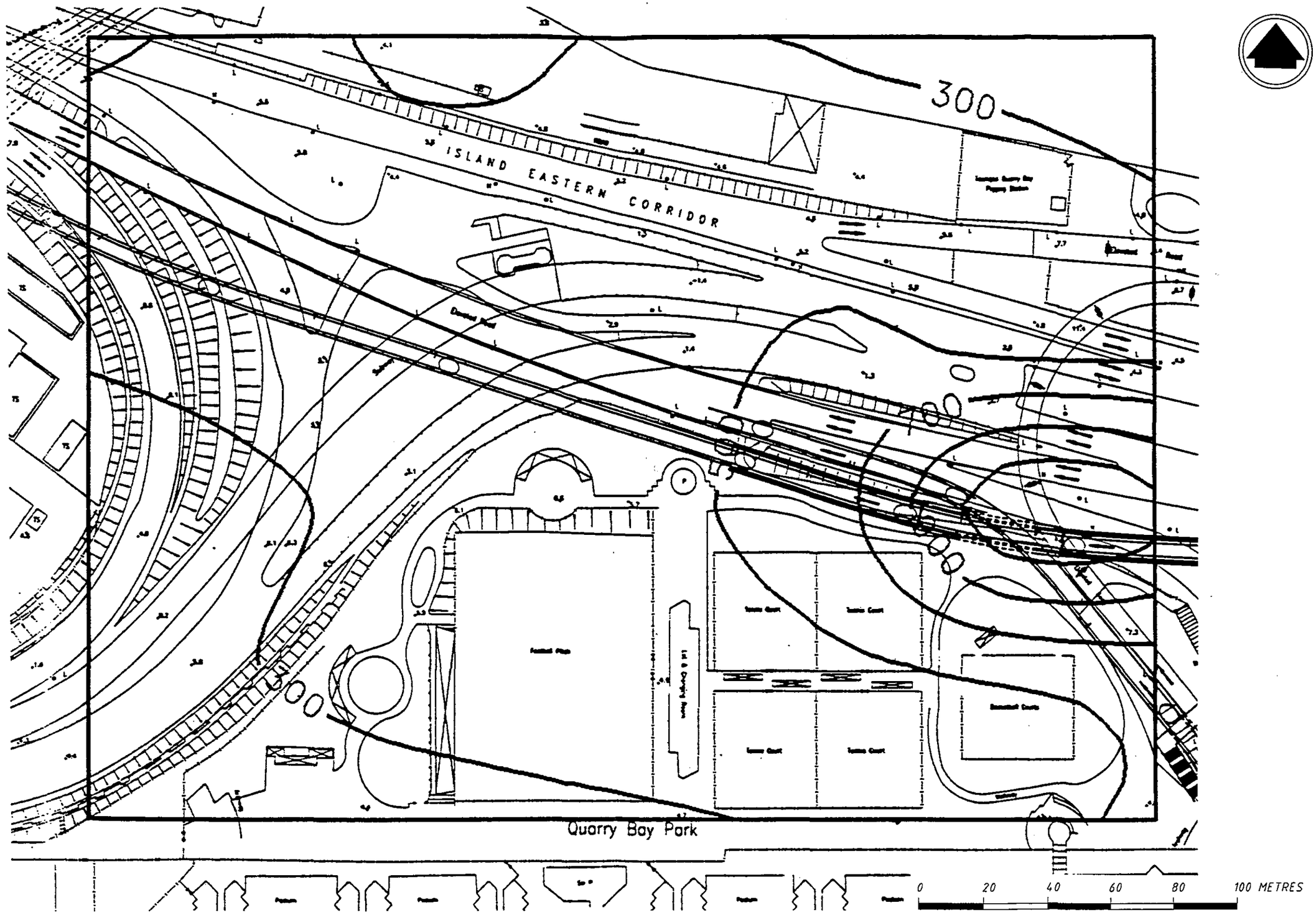

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FIGURE NO.	
4-1	
SCALE: AS SHOWN	DATE. JANUARY 98

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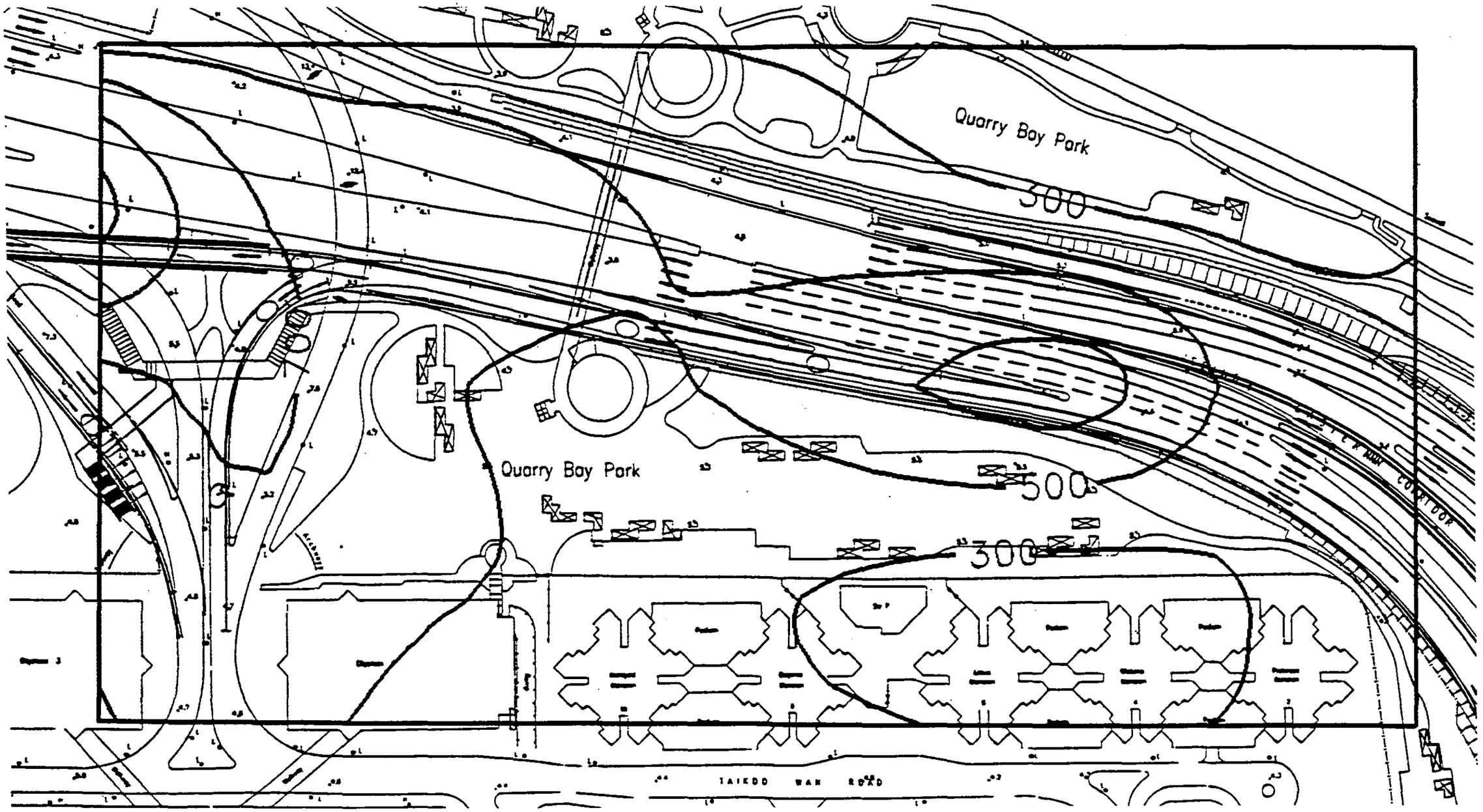

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PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - UNMITIGATED (SHEET 3 OF 4)

FIGURE NO.	
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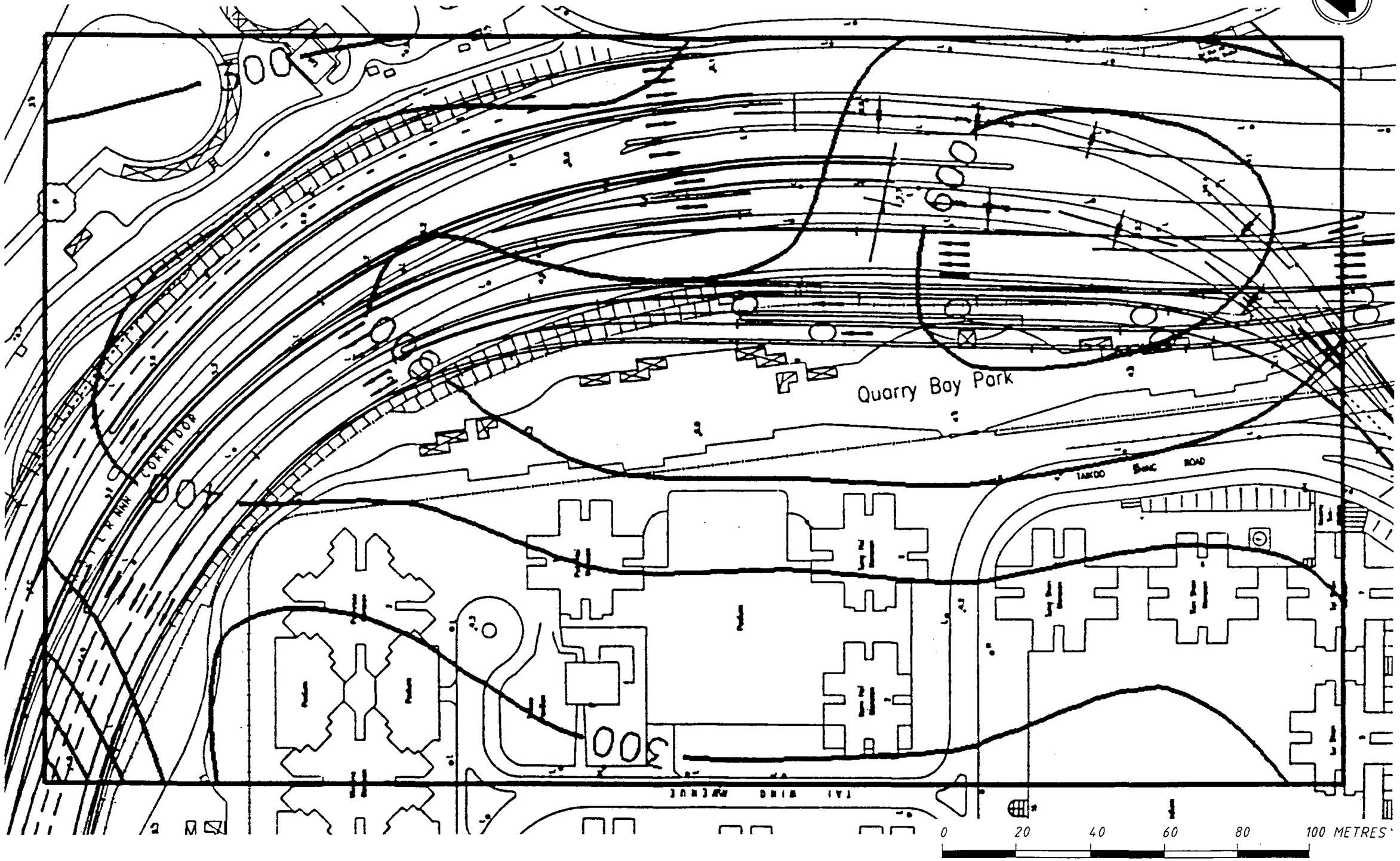

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PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - UNMITIGATED (SHEET 4 OF 4)

FIGURE NO.	
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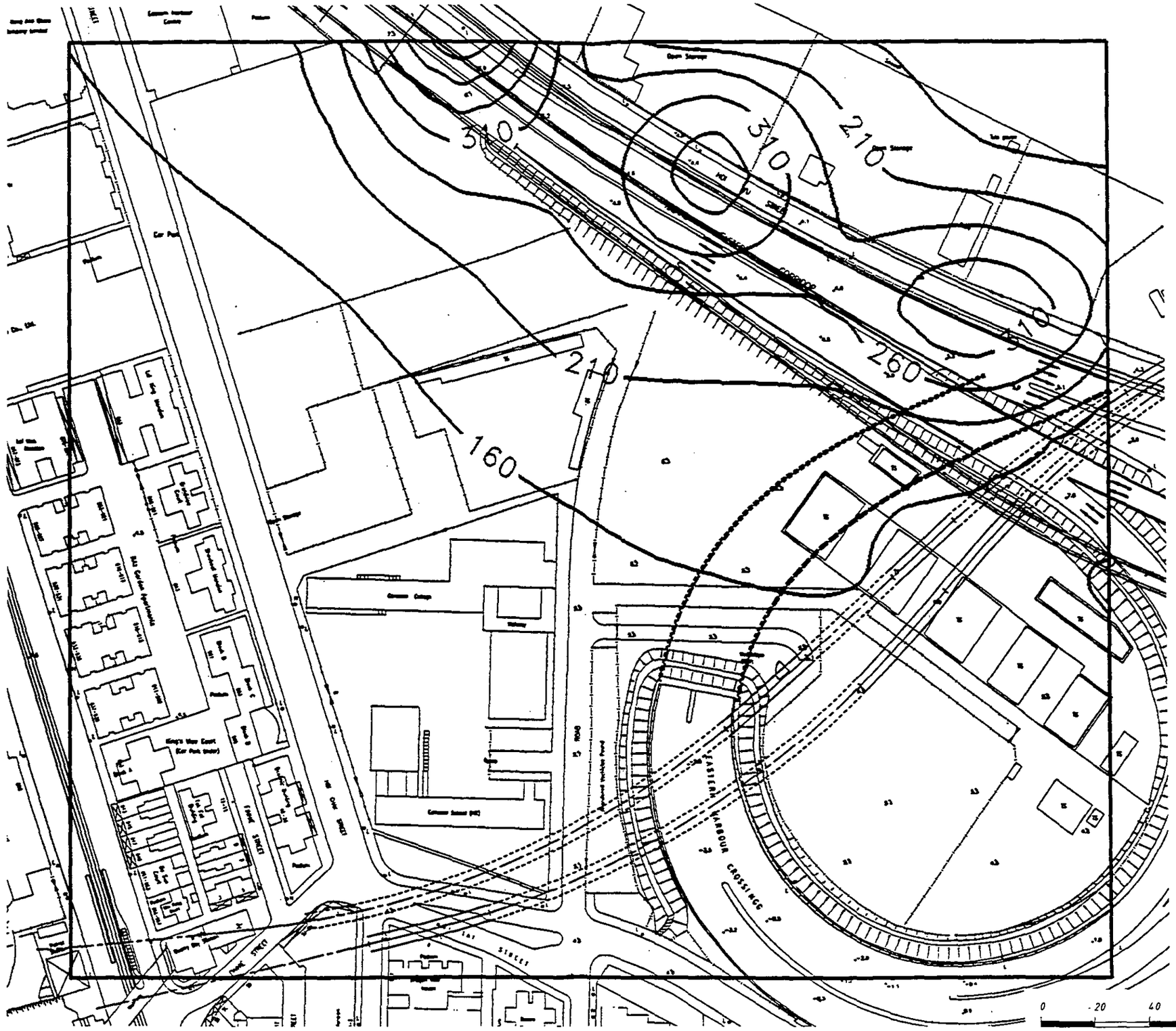
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell



AGREEMENT NO. CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PREDICTED 24-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - UNMITIGATED (SHEET 1 OF 4)

FIGURE NO.	
4-2	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

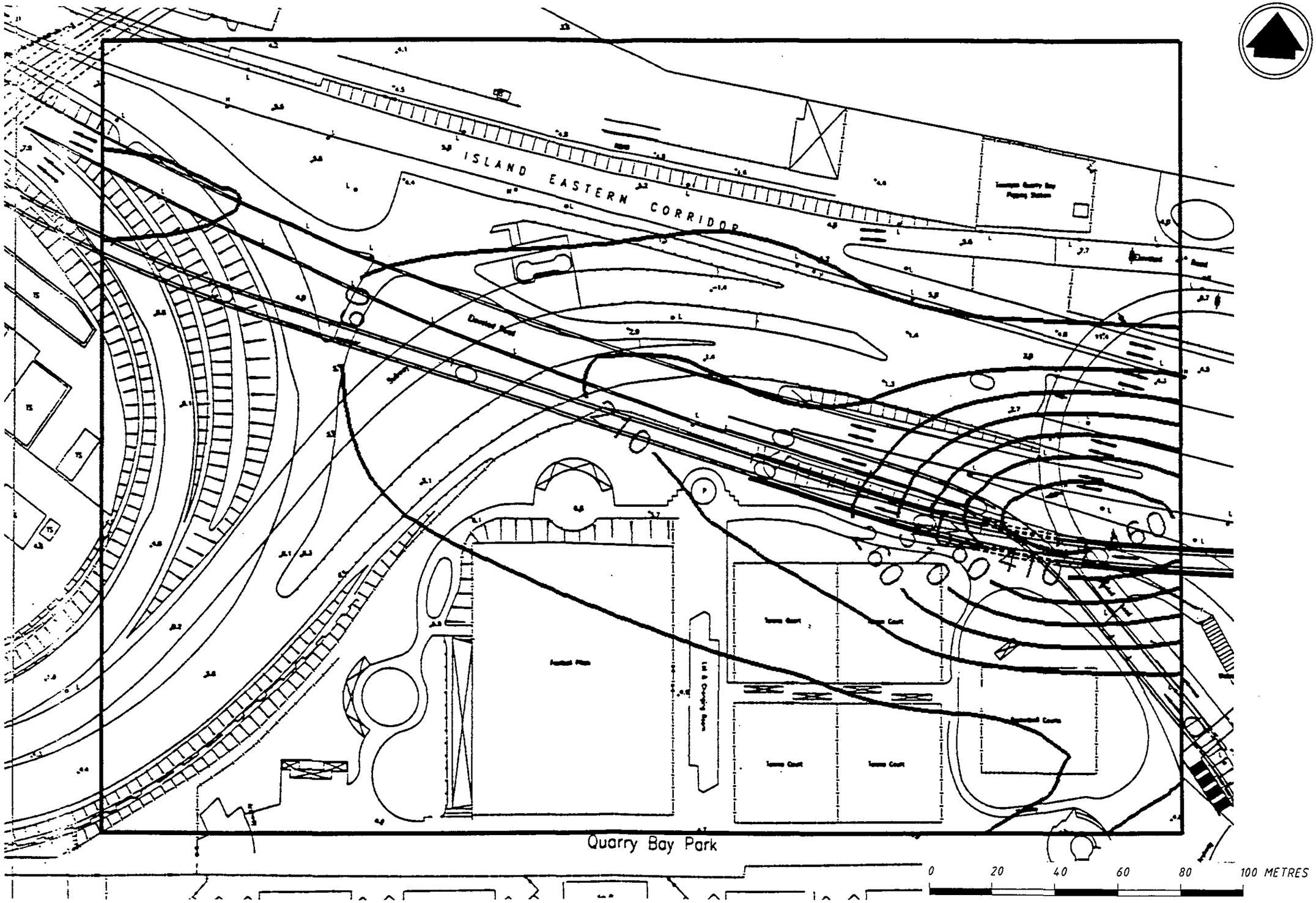


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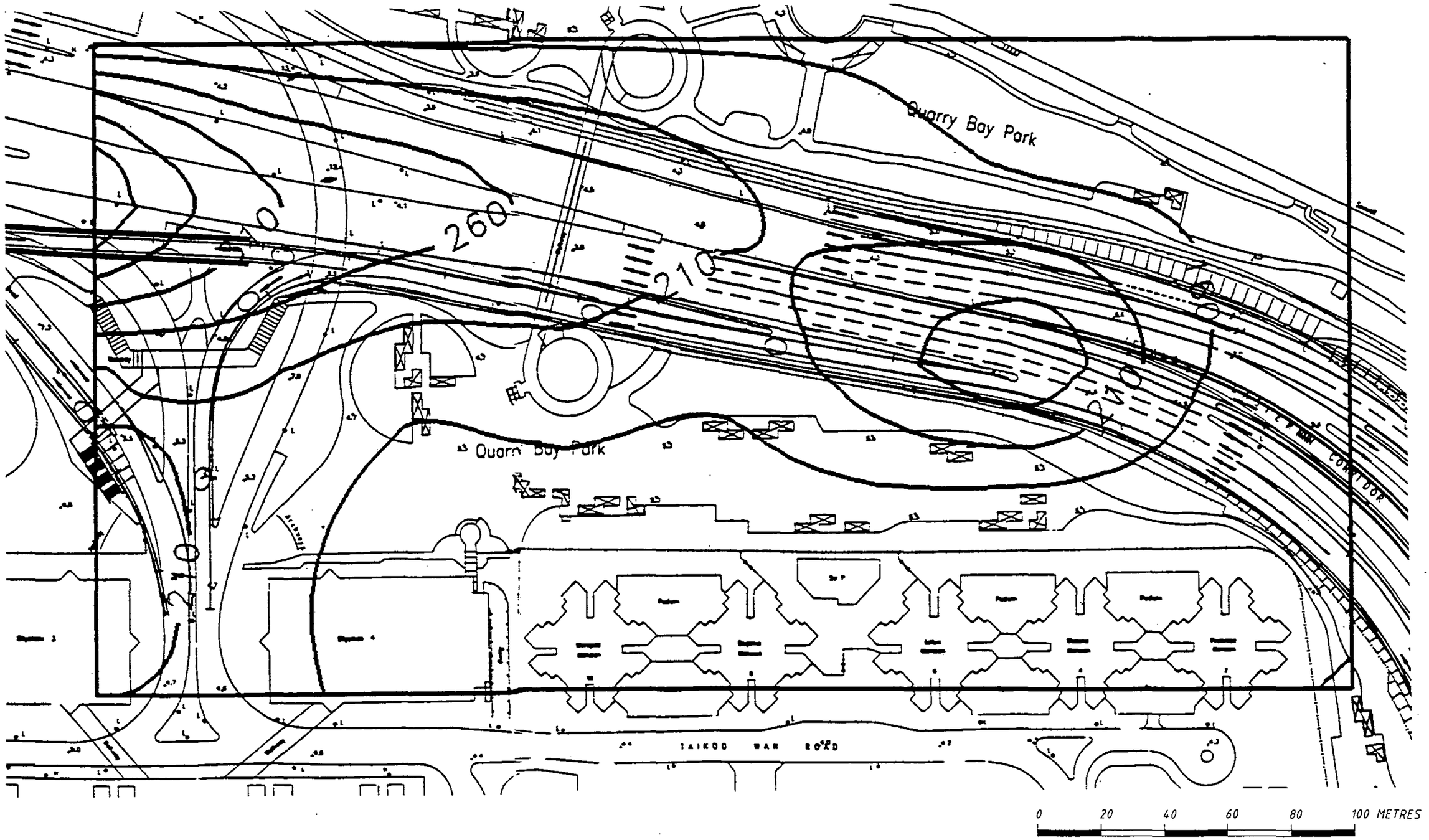
FIGURE NO.	
4-2	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell



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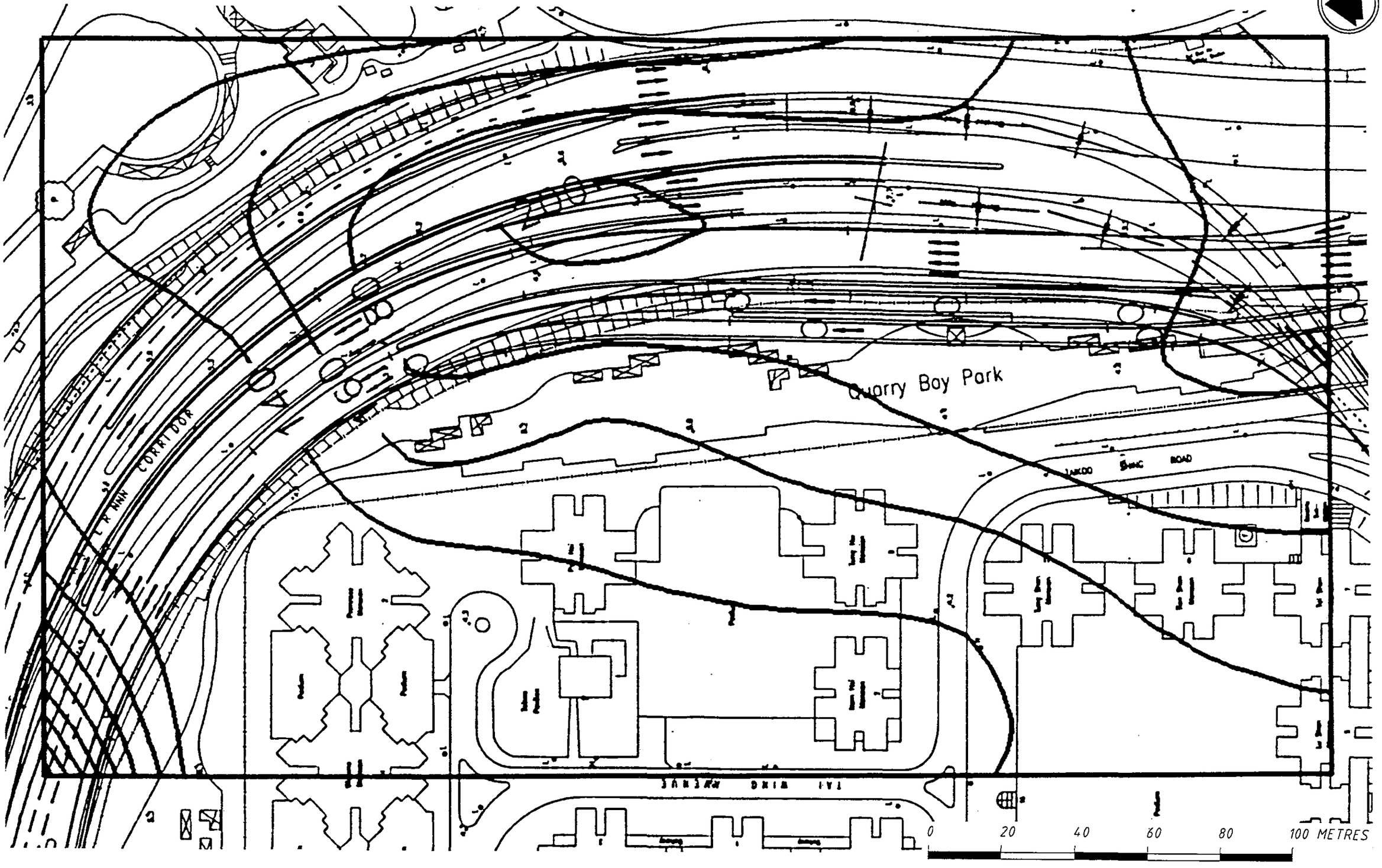
PREDICTED 24-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - UNMITIGATED (SHEET 3 OF 4)

FIGURE NO.	
4-2	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell



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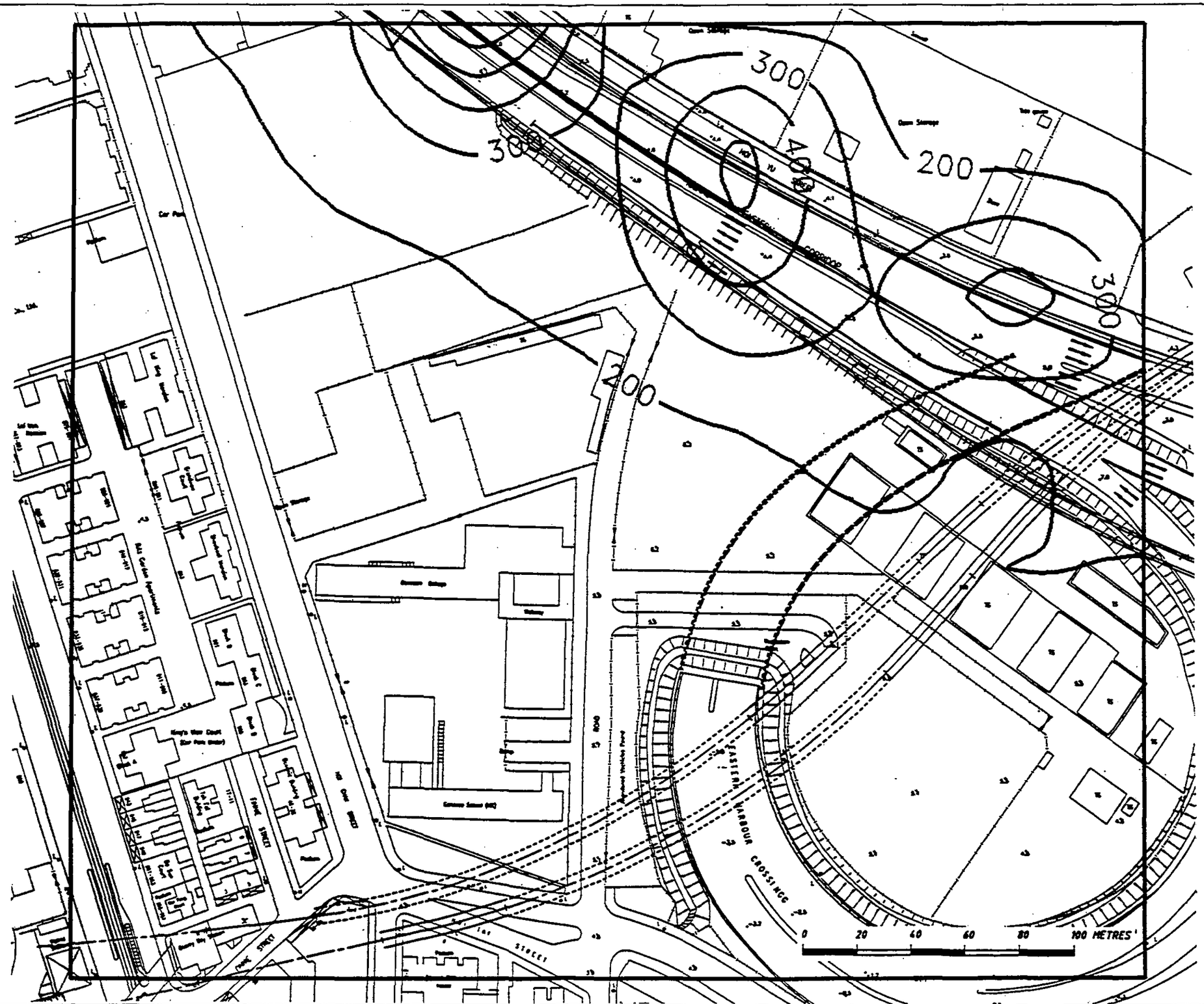
PREDICTED 24-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - UNMITIGATED (SHEET 4 OF 4)

FIGURE NO.	
4-2	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

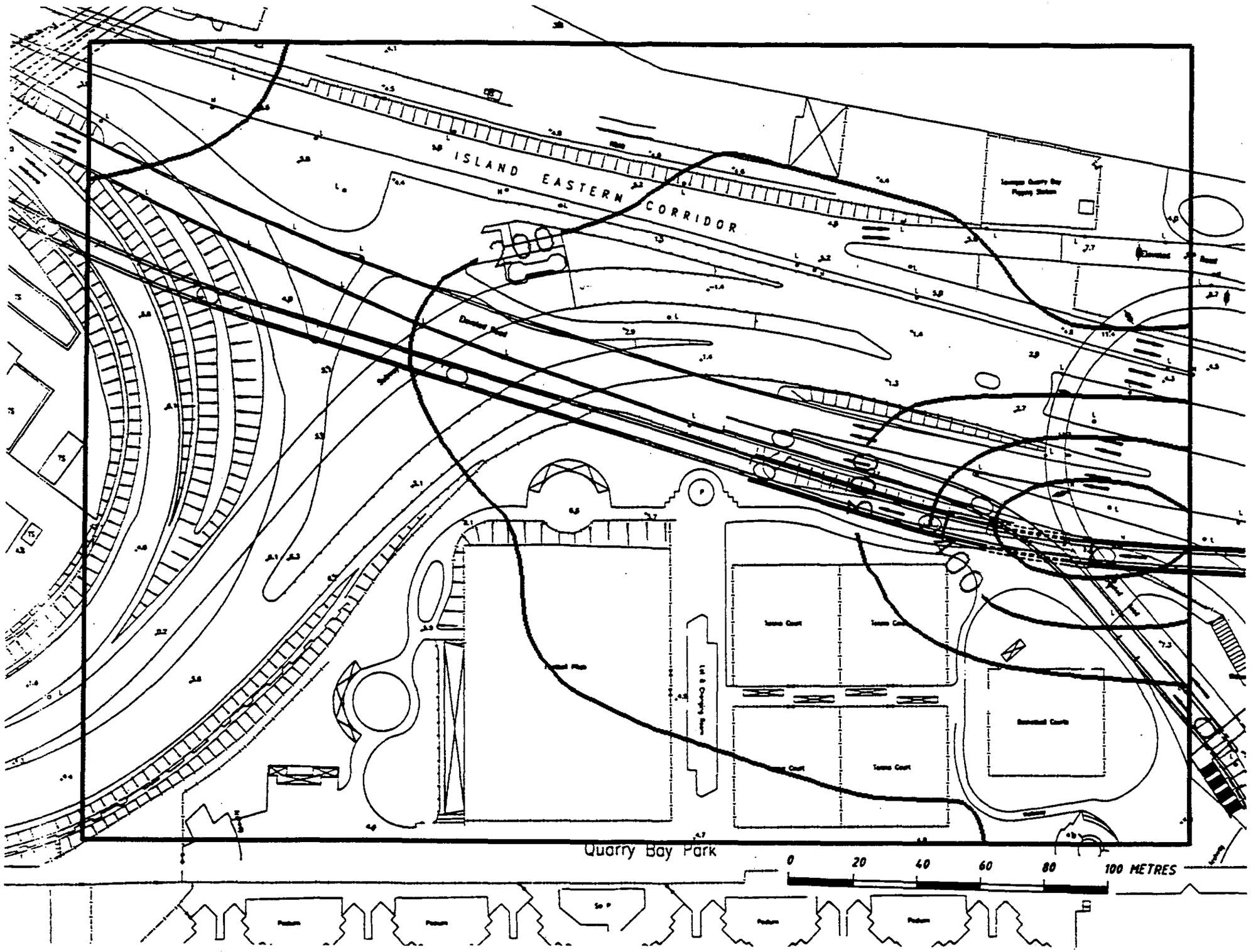


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - MITIGATED (SHEET 1 OF 4)

FIGURE NO.	
4-3	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

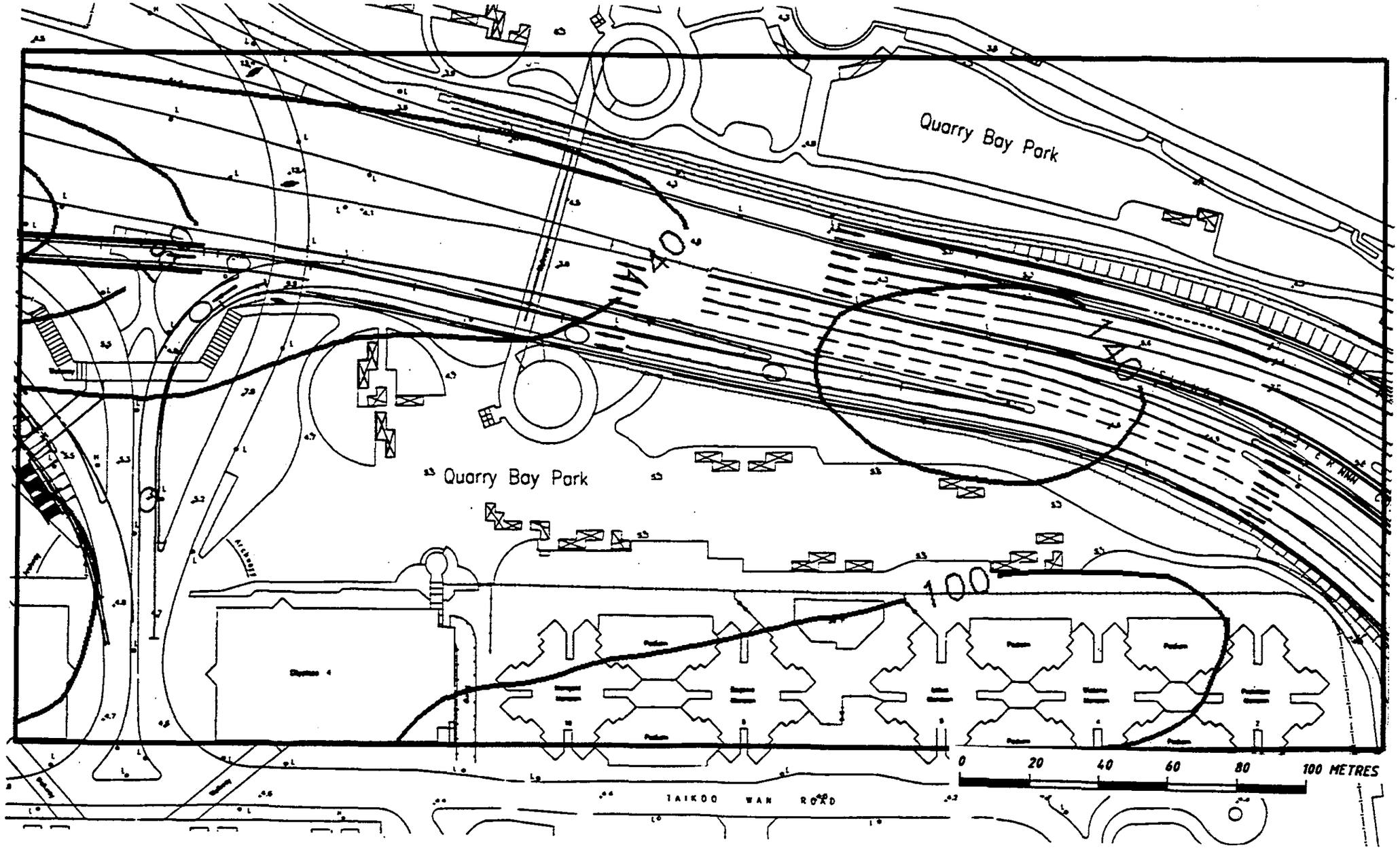


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - MITIGATED (SHEET 2 OF 4)

FIGURE NO	
4-3	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell



AGREEMENT NO. CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PREDICTED 1-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - MITIGATED (SHEET 3 OF 4)

FIGURE NO.	
4-3	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

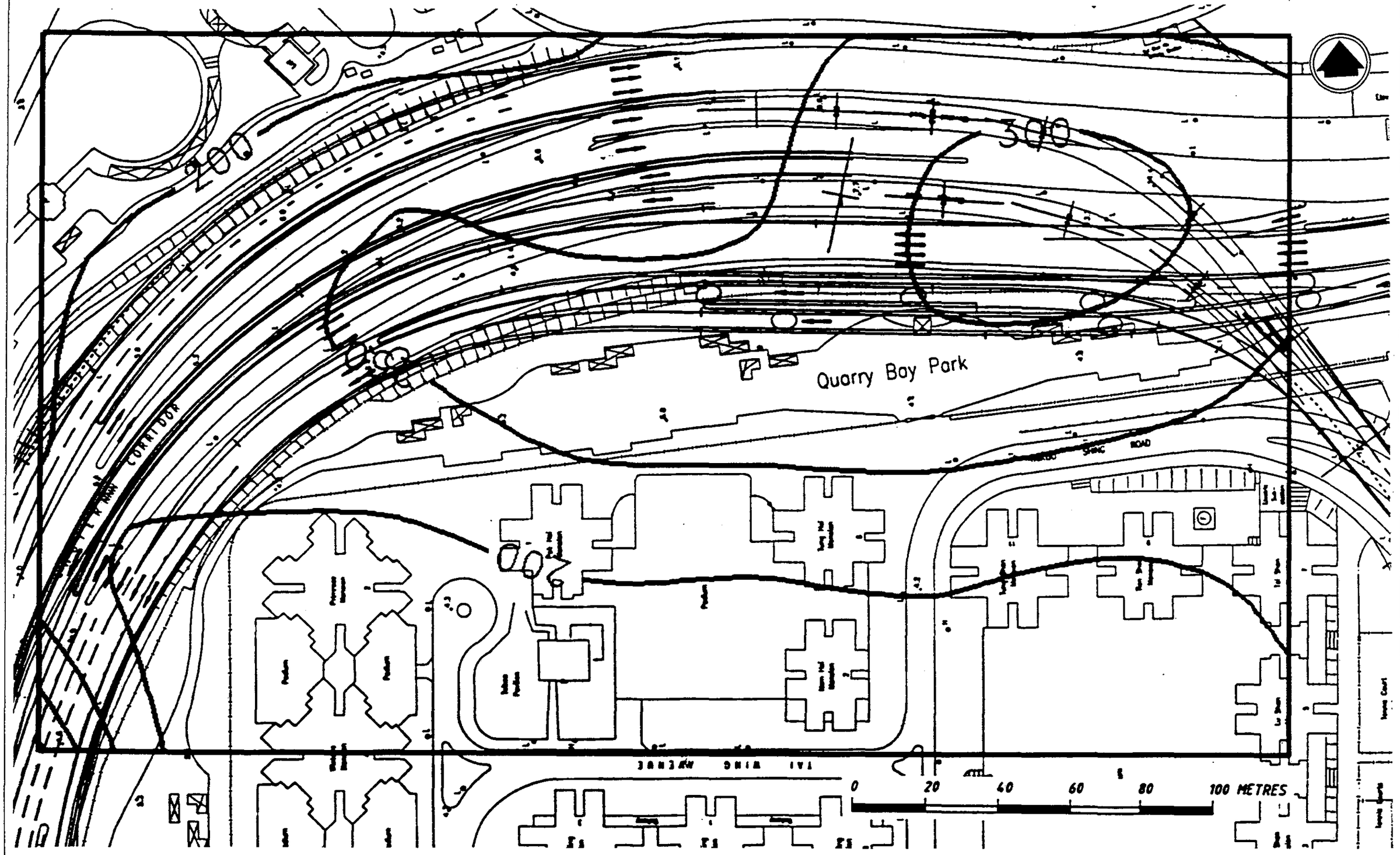


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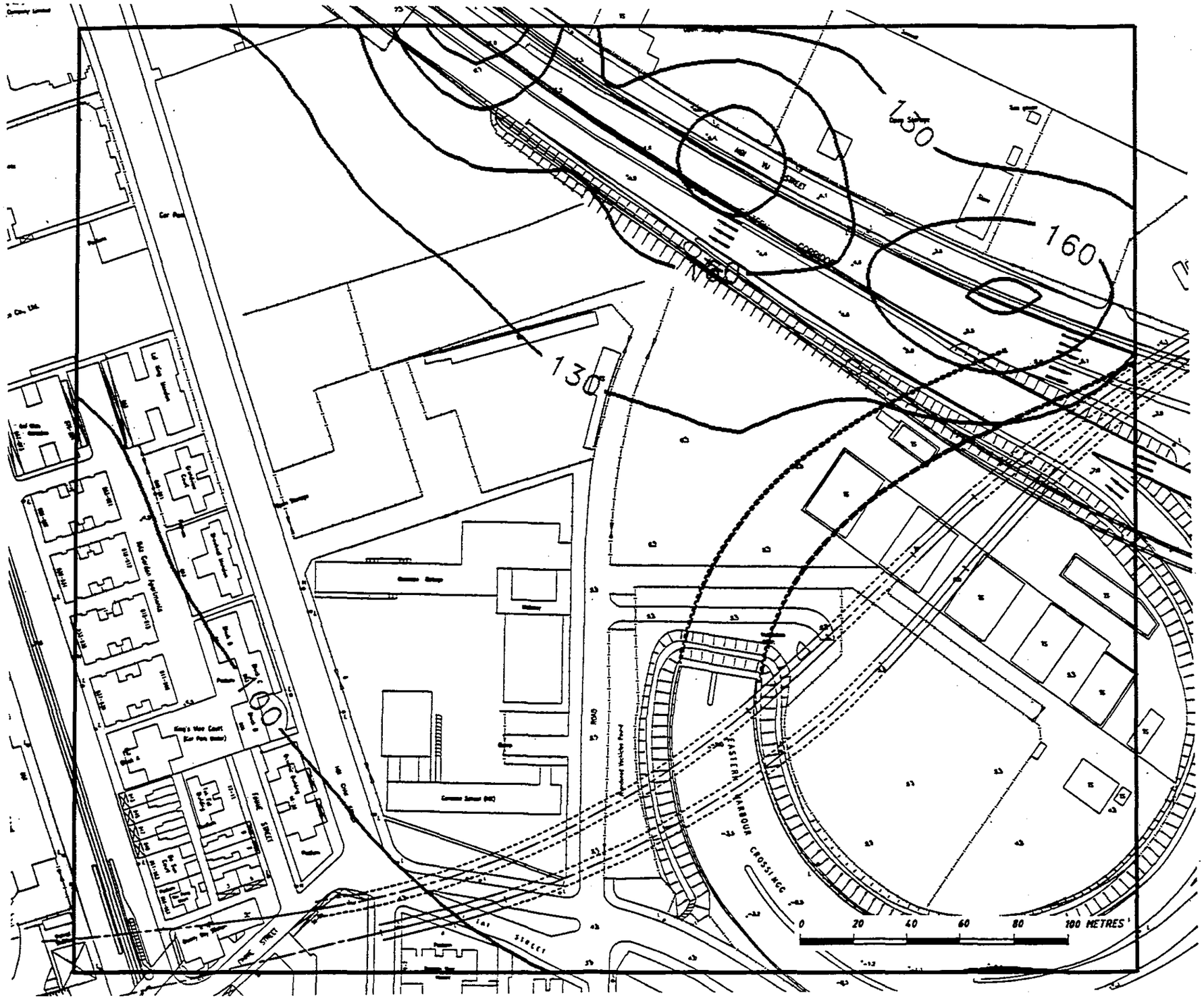
FIGURE NO.	
4-3	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

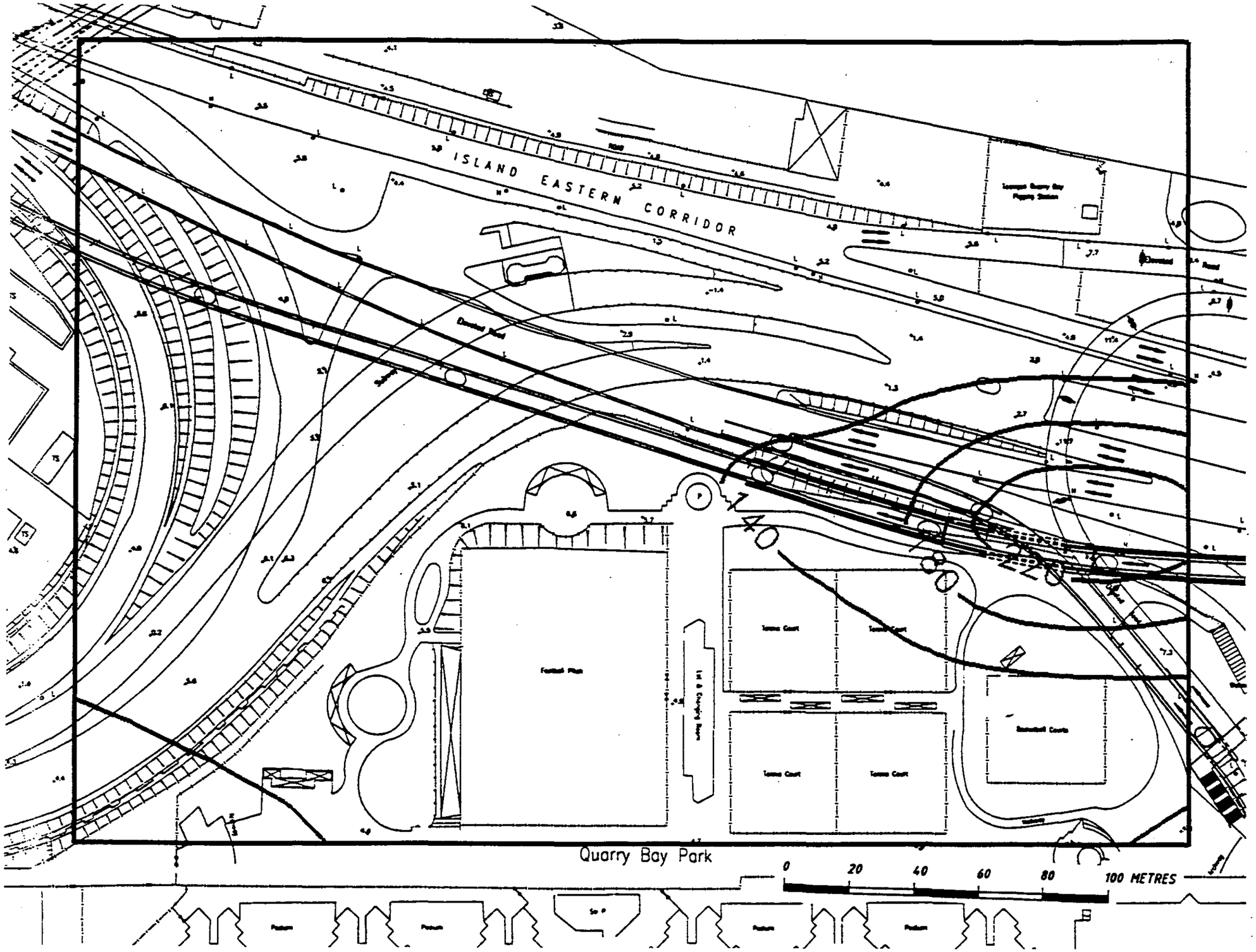


AGREEMENT NO. CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PREDICTED 24-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - MITIGATED (SHEET 1 OF 4)

FIGURE NO.	
4-4	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

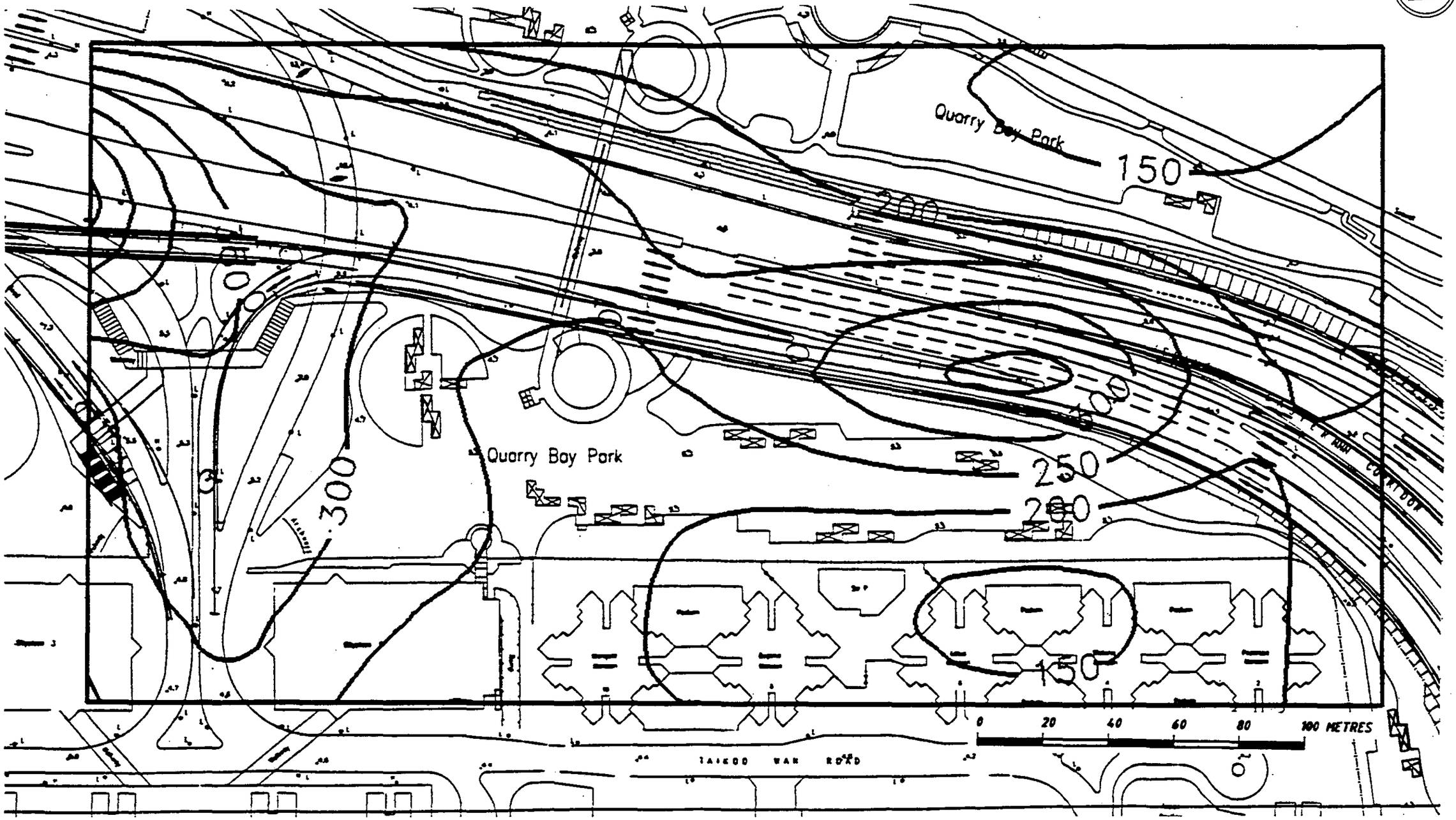


AGREEMENT NO. CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PREDICTED 24-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - MITIGATED (SHEET 2 OF 4)

FIGURE NO.	
4-4	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

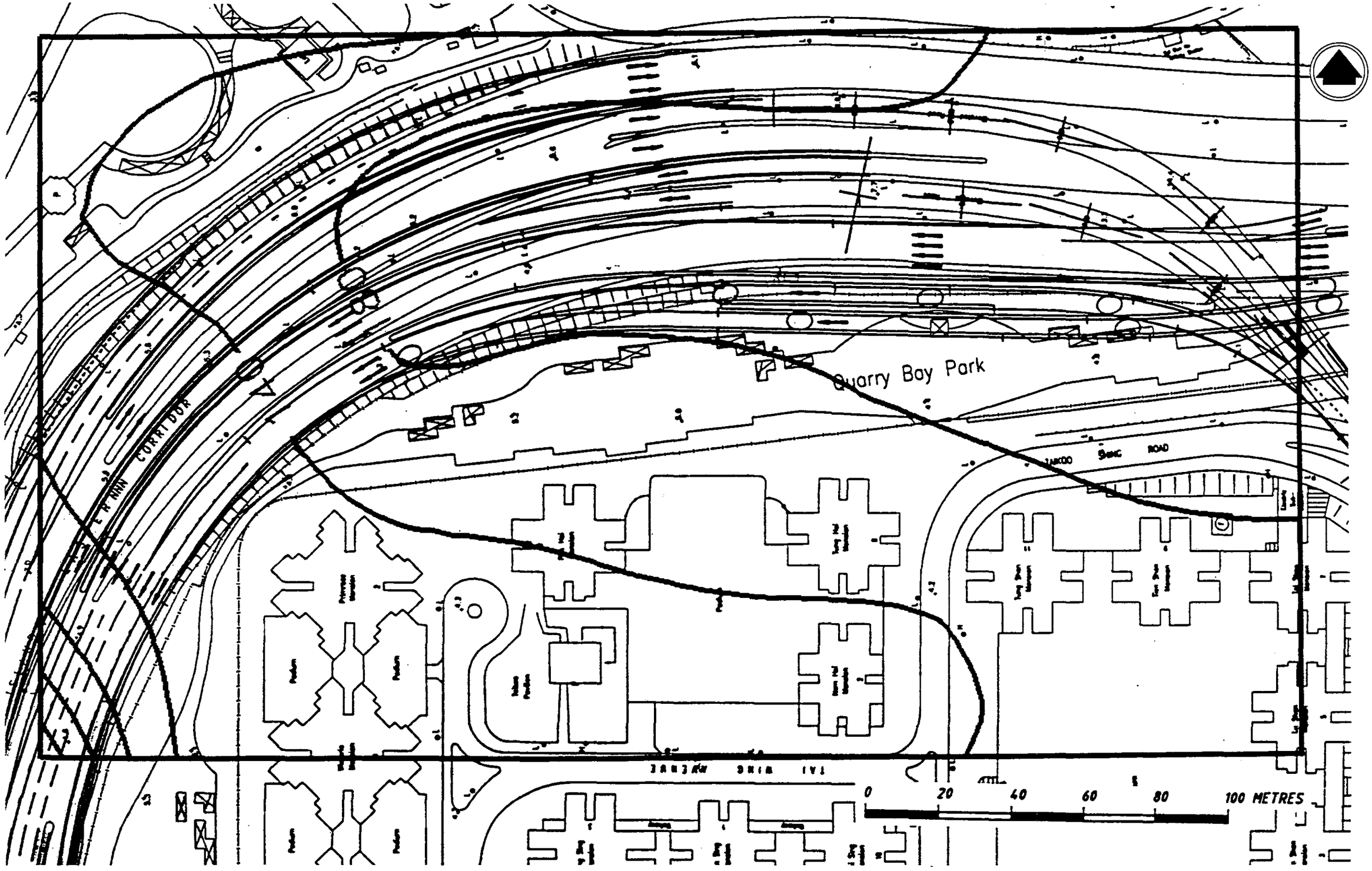


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

PREDICTED 24-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - MITIGATED (SHEET 3 OF 4)

FIGURE NO.	
4-4	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell



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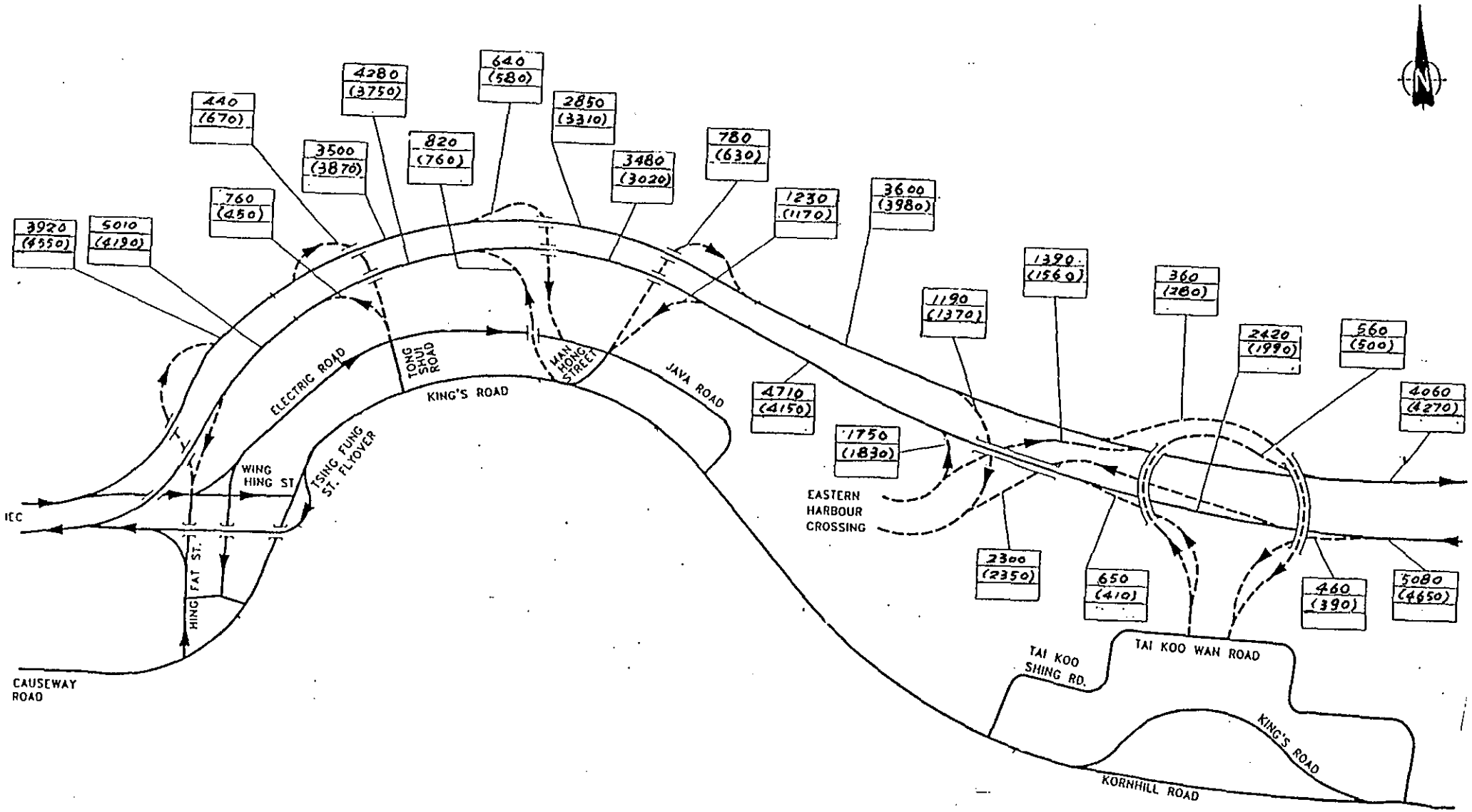
PREDICTED 24-HOUR AVERAGE TSP CONCENTRATIONS ($\mu g/m^3$) CONTOURS AT LOCAL GROUND LEVEL - MITIGATED (SHEET 4 OF 4)

FIGURE NO.	
4-4	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell



LEGEND :

6000 / (5900) AM PEAK HOUR FLOW IN VEH/HR
PM PEAK HOUR FLOW IN VEH/HR

AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

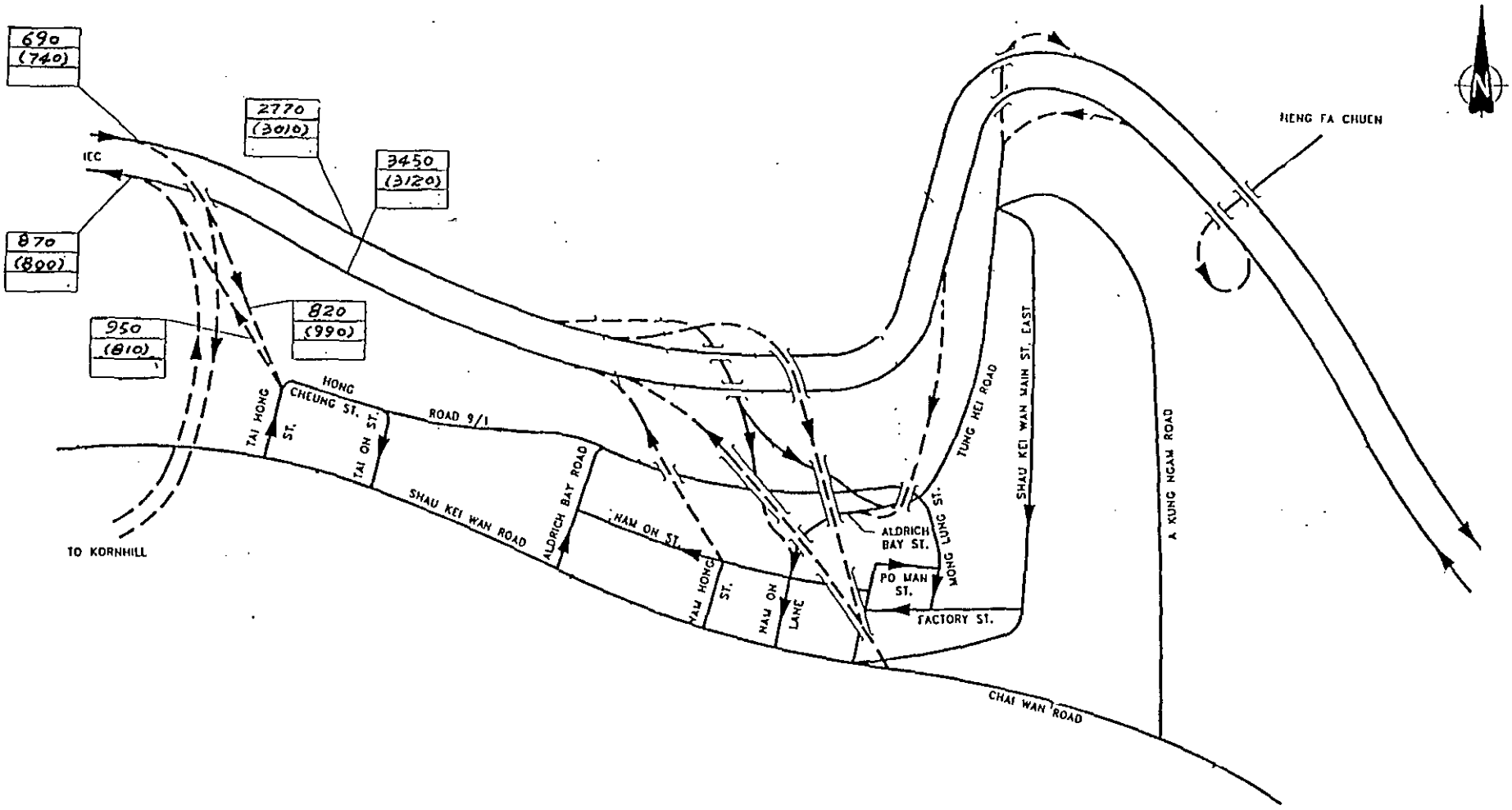
PREDICTED TRAFFIC FLOWS FOR YEAR 2000 ALONG MAJOR ROADS (SHEET 1 OF 2)

FIGURE NO. 5 – 1

SCALE:

DATE: JANUARY 98

Maunsell



LEGEND :

1200	AM PEAK HOUR FLOW IN VEH / HR
(1700)	PM PEAK HOUR FLOW IN VEH / HR

AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

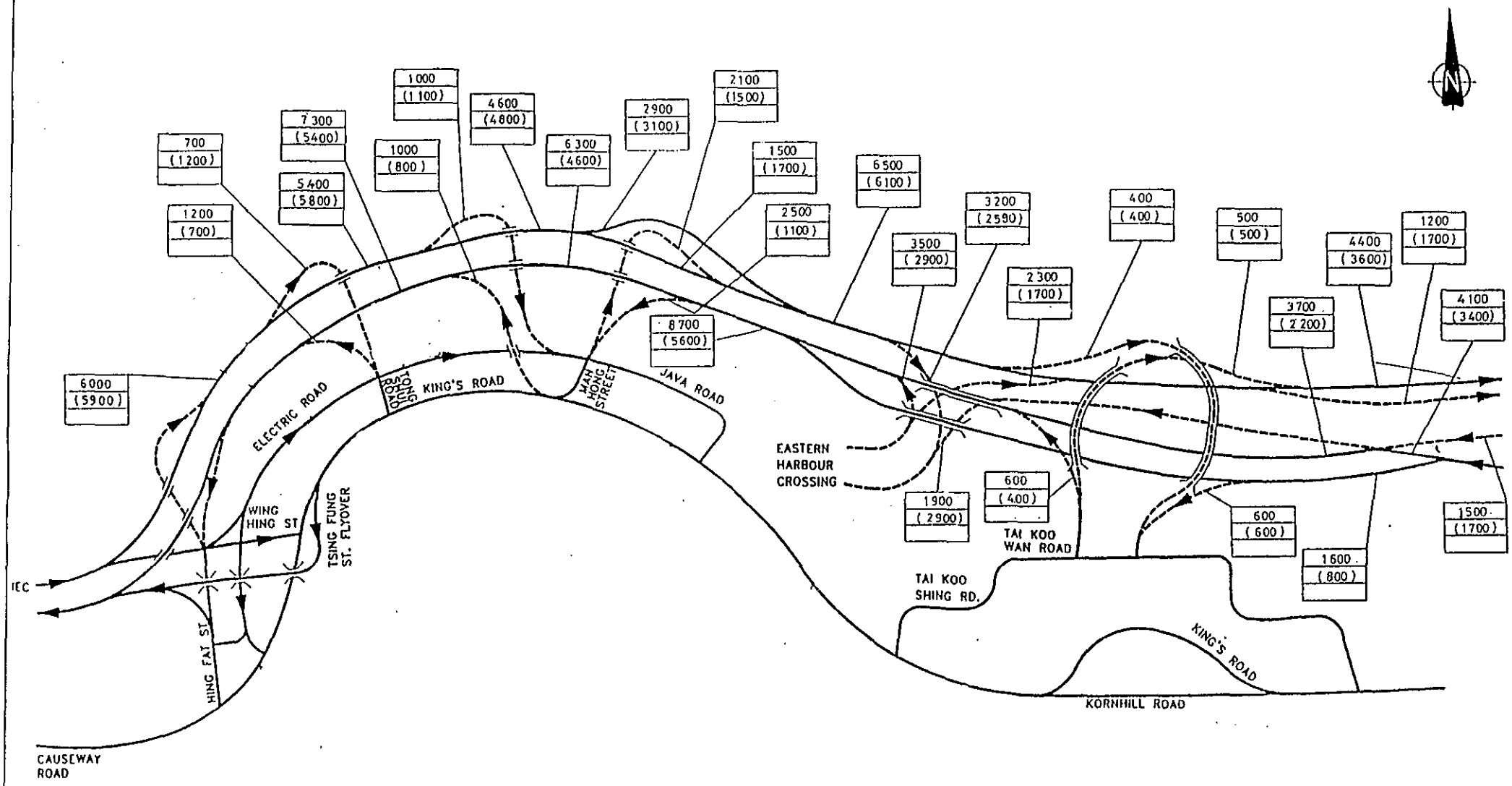
PREDICTED TRAFFIC FLOWS FOR YEAR 2000 ALONG MAJOR ROADS (SHEET 2 OF 2)

FIGURE NO. 5 – 1

SCALE:

DATE: JANUARY 98

Maunsell



LEGEND :

6000 (5900) AM PEAK HOUR FLOW IN VEH/HR
PM PEAK HOUR FLOW IN VEH/HR

AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

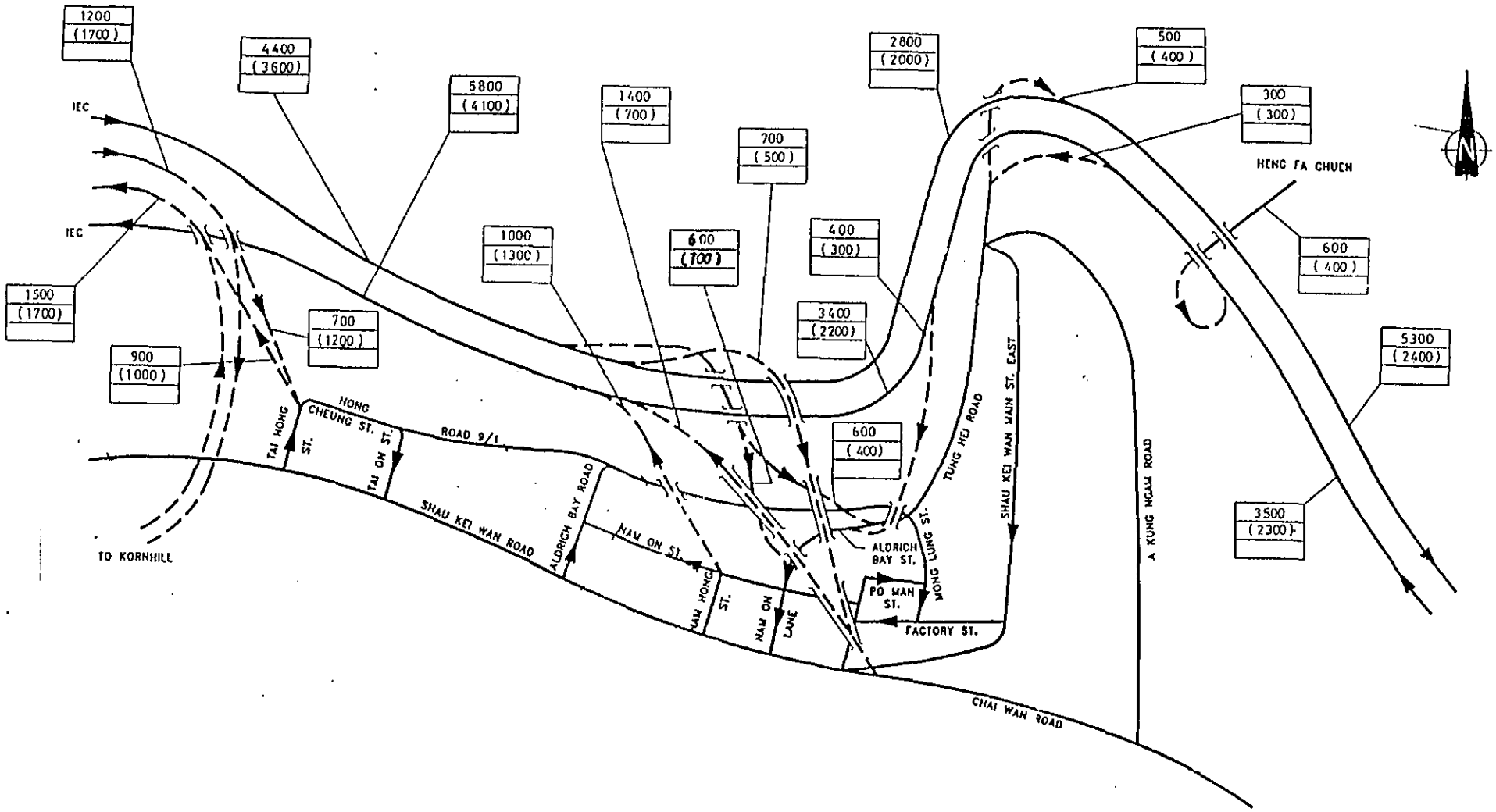
PREDICTED TRAFFIC FLOWS FOR YEAR 2018 ALONG MAJOR ROADS (SHEET 1 OF 2)

FIGURE NO. 5 – 2

SCALE:

DATE: JANUARY 98

Maunsell



LEGEND :

1200	AM PEAK HOUR FLOW IN VEH / HR
(1700)	PM PEAK HOUR FLOW IN VEH / HR

AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

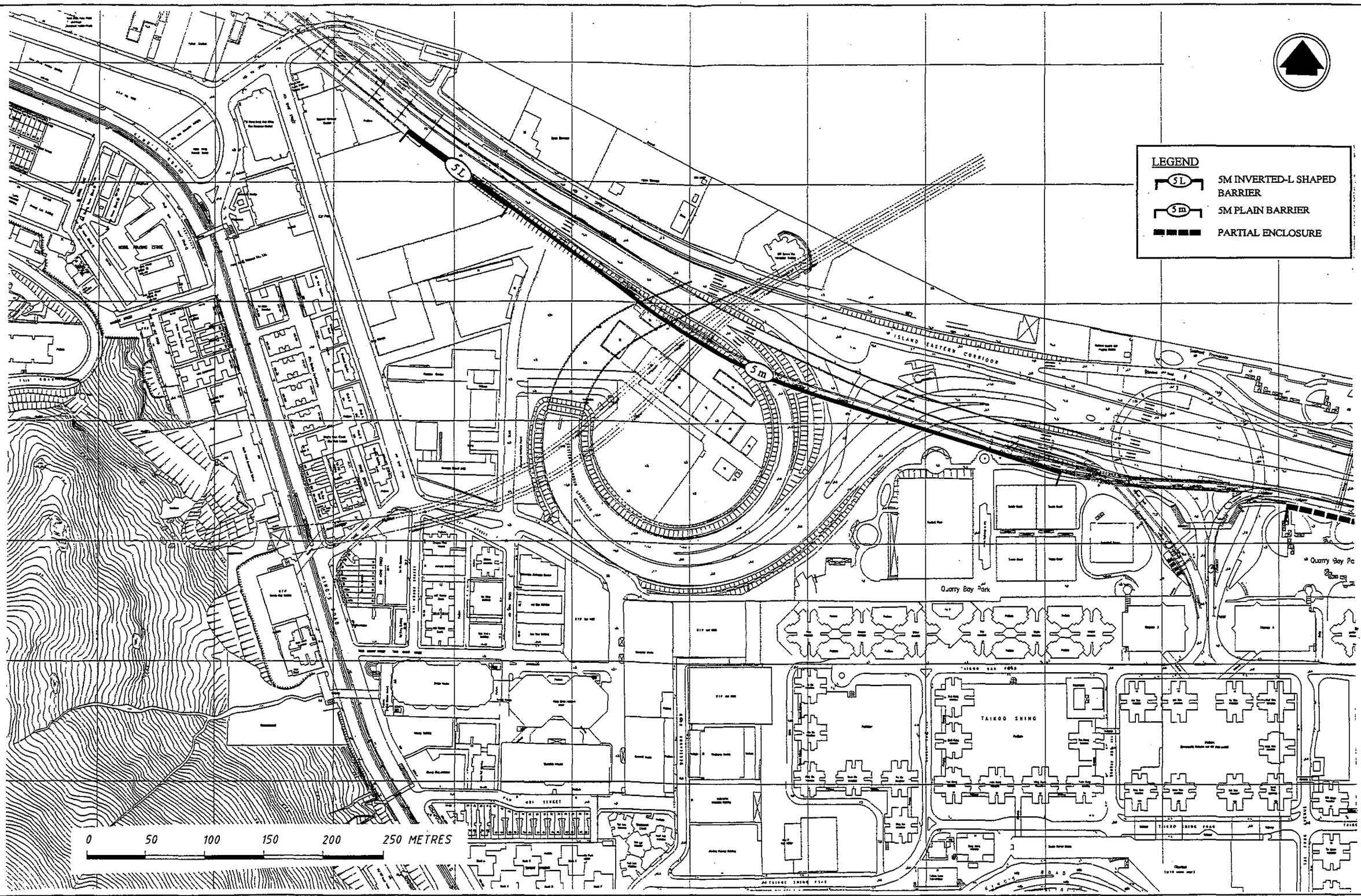
PREDICTED TRAFFIC FLOWS FOR YEAR 2018 ALONG MAJOR ROADS (SHEET 2 OF 2)

FIGURE NO. 5 – 2

SCALE:

DATE: JANUARY 98

Maunsell

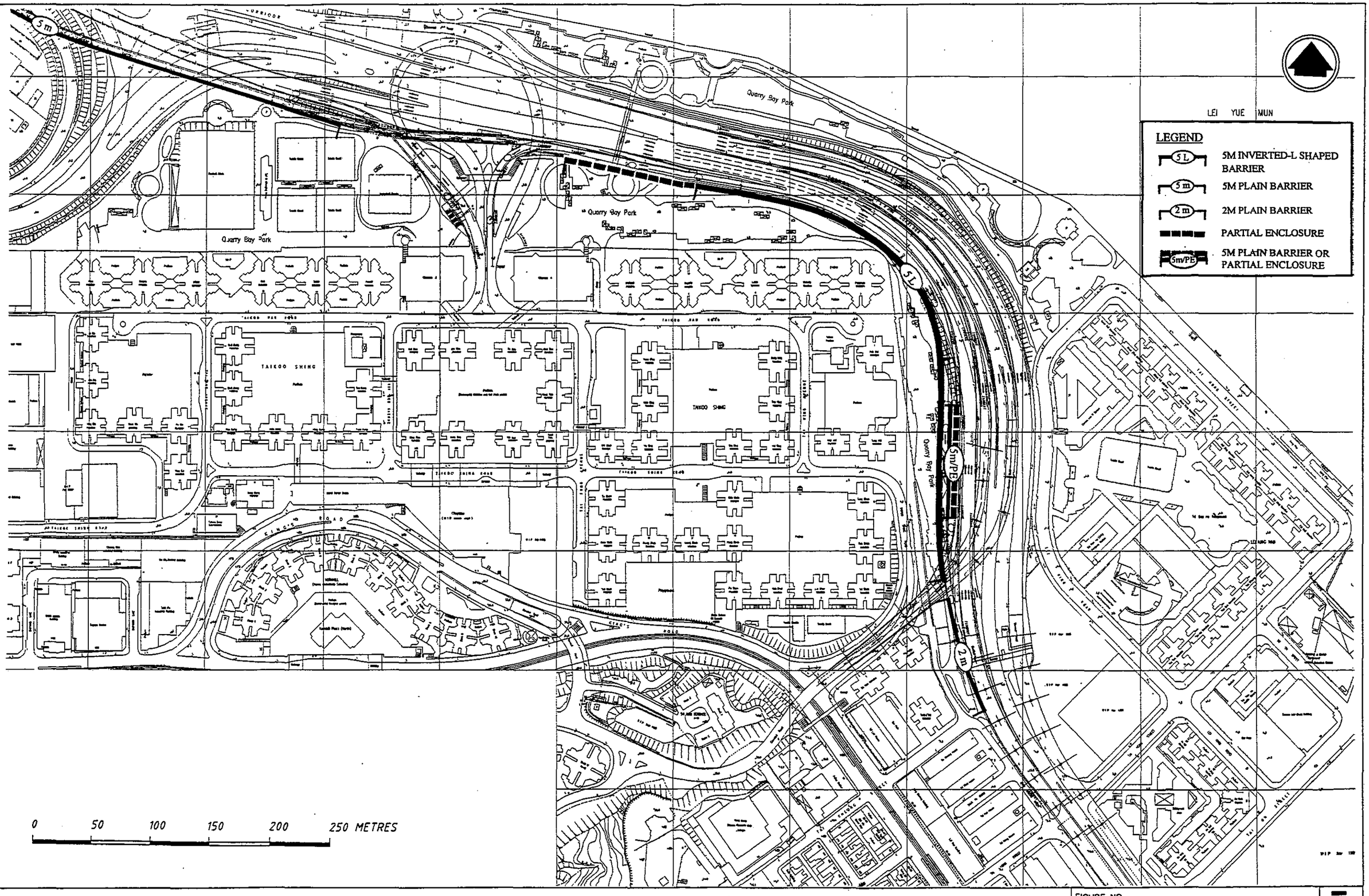


AGREEMENT NO. CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

LOCATIONS OF BARRIERS EXAMINED (SHEET 1 OF 2)

FIGURE NO.	
5-3	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

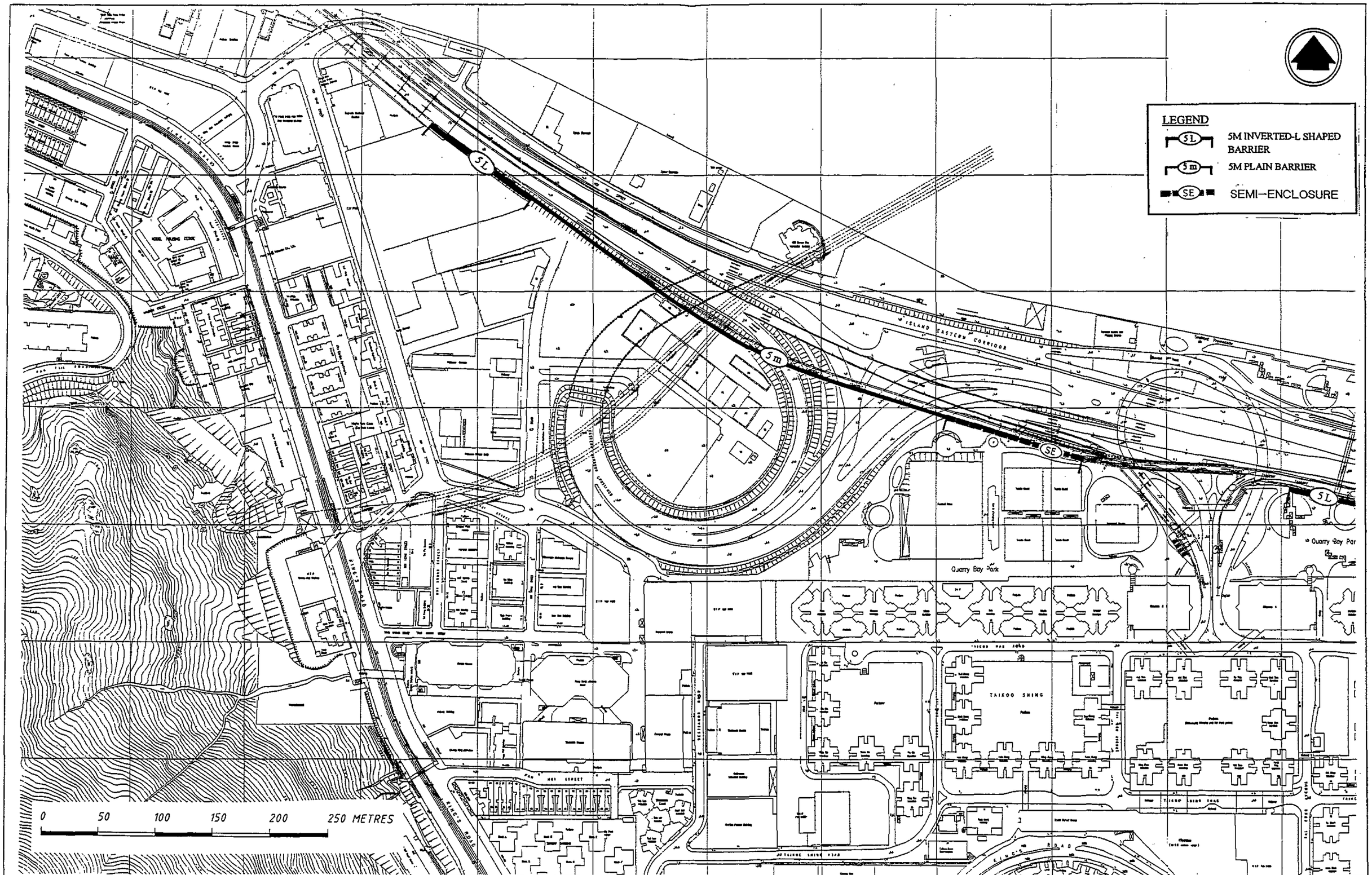


AGREEMENT NO. CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

LOCATIONS OF BARRIERS EXAMINED (SHEET 2 OF 2)

FIGURE NO.	
5-3	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

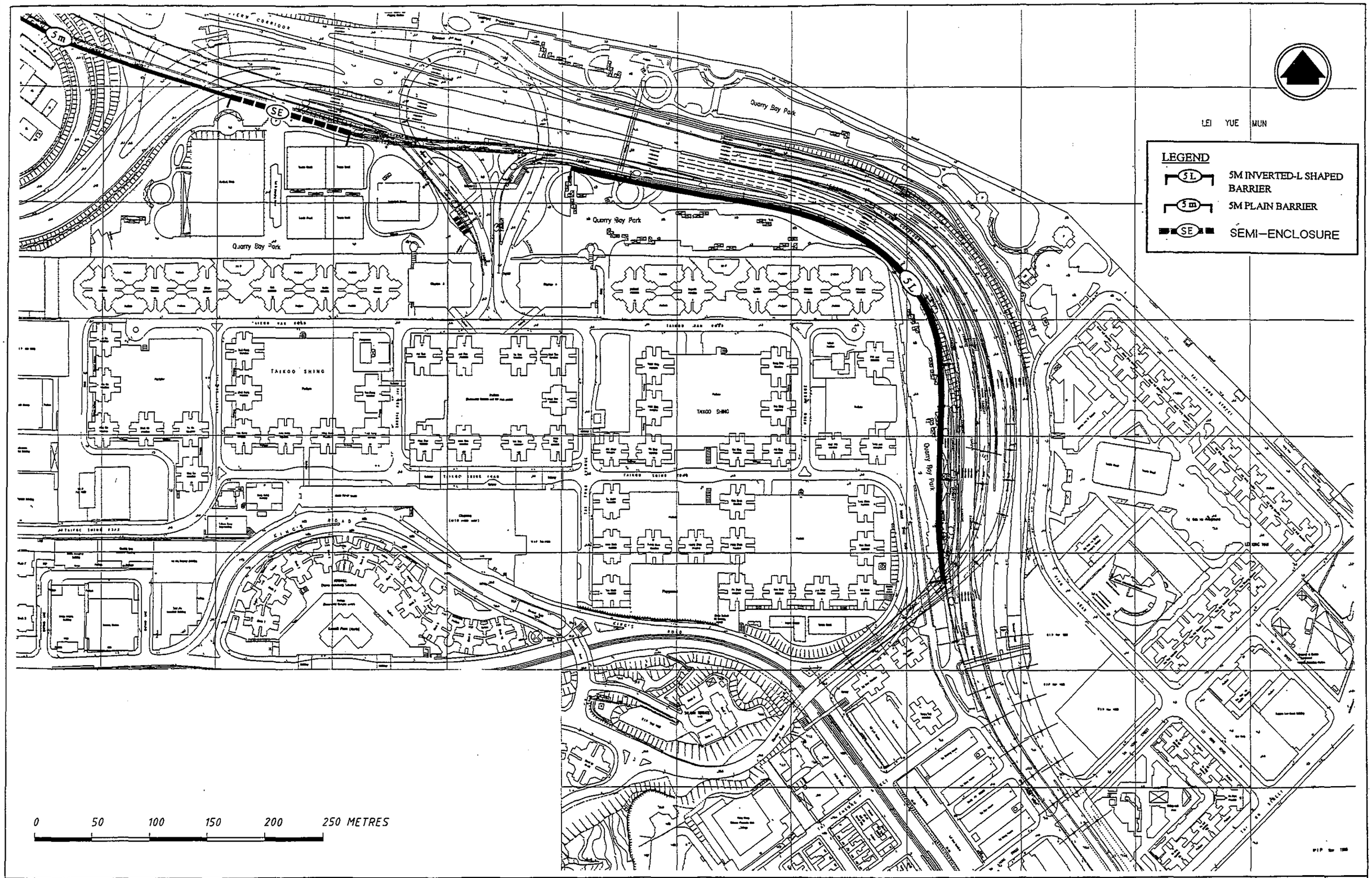


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

RECOMMENDED MITIGATION MEASURES (SHEET 1 OF 2)

FIGURE NO.	
5-4	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

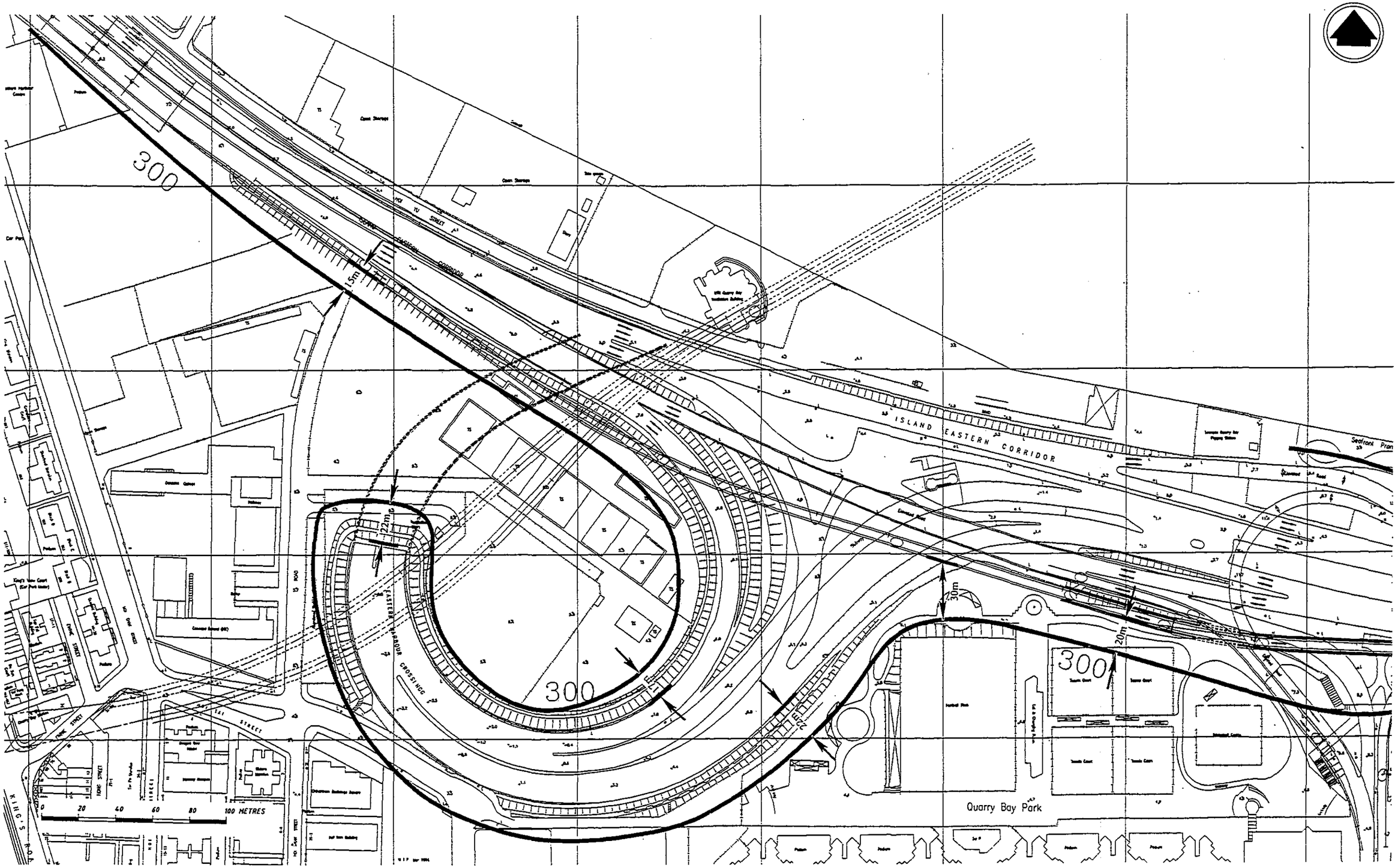


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

RECOMMENDED MITIGATION MEASURES (SHEET 2 OF 2)

FIGURE NO.	5-4
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

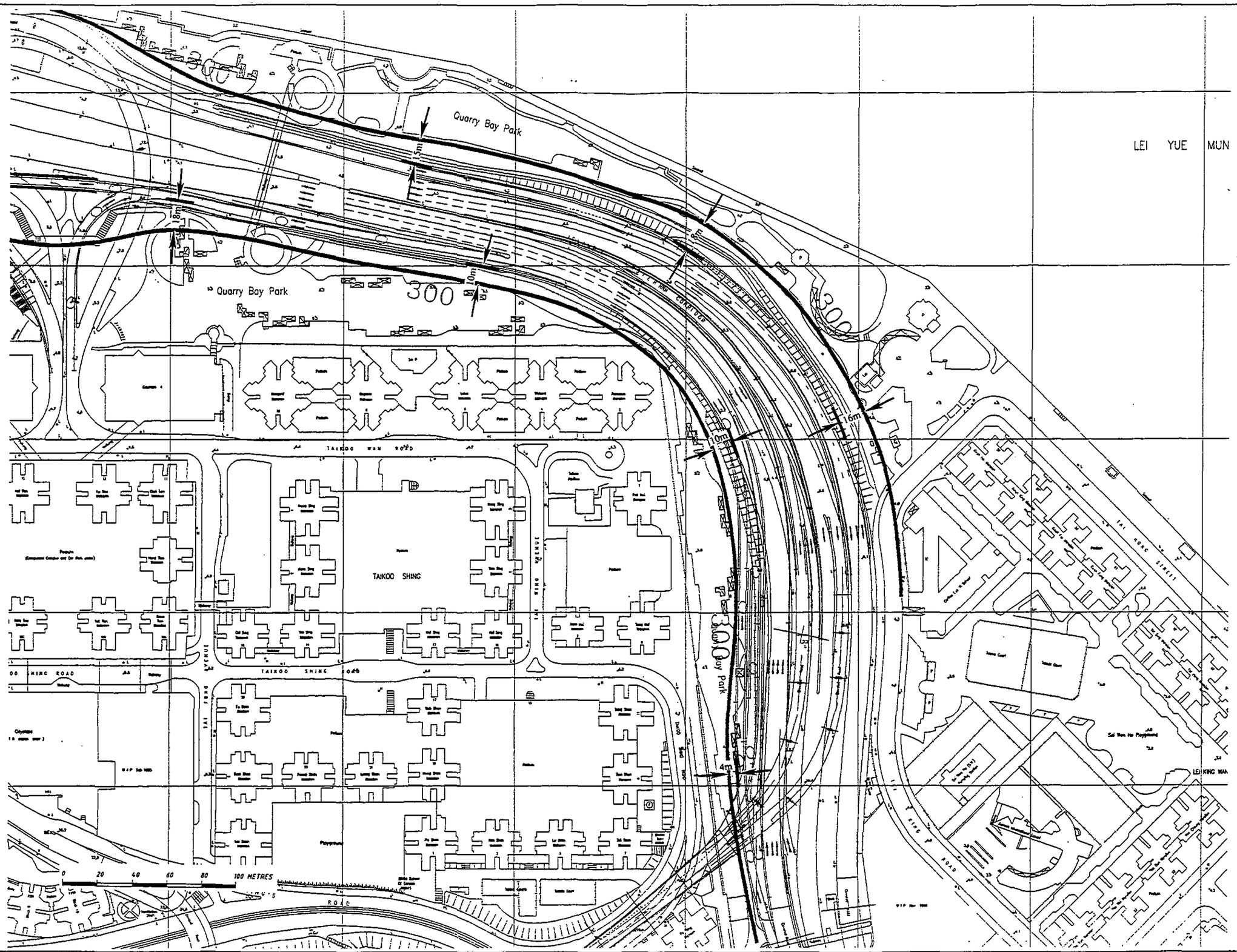


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

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

FIGURE NO.	
5-5	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

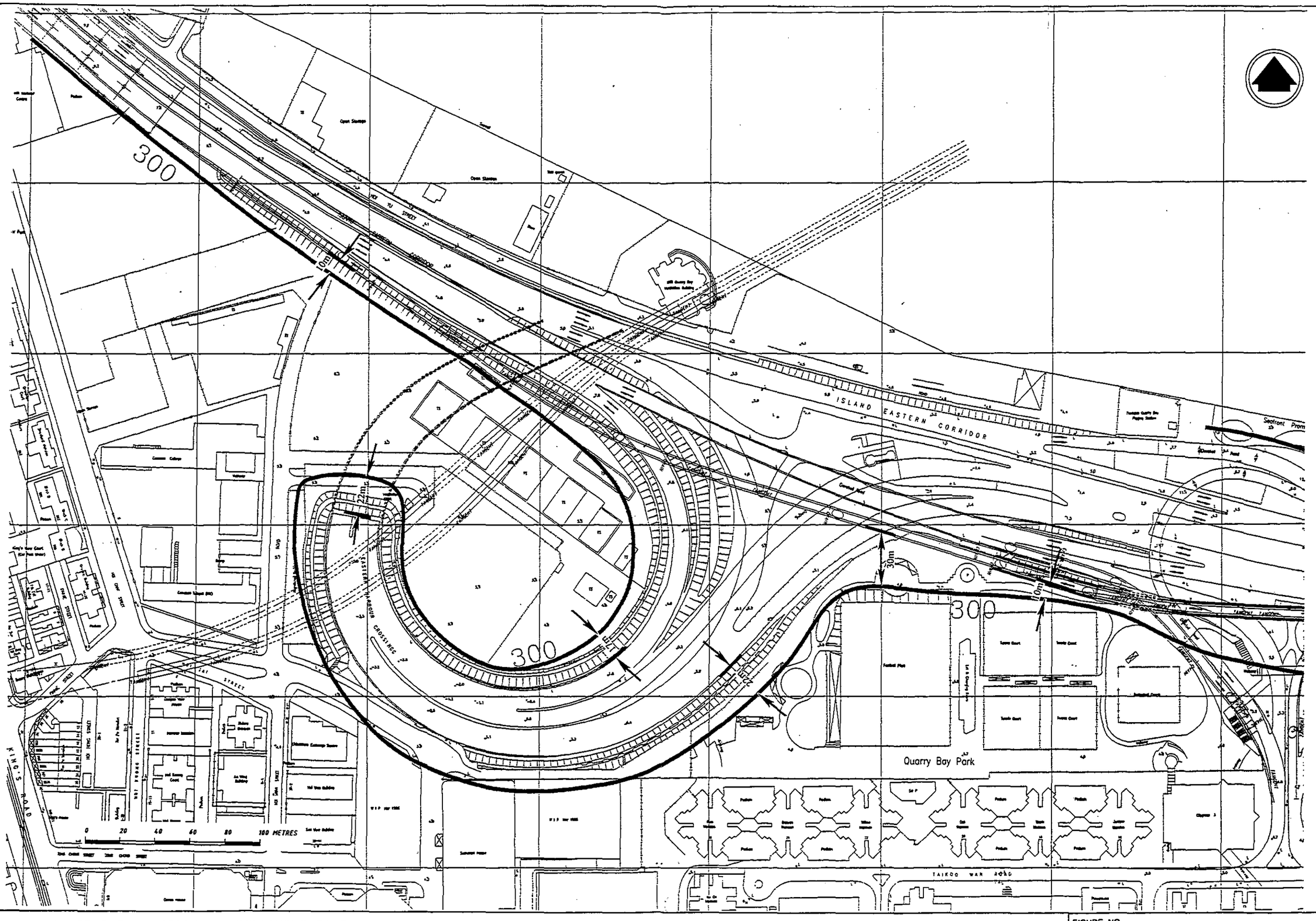


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

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

FIGURE NO.	
5-5	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

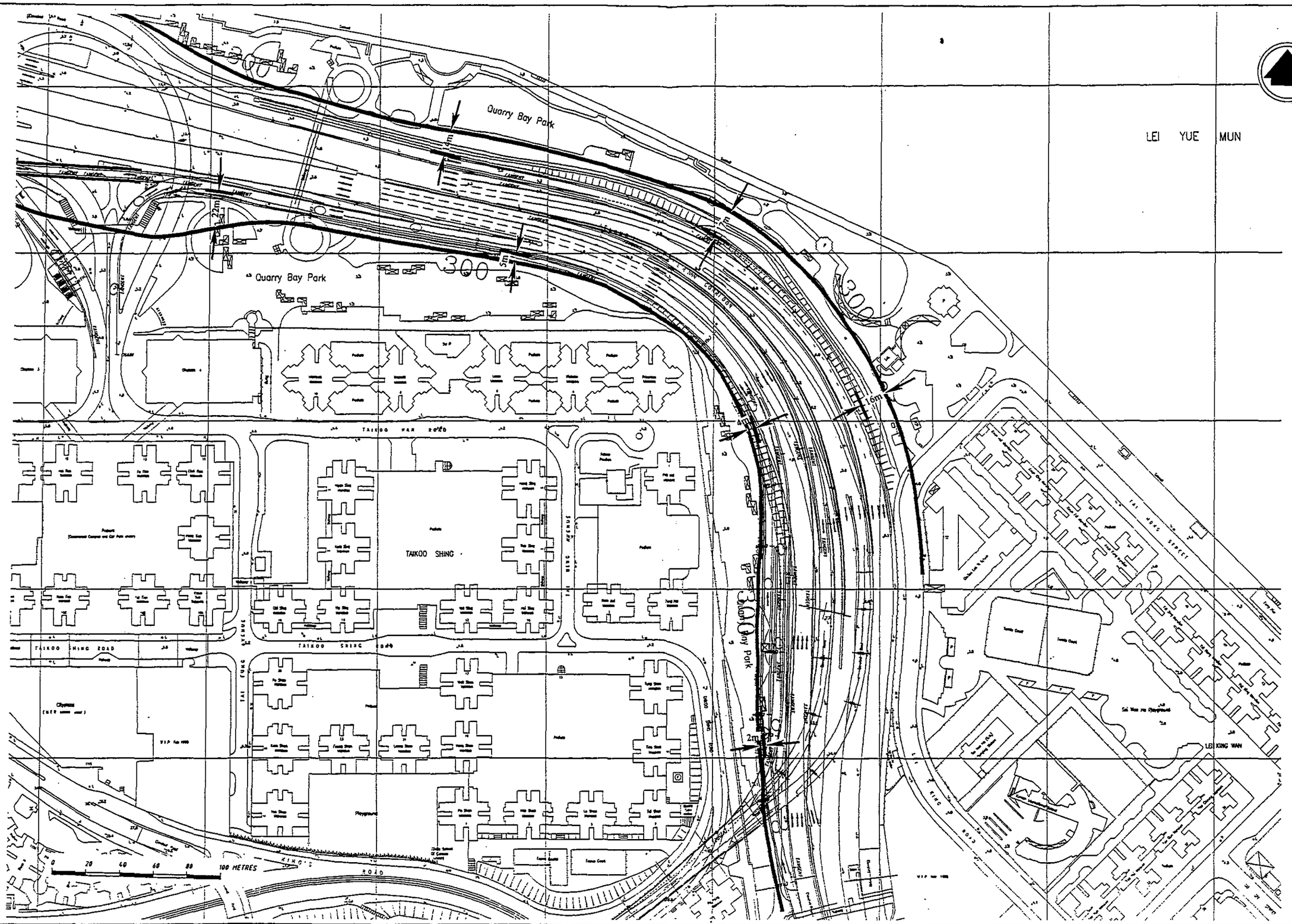


AGREEMENT NO. CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

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

FIGURE NO.	
5-6	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell

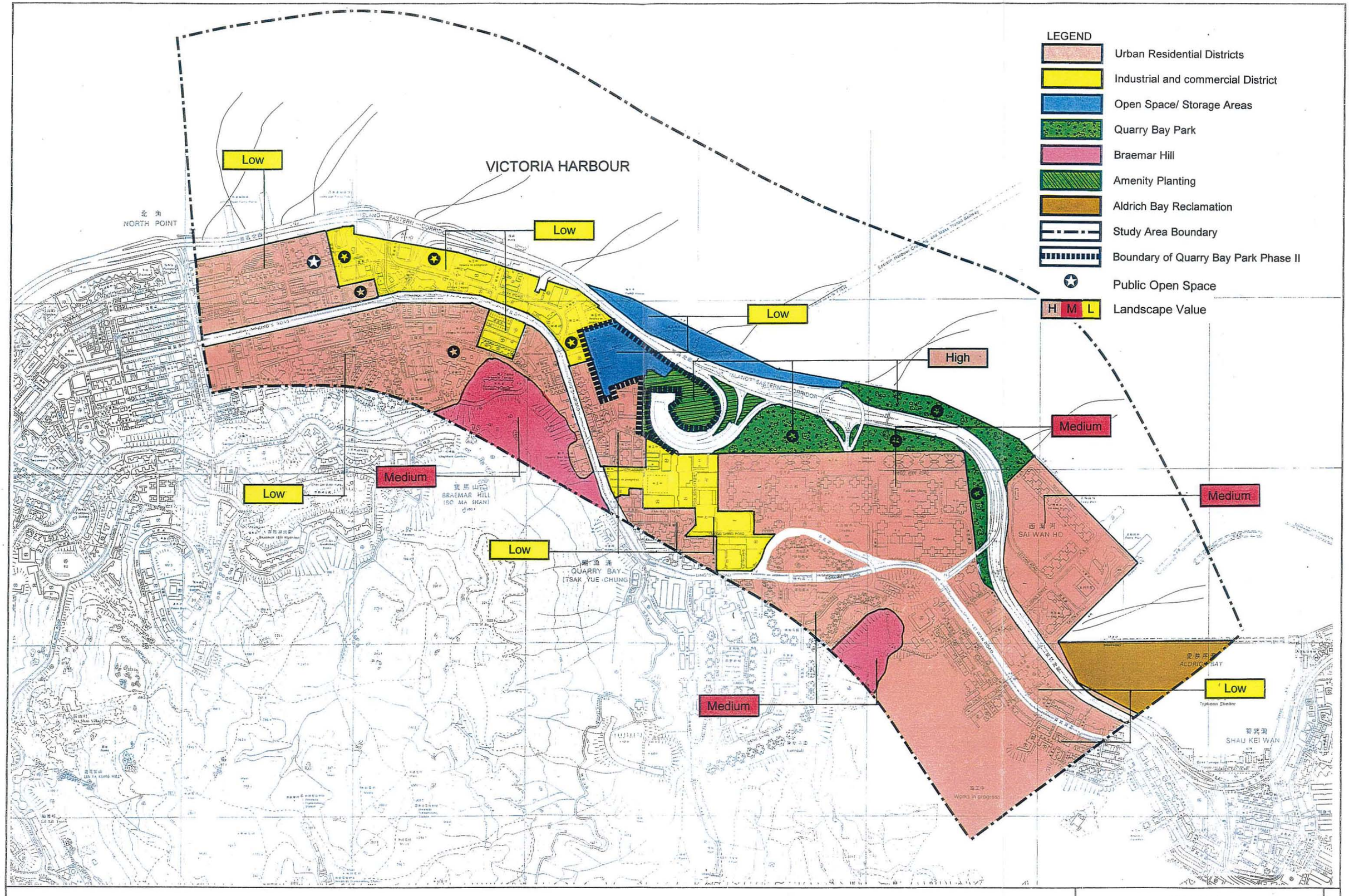


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

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

FIGURE NO.	
5-6	
SCALE: AS SHOWN	DATE: JANUARY 98

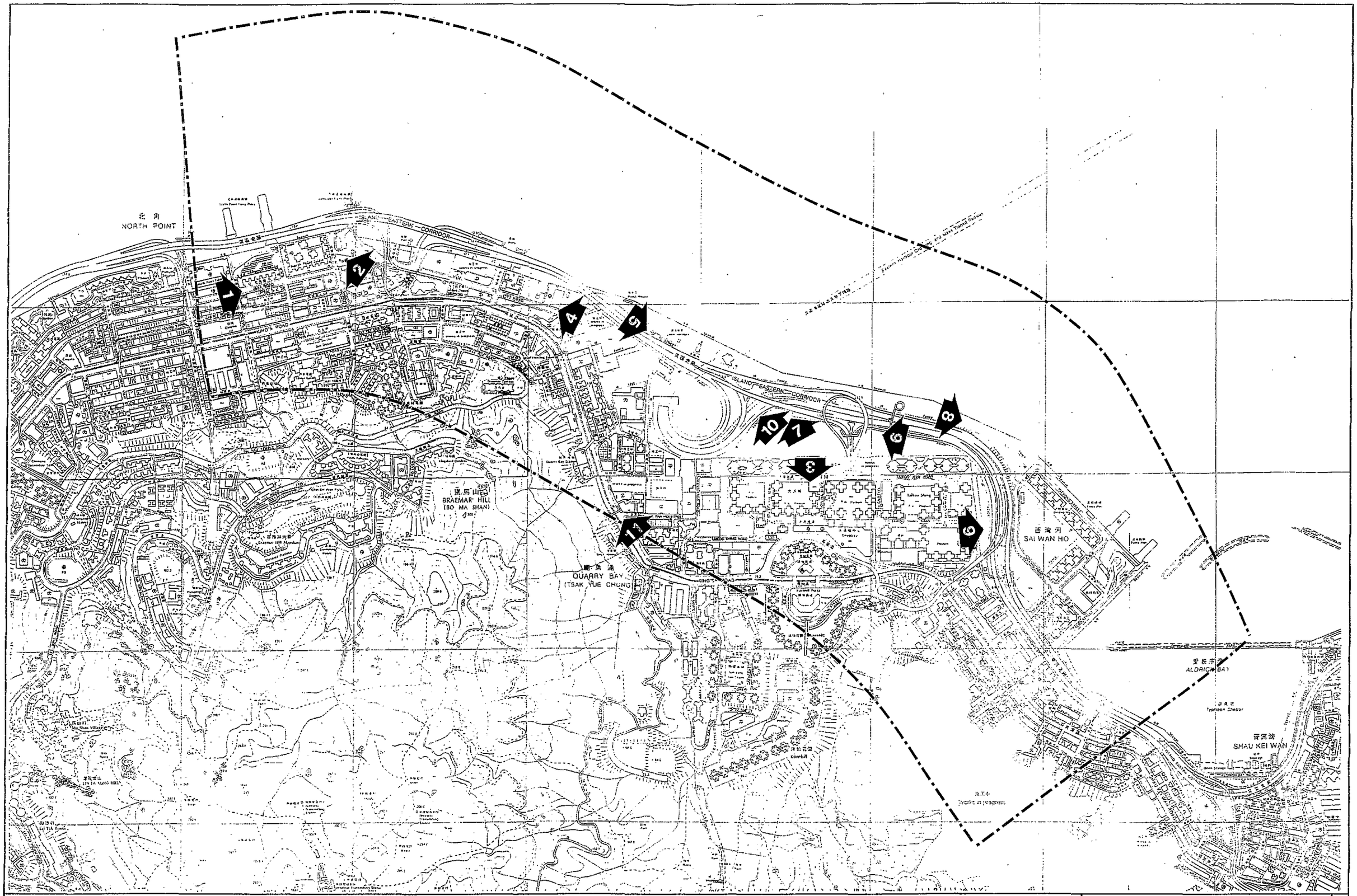
Maunsell



ISLAND EASTERN CORRIDOR
EXISTING LANDSCAPE CONTEXT

FIGURE 6.1

Scale: 1:10000 | Date: NOV. 1997



ISLAND EASTERN CORRIDOR
PHOTOGRAPHIC VIEWPOINTS

FIGURE 6.2

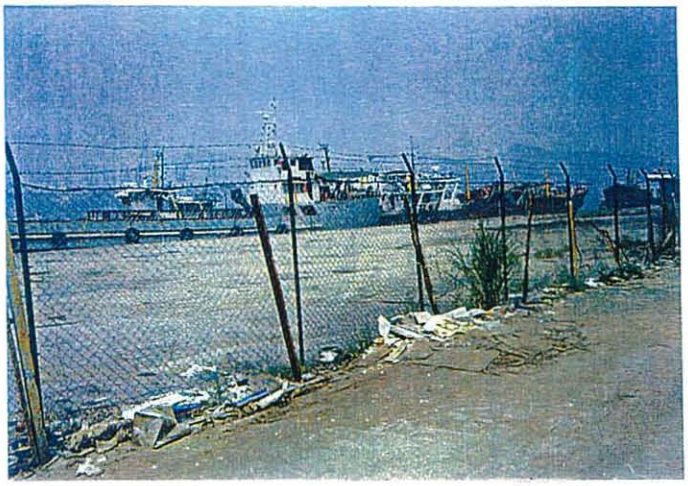
Date: NOV. 1997

Photograph 1
Typical view of the older medium rise residential areas.

Photograph 2
Tin Chiu Street Children's Playground.

Photograph 3
View within Taikoo Shing Housing Estate.

Photograph 4
View within Industrial and Commercial District.



Photograph 5
View from Hoi Yu Street showing the typical open space and storage areas with docking facilities.

Photograph 6
View of Quarry Bay Park adjacent to the Taikoo Shing Interchange.

ISLAND EASTERN CORRIDOR PHOTOGRAPHS 1	FIGURE 6.3 Date: NOV. 1997

Photograph 7
Dense screen and buffer planting along the north-western boundary of Quarry Bay Park.

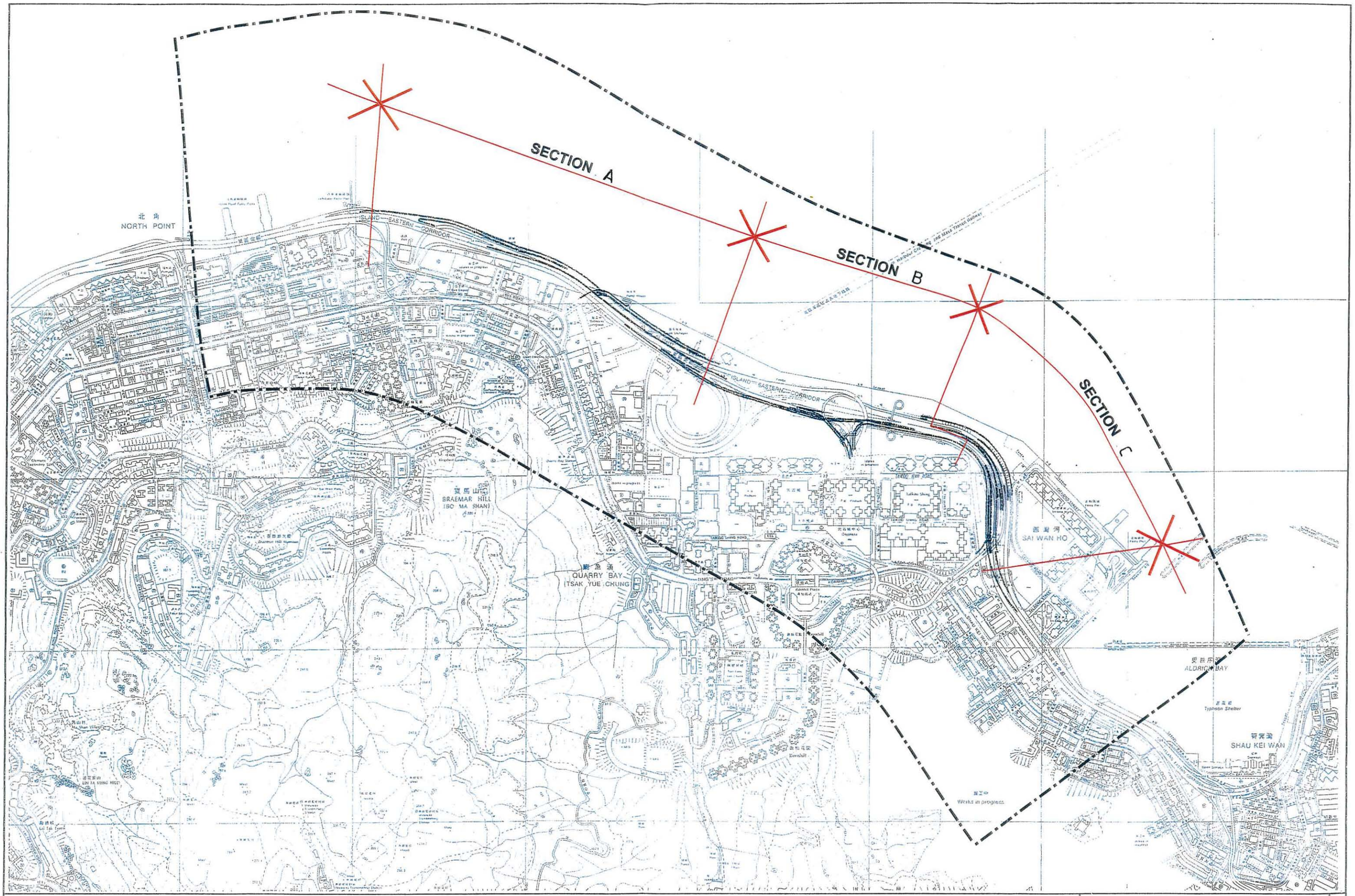
Photograph 8
Waterfront section of Quarry Bay Park.

Photograph 9
Dense screen and buffer planting along the eastern boundary of Quarry Bay Park.

Photograph 10
Amenity planting adjacent to the Eastern Harbour Crossing Tunnel Entrance.

Photograph 11
View along King's Road showing Braemar Hill.

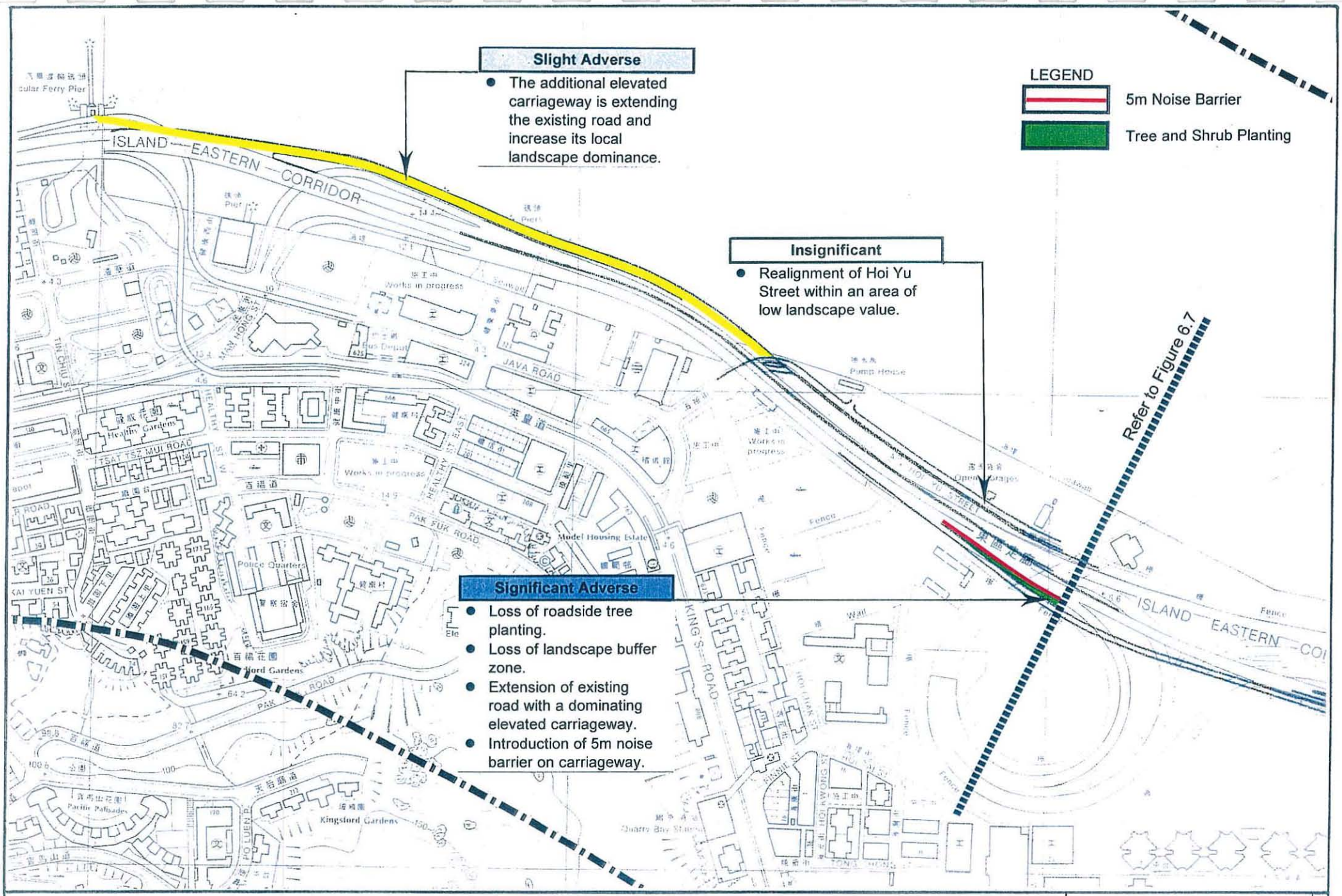
ISLAND EASTERN CORRIDOR PHOTOGRAPHS 2	FIGURE 6.4	
	Date: NOV. 1997	



ISLAND EASTERN CORRIDOR
ISLAND EASTERN CORRIDOR IMPROVEMENTS SECTIONS

FIGURE 6.5

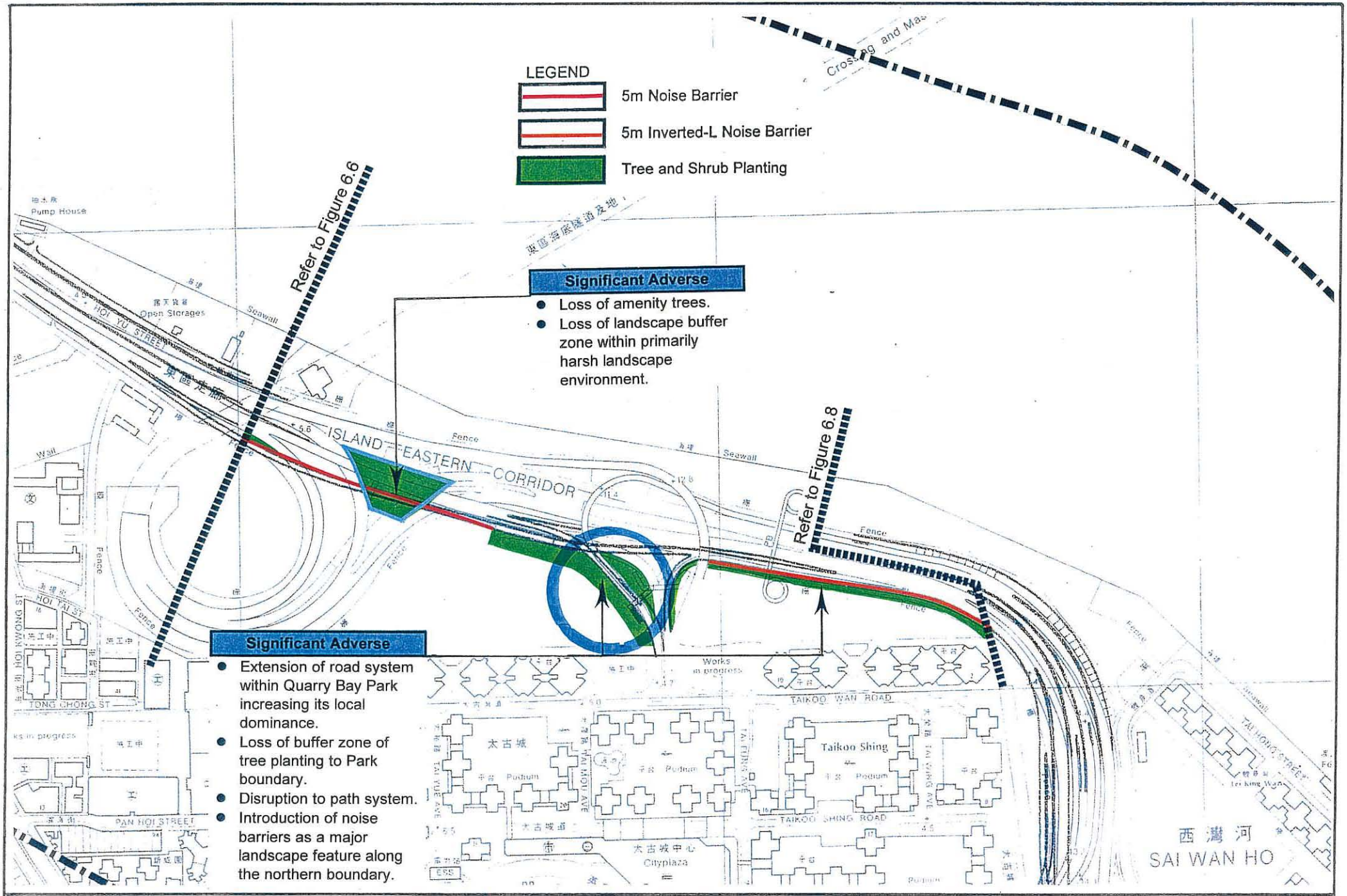
Scale: 1:10000 | Date: NOV. 1997



ISLAND EASTERN CORRIDOR
LANDSCAPE IMPACTS SECTION A

FIGURE 6.6

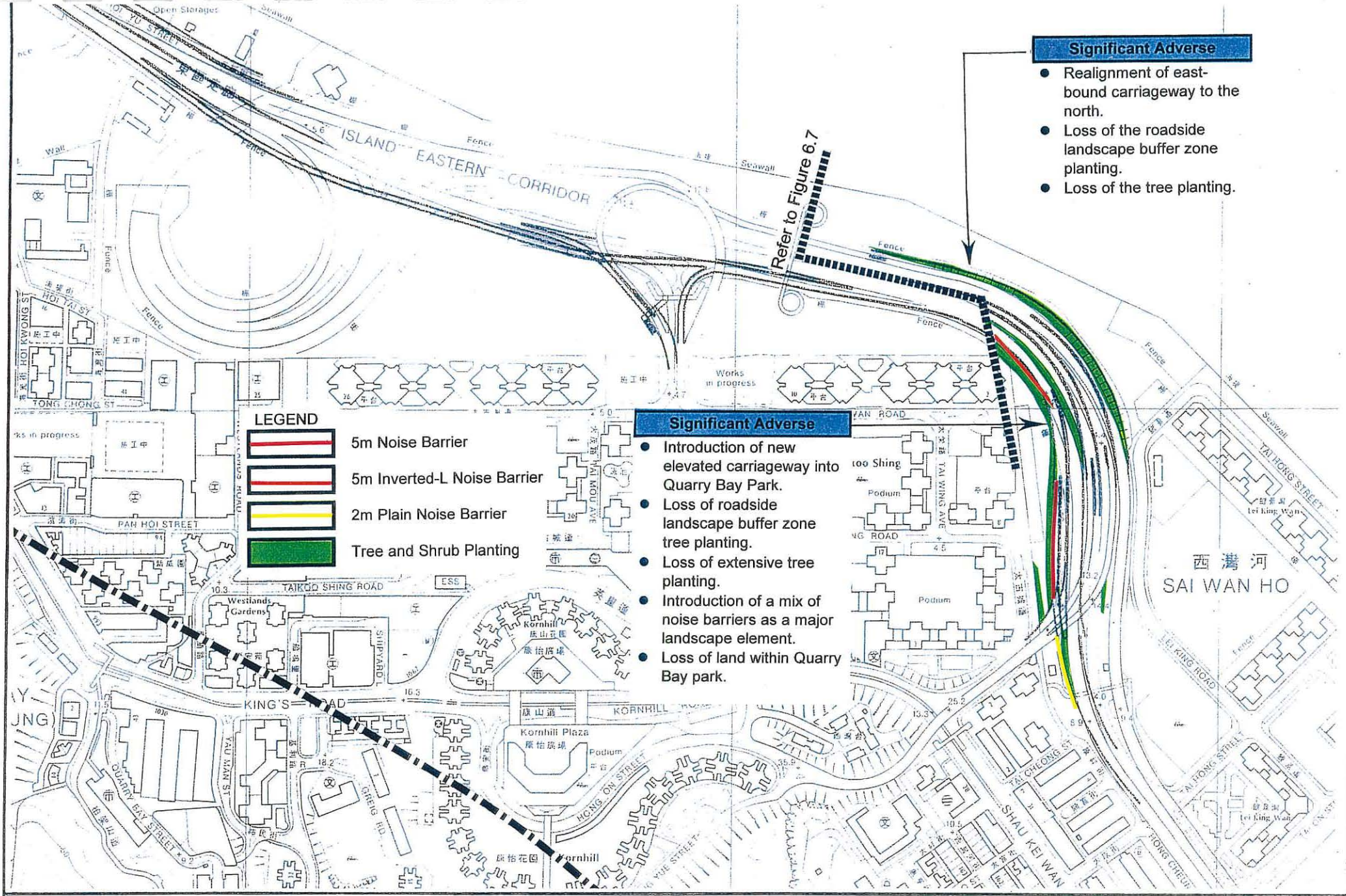
Scale: 1:5000 NOV. 1997



ISLAND EASTERN CORRIDOR
LANDSCAPE IMPACTS SECTION B

FIGURE 6.7

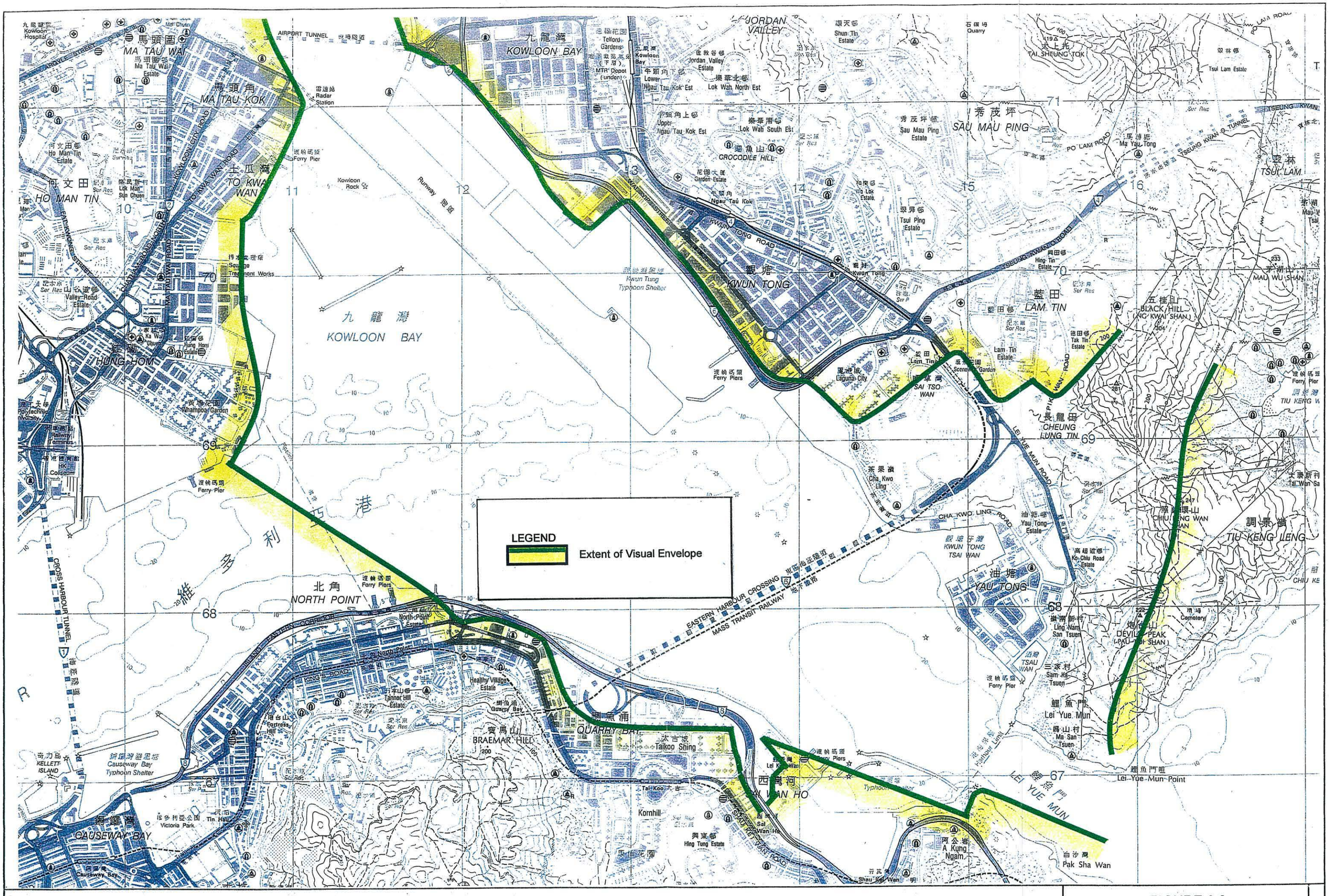
Scale: 1:5000 NOV. 1997



ISLAND EASTERN CORRIDOR
LANDSCAPE IMPACTS SECTION C

FIGURE 6.8

Scale: 1:5000 NOV. 1997



ISLAND EASTERN CORRIDOR
EXTENT OF VISUAL ENVELOPE

FIGURE 6.9

Scale: 1:20000 | Date: NOV. 1997

LEGEND

- Primary VSRs
- Secondary VSRs
- Victoria Habour Boat Traffic VSRs
- Quarry Bay Park VSRs
- Vehicular VSRs
- East and West Kowloon VSRs

北角
NORTH POINT

BRAEMAR HILL
(BO MA SHAN)

QUARRY BAY
(TSAK YUE CHUNG)

SAI WAN HO

ALDRICH BAY

SHAU KEI WAN

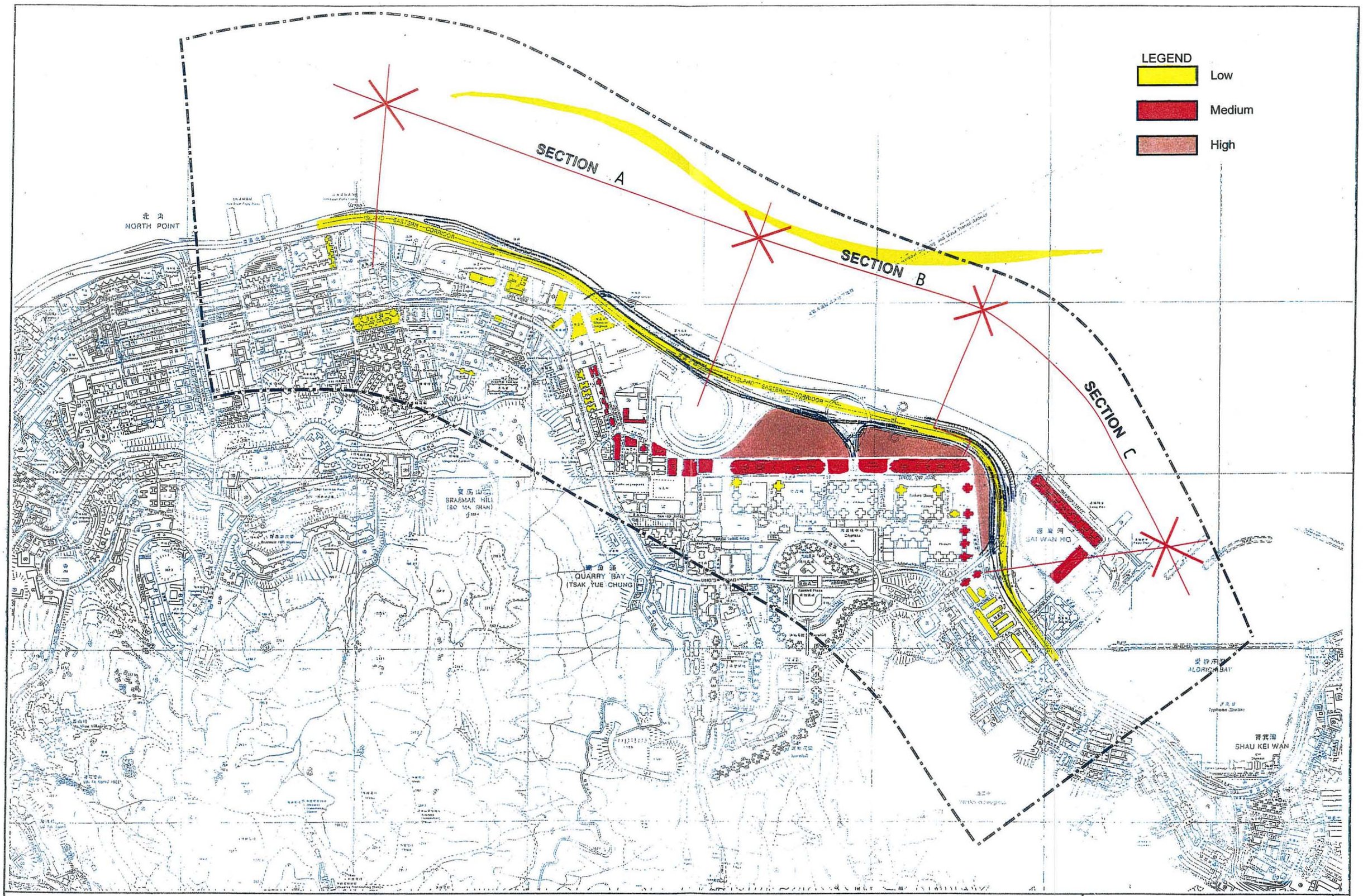
Works in progress

ISLAND EASTERN CORRIDOR
VISUALLY SENSITIVE RECEIVERS

FIGURE 6 .10

Scale: 1:10000

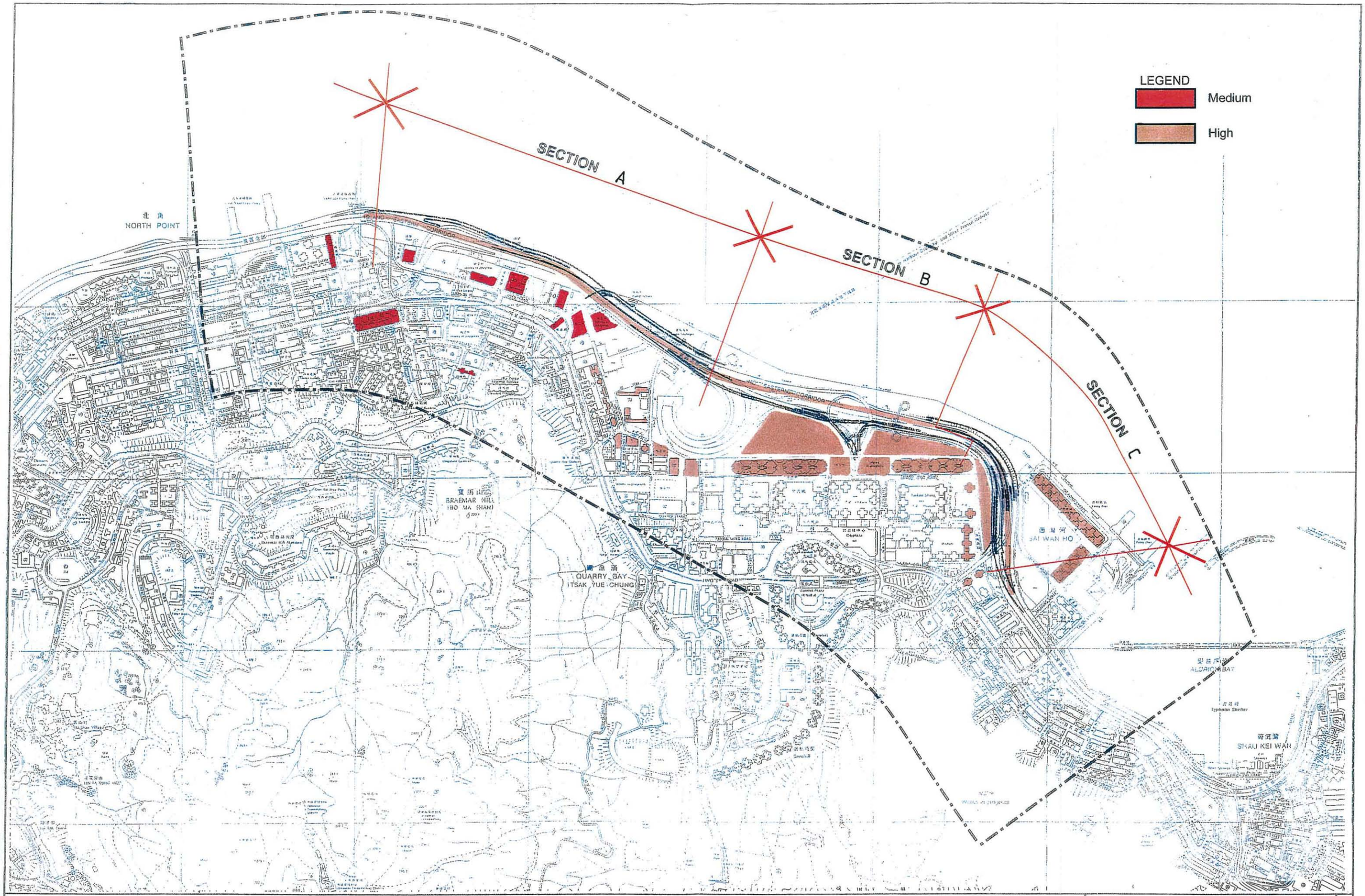
NOV. 1997



ISLAND EASTERN CORRIDOR
VISUAL QUALITY

FIGURE 6.10a

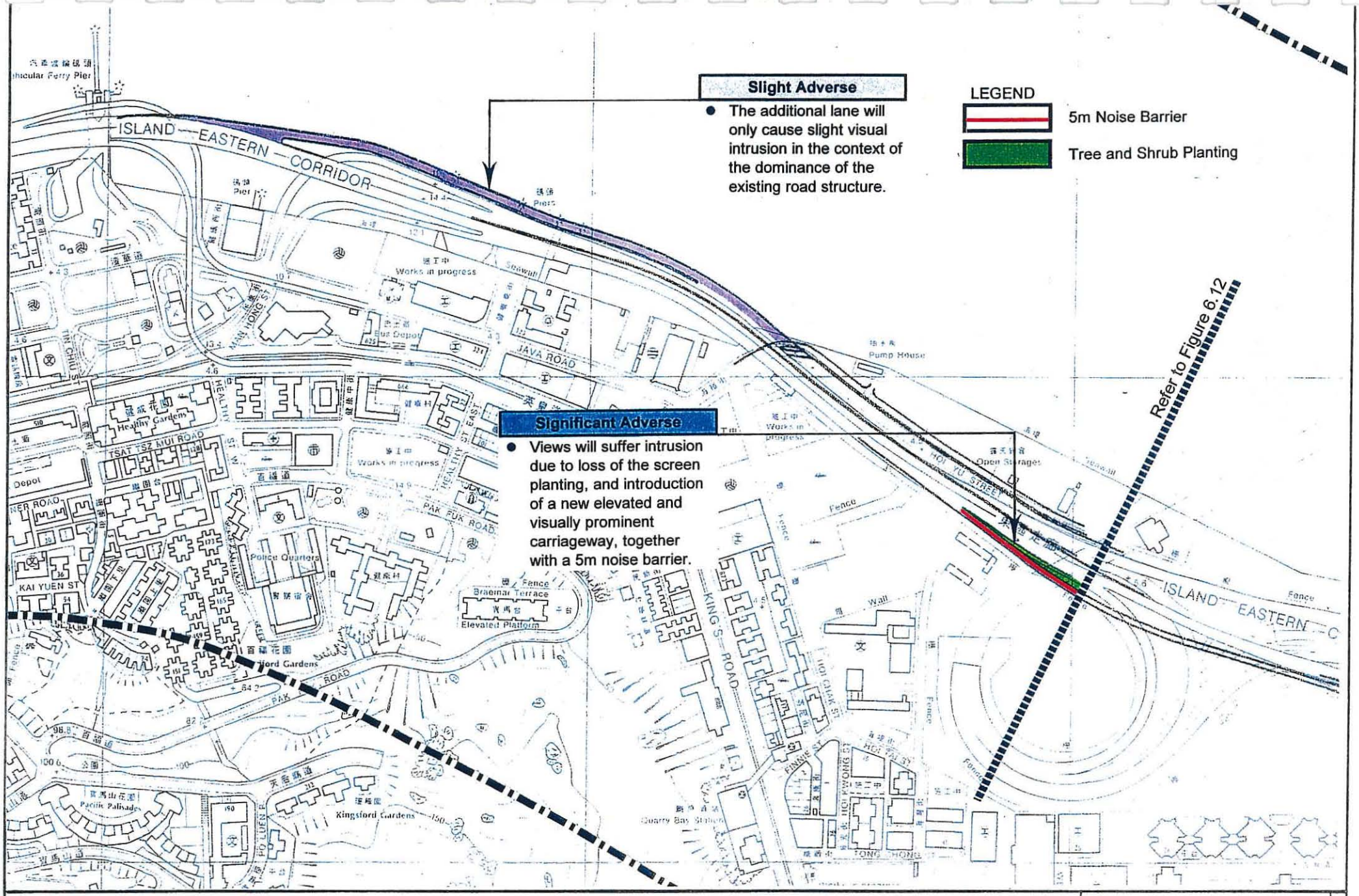
Scale: 1:10000 | Date: NOV. 1997



ISLAND EASTERN CORRIDOR
VISUAL IMPACT ON VSRs.

FIGURE 6.10b

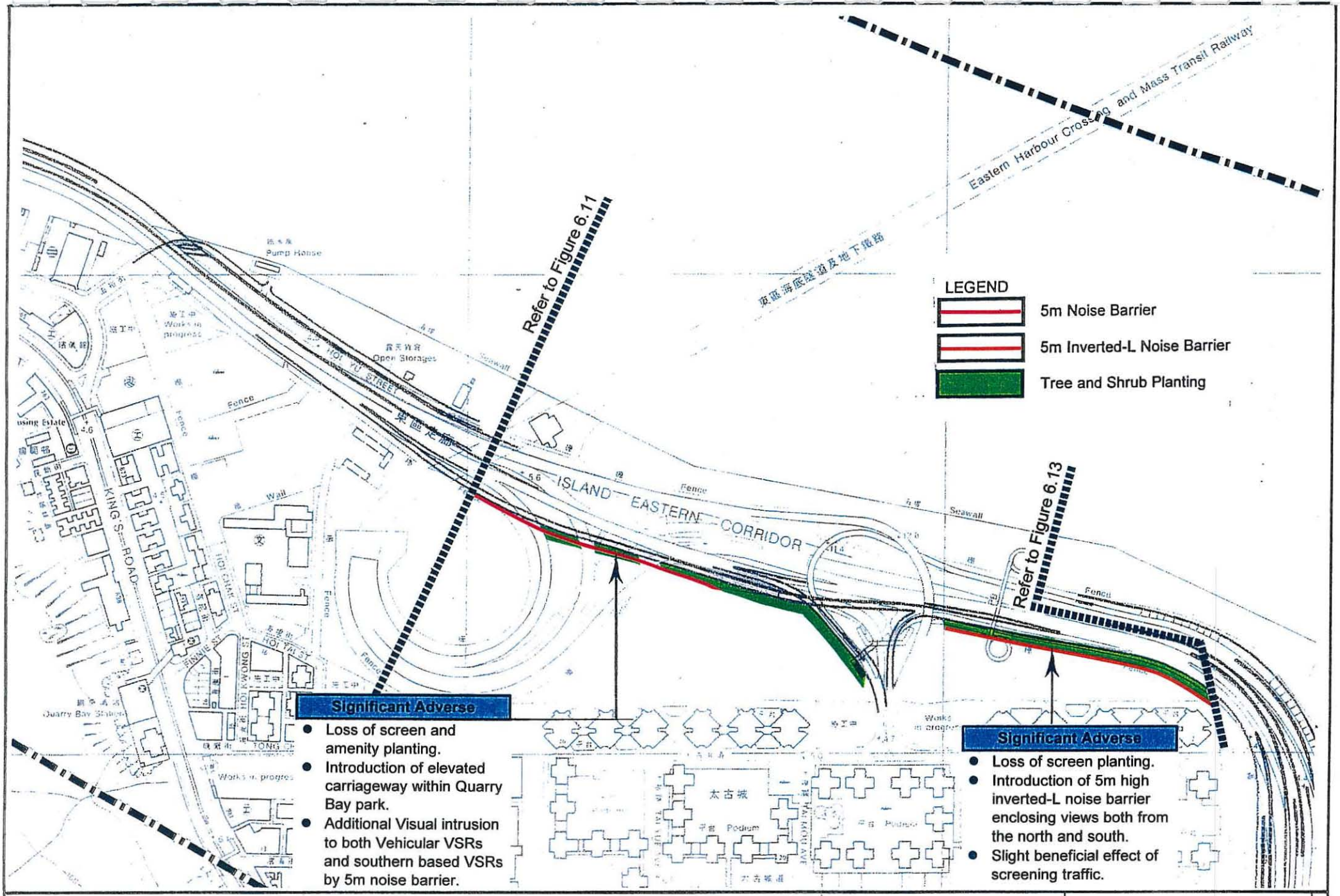
Scale: 1:10000 | Date: NOV. 1997



ISLAND EASTERN CORRIDOR
VISUAL IMPACTS SECTION A

FIGURE 6.11

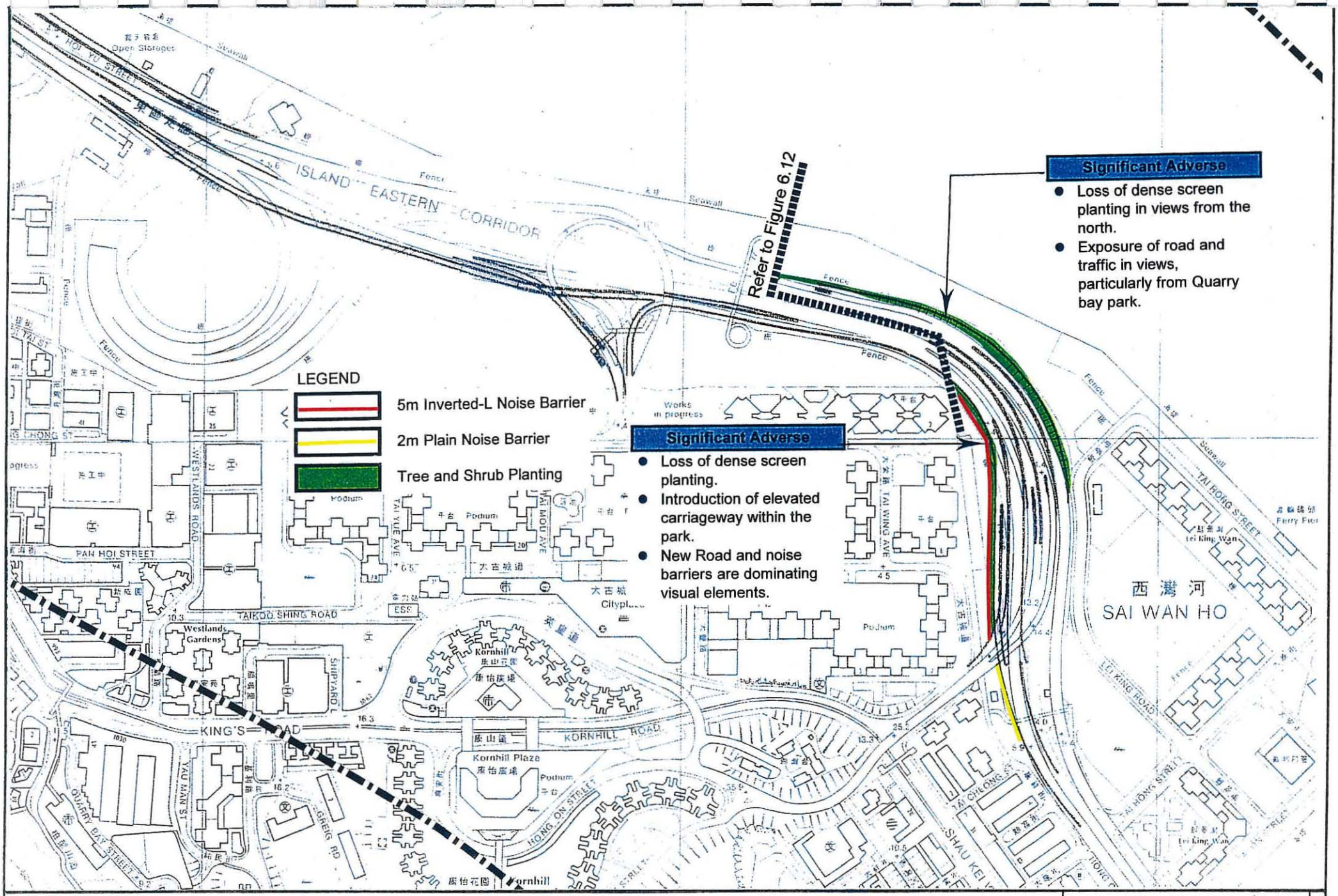
Scale: 1:5000 NOV. 1997



ISLAND EASTERN CORRIDOR
VISUAL IMPACTS SECTION B

FIGURE 6.12

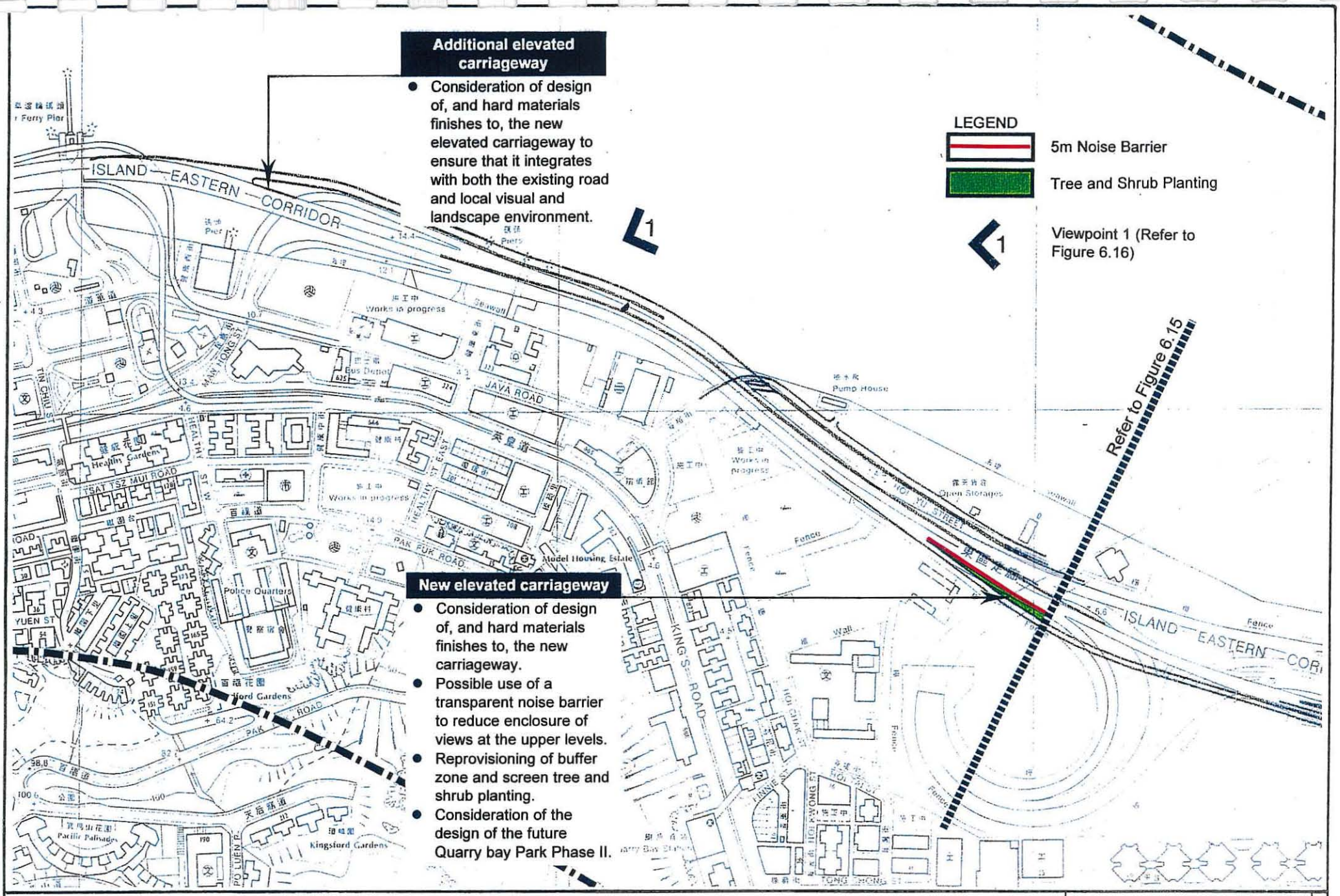
Scale: 1:5000 | NOV. 1997



ISLAND EASTERN CORRIDOR
VISUAL IMPACTS SECTION C

FIGURE 6.13

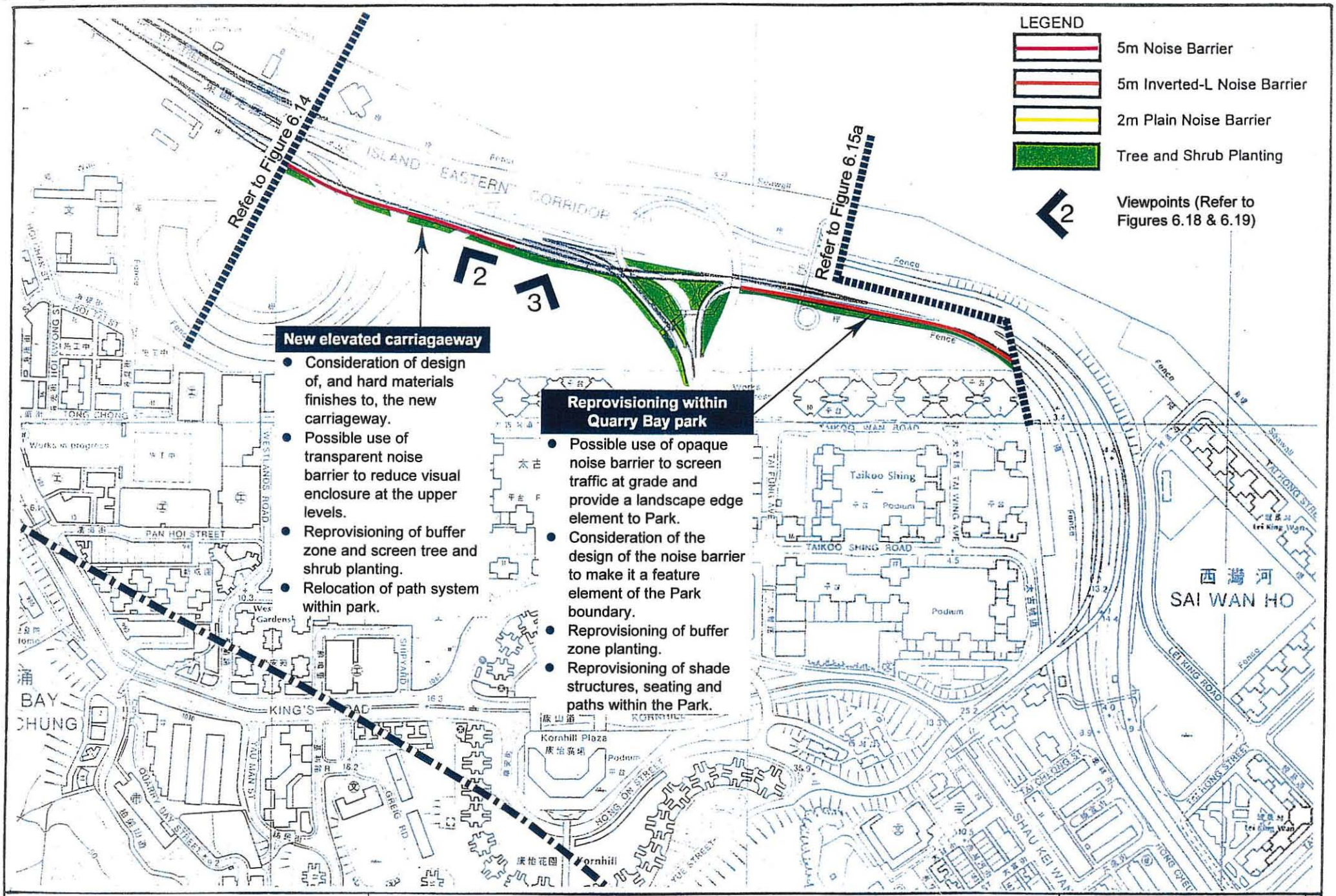
Scale: 1:5000 NOV. 1997



ISLAND EASTERN CORRIDOR
MITIGATION MEASURES - SECTION A

FIGURE 6.14

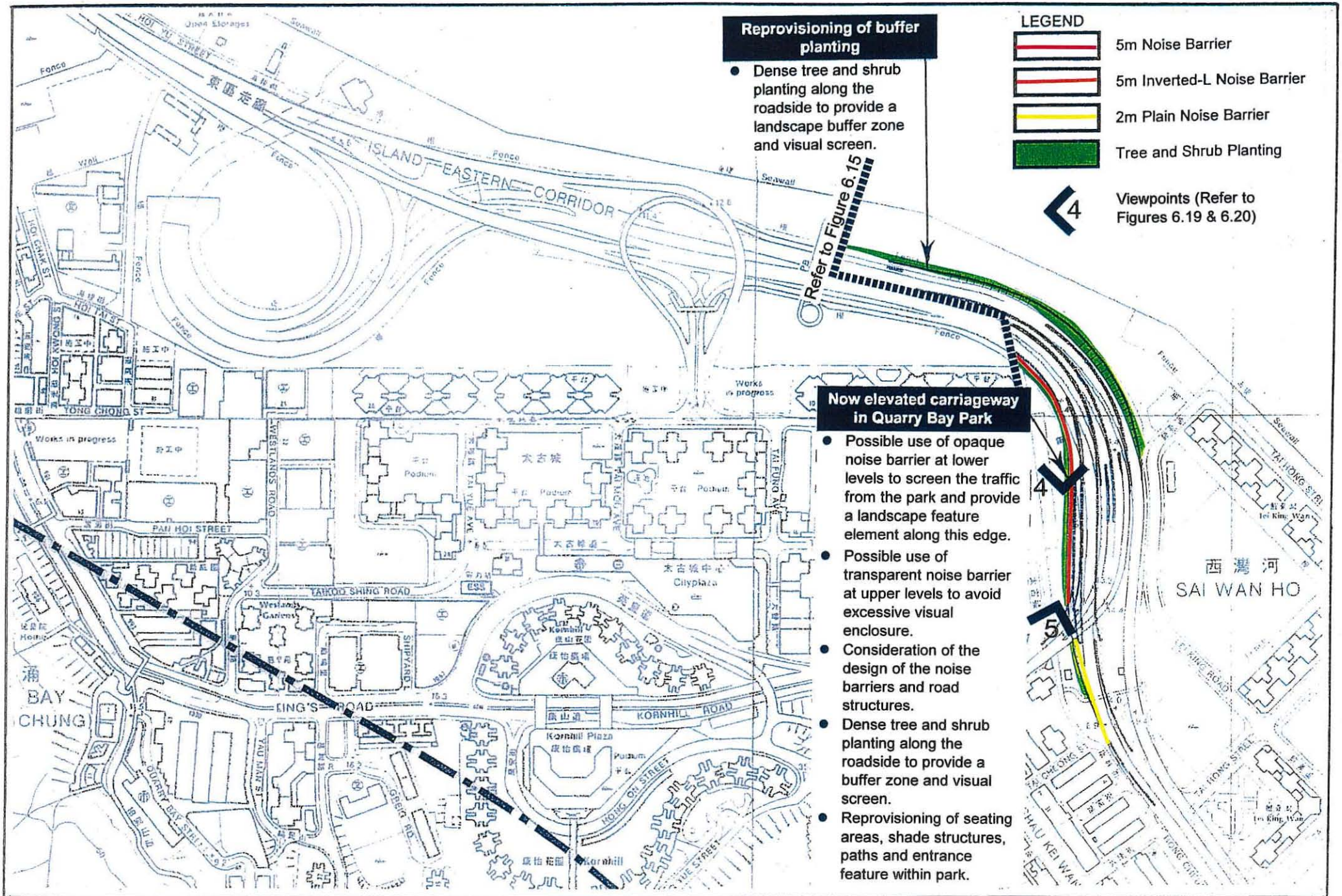
Scale: 1:5000 | JAN 1998



ISLAND EASTERN CORRIDOR
MITIGATION MEASURES - SECTION B

FIGURE 6.15

Scale: 1:5000 JAN 1998



ISLAND EASTERN CORRIDOR
MITIGATION MEASURES - SECTION C

FIGURE 6.15a

Scale: 1:5000 JAN 1998

Existing Viewpoint 1

Existing Viewpoint 3

Existing Viewpoint 4

Existing Viewpoint 5

ISLAND EASTERN CORRIDOR
EXISTING VIEWPOINTS OF PHOTOMONTAGE AND SKETCHES

FIGURE No. FIGURE 6.15b

JAN. 1998

ISLAND EASTERN CORRIDOR
SECTION A VIEWPOINT 1

FIGURE 6.16

JAN 1998

ISLAND EASTERN CORRIDOR
SECTION B VIEWPOINT 2

FIGURE 6.17

JAN 1998

ISLAND EASTERN CORRIDOR
SECTION B VIEWPOINT 3

FIGURE 6.18

JAN 1998

ISLAND EASTERN CORRIDOR
SECTION C VIEWPOINT 4

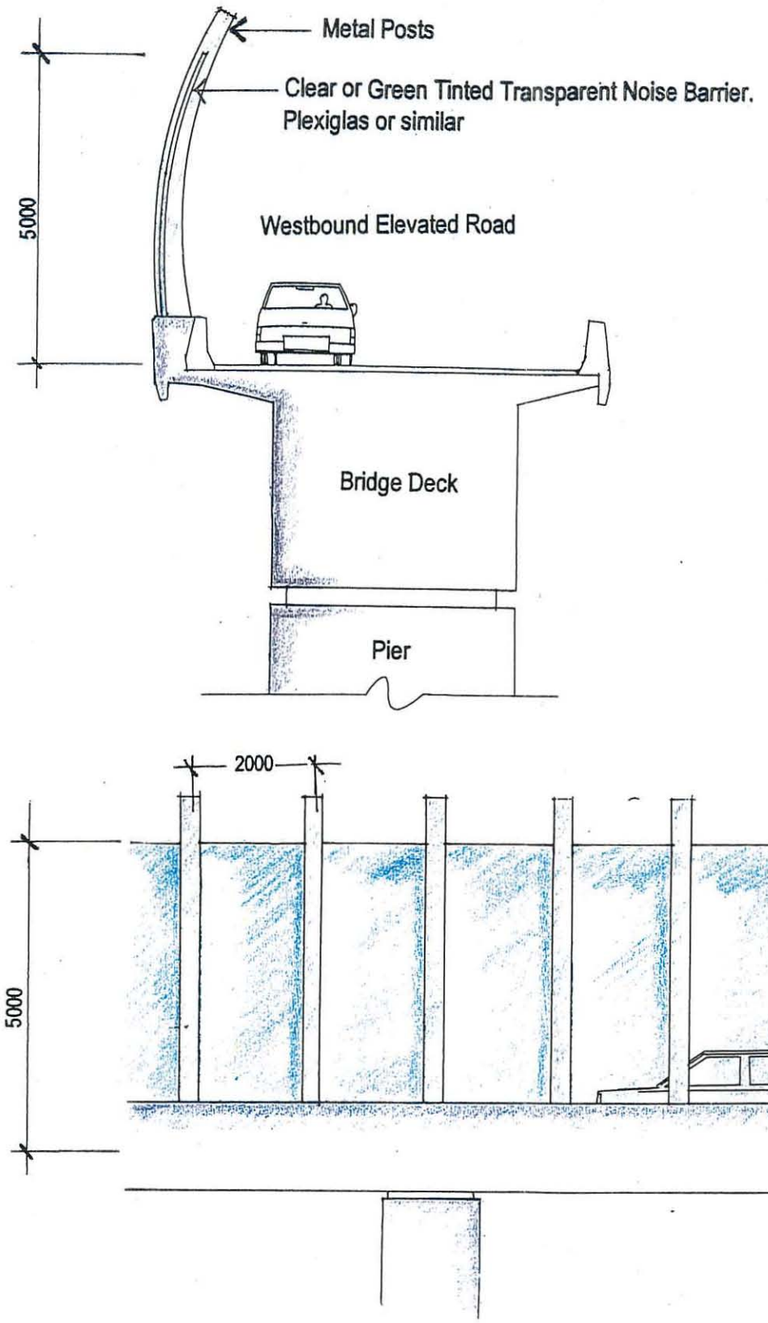
FIGURE 6.19

JAN 1998

ISLAND EASTERN CORRIDOR
SECTION C VIEWPOINT 5

FIGURE 6.20

JAN 1998



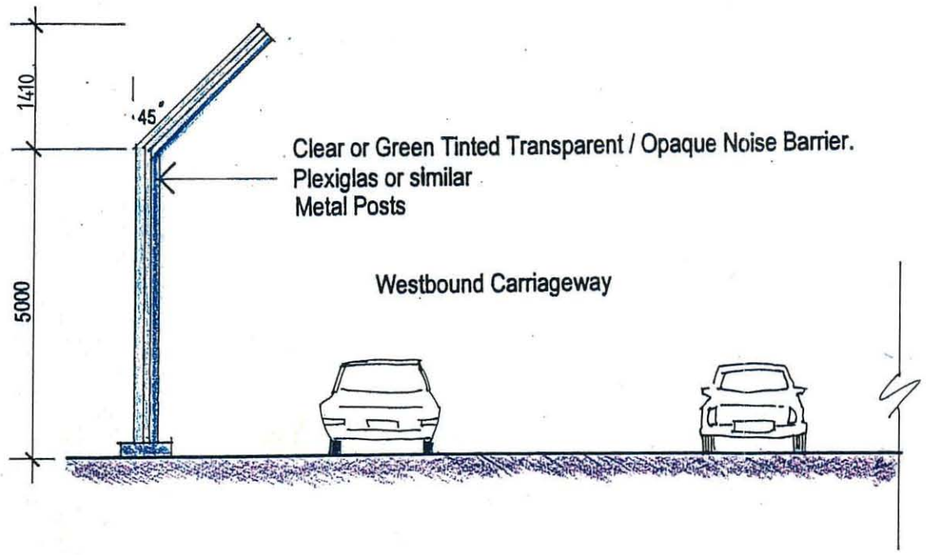
ISLAND EASTERN CORRIDOR

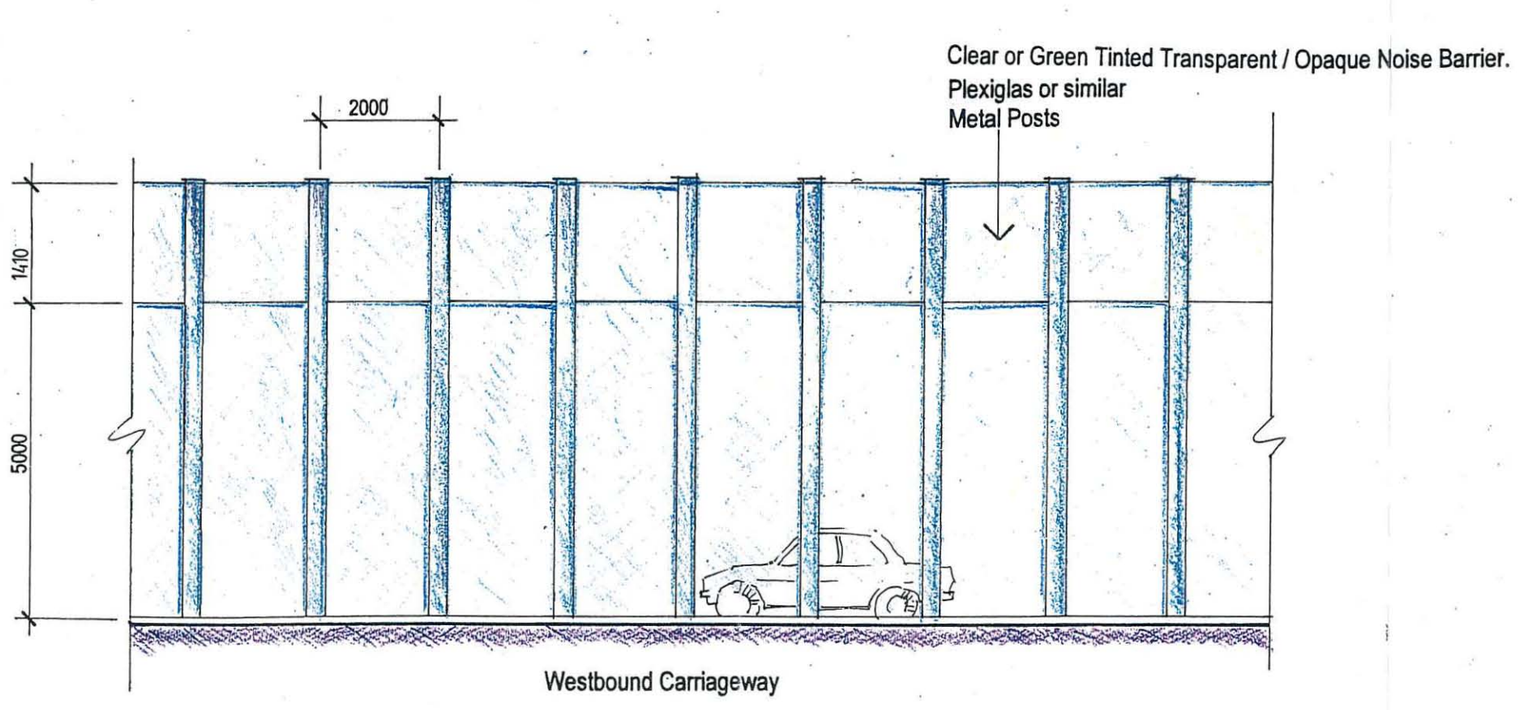
Plain Barrier sketch

FIGURE 6.21

Scale: 1:100

Date: JAN. 1998



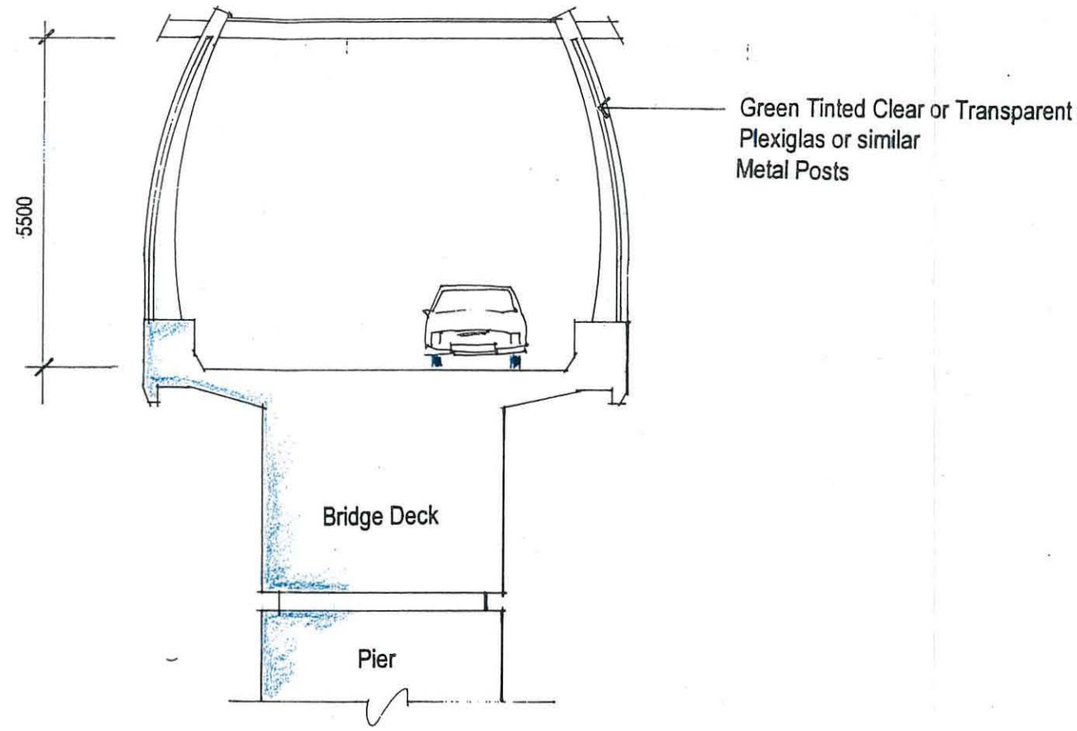


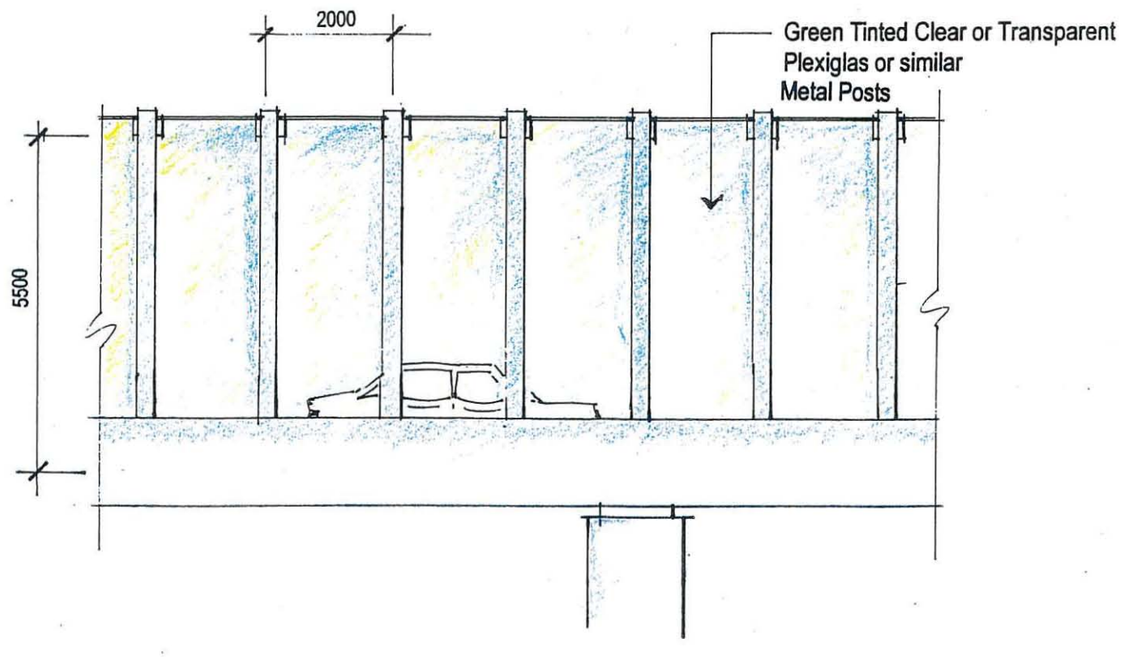
ISLAND EASTERN CORRIDOR

Inverted L Barrier sketch

FIGURE 6.22

Scale: 1:100 | Date: JAN. 1998



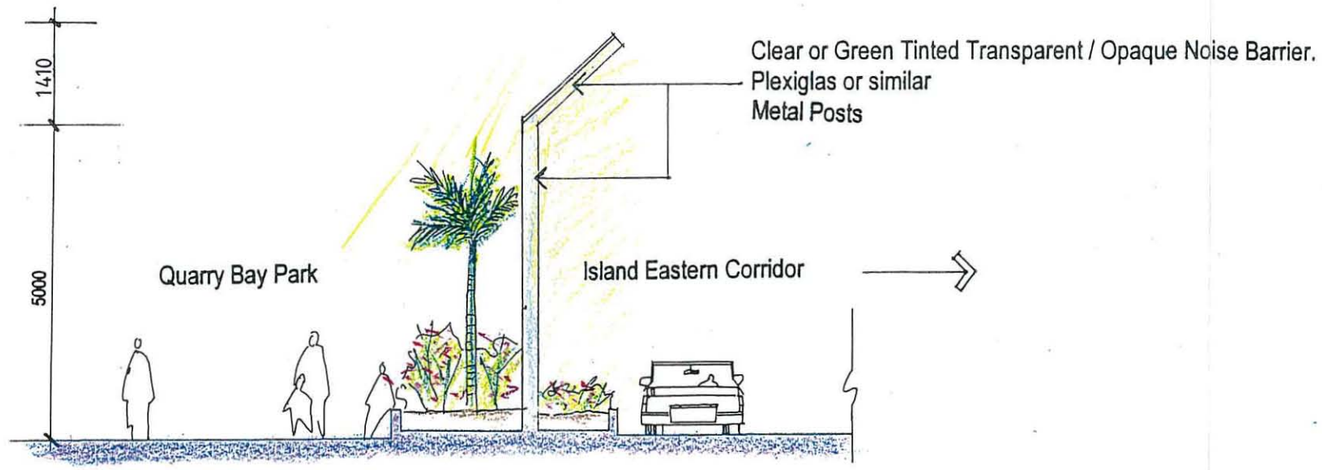


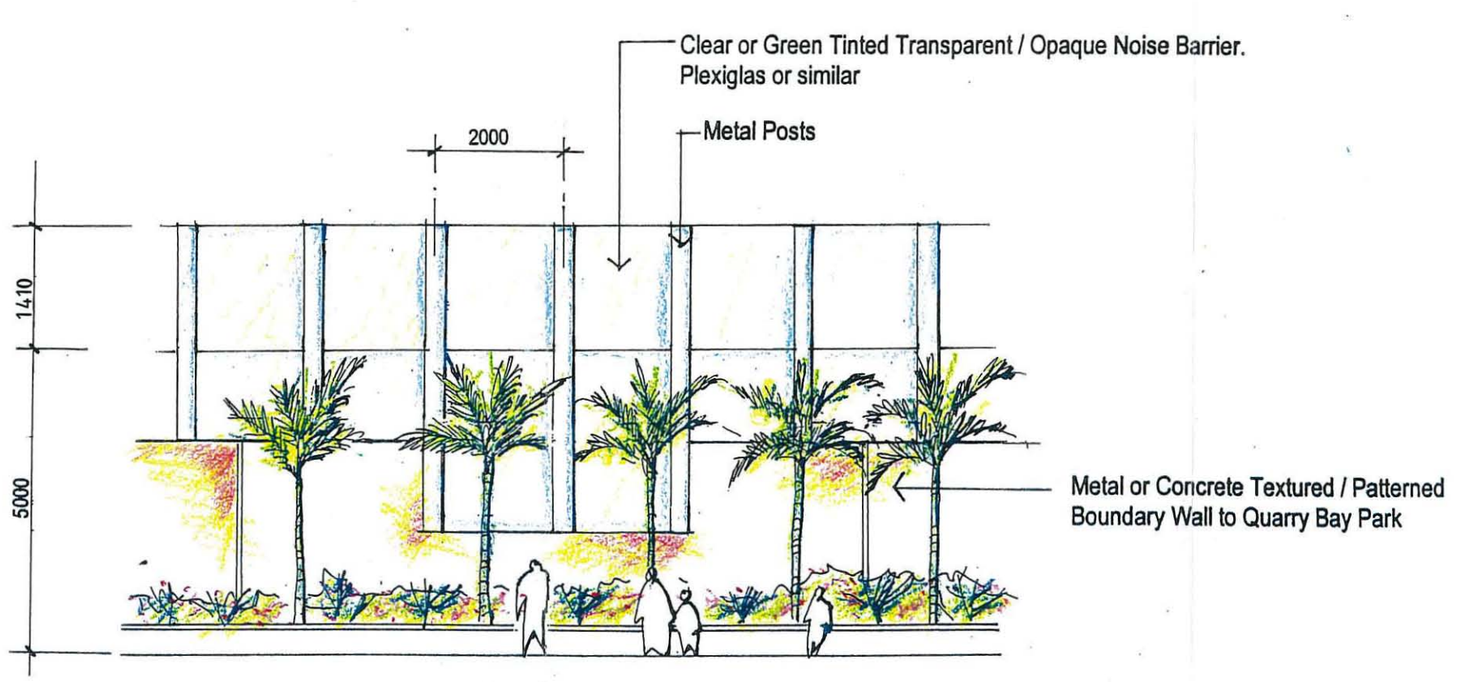
ISLAND EASTERN CORRIDOR

Semi-enclosure sketch

FIGURE 6.23

Scale: 1:100 | Date: JAN. 1998



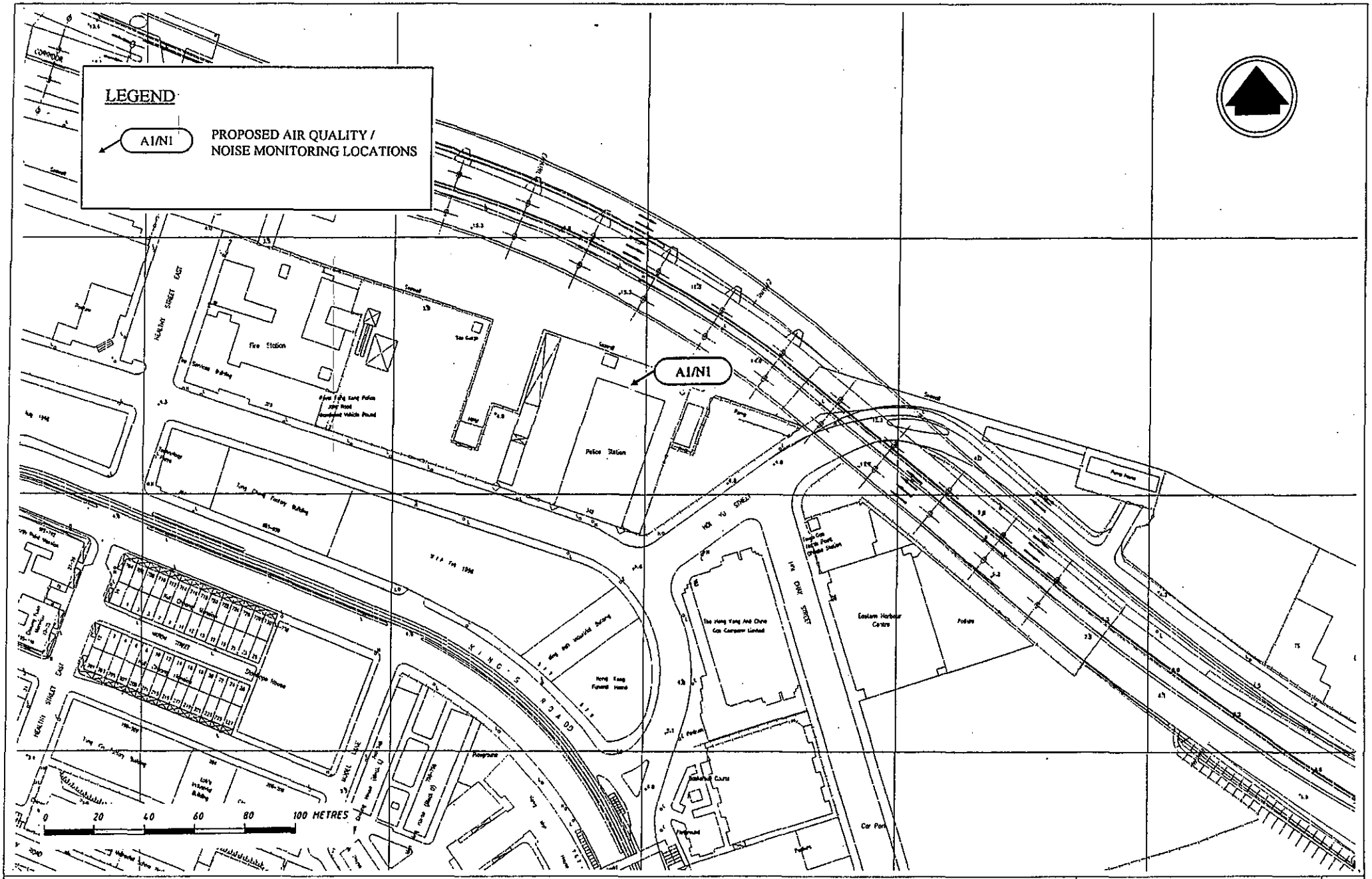


ISLAND EASTERN CORRIDOR

Inverted L Barrier as Boundary Wall to Quarry Bay Park sketch

FIGURE 6.24

Scale: 1:100 | Date: JAN. 1998

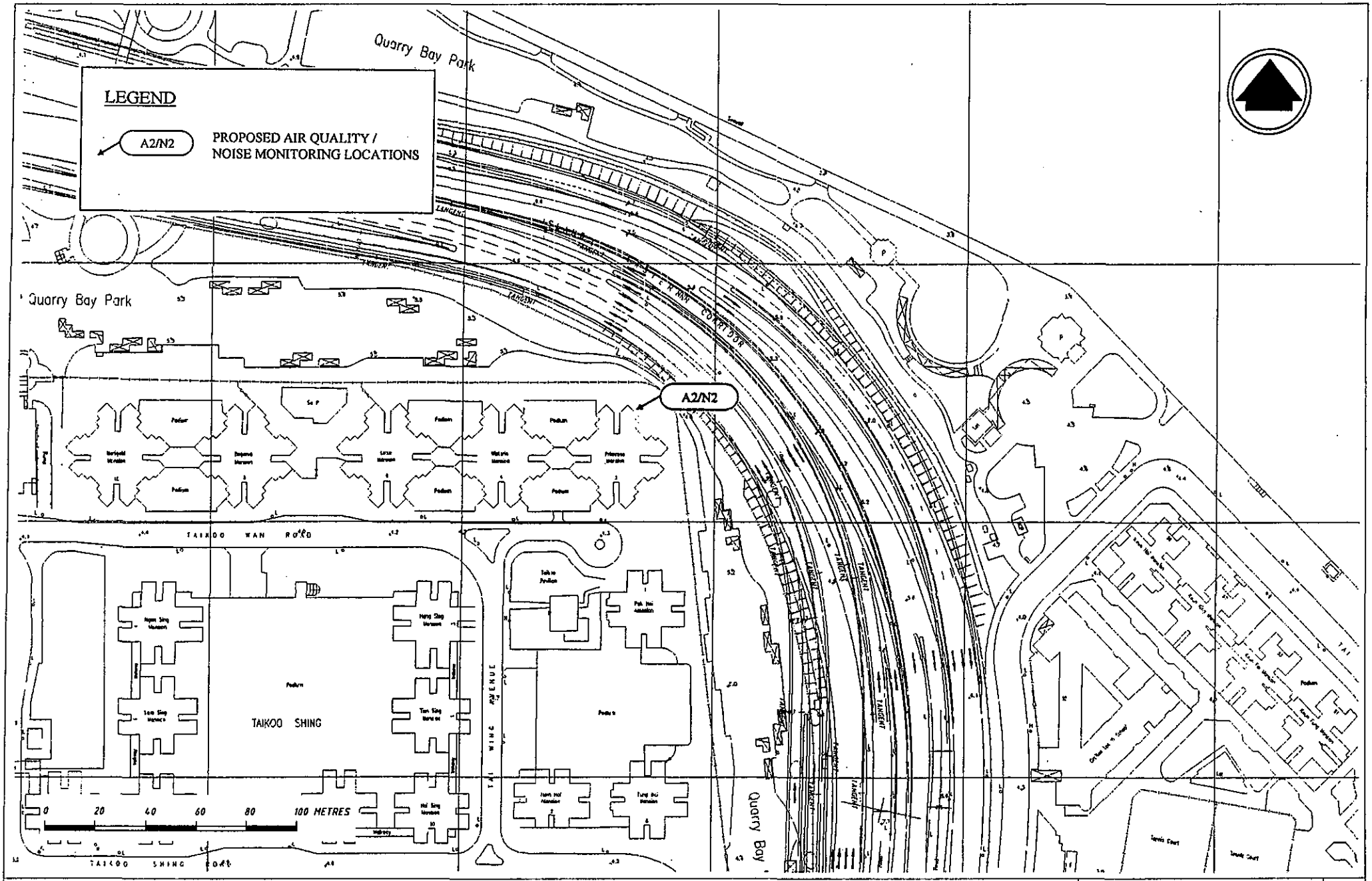


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

ENVIRONMENTAL MONITORING LOCATIONS (SHEET 1 OF 2)

FIGURE NO	
7-1	
SCALE: AS SHOWN	DATE: JANUARY 98

Maunsell



AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

ENVIRONMENTAL MONITORING LOCATIONS (SHEET 2 OF 2)

FIGURE NO	7-1
SCALE:	AS SHOWN
DATE:	JANUARY 98

Maunsell

Appendices

APPENDIX A RECOMMENDED ENVIRONMENTAL POLLUTION CONTROL MEASURES

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. The Contractor shall be responsible for any claims and demands arising out of any nuisance caused by such washing down of spoils.

(d) The Contractor shall carry out the Works in such a manner as to minimise 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 minimise 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) 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.

(k) 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°C) and pressure (1.0 bar) averaged over one hour, and 0.26 milligrams per cubic metre, at standard temperature (25°C) 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 minimise the fugitive dust emissions.

(h) The Contractor shall restrict all motorised 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 motorised 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 minimise 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 B SAMPLE CALCULATION FOR MITIGATION OF CONSTRUCTION NOISE

In order to reduce the maximum anticipated construction noise to an acceptable level, the following package of noise control measures could be used:

Mitigation Measures	*Anticipated Noise Reduction*
A. Fit more efficient exhaust or sound reduction equipment, and keep closed the machine's enclosure panels	10 dB(A)
B. Erect inverted-L acoustic barrier between the equipment and NSRs, and locate the barrier right adjacent to the equipment	15 dB(A)
C. Enclose the equipment in acoustic enclosure	20 dB(A)

The above measures are then applied to the construction equipment requirements for the noisiest construction activities, as indicated in Table B.1.

Table B.1 Mitigated Construction Activities

Noise Activity	Equipment	Mitigation	Mitigated SWL, dB(A) (Per piece)
Bored Piles	Bored piling rig	A, B	105
	Concrete mixer truck	B	94
	Concrete pump	C	89
	Water pump	A, B	78
Pile Cap	Excavator	A, B	102
	Compressor	A, B	92
	Bar bender	A, B	80
	Concrete mixer truck	B	94
	Vibratory poker	C	93
	Mobile crane	B	97
Breaking of Existing IEC	Pneumatic breaker (hand-held)	C	97
	Excavator breaker	B	107
	Lorry	B	97
	Backhoe	A, B	99

Appendix C Prevailing (2000) Road Traffic Noise Levels

NSR	Facade Noise Levels L_{10}(1-hr) dB(A)							Top Floor Level
	1/F	5/F	10/F	15/F	20/F	25/F	T/F	
NPE1	71	75	-	-	-	-	77	10
NPE2	74	74	-	-	-	-	73	10
NPE3	70	79	-	-	-	-	79	10
KFB	76	74	72	74	74	-	74	21
HG1	81	79	77	77	76	-	76	22
HG2	81	80	78	77	77	-	76	22
KR1	81	81	79	-	-	-	79	11
KR2	79	79	78	-	-	-	78	11
HV1	80	79	77	76	75	75	75	27
HV2	77	76	75	75	74	74	74	27
HV3	70	70	71	71	71	72	72	27
HV4	65	65	66	67	68	68	68	27
FSDSQ	69	78	78	-	-	-	78	11
MHE	83	81	79	77	-	-	77	19
HCS1	70	71	71	-	-	-	71	11
HCS2	70	70	71	71	71	-	72	24
HCS3	65	67	71	71	71	-	72	24
TPM1	69	68	-	-	-	-	70	8
DVH1	70	70	72	72	73	-	73	25
RM1	71	73	74	74	74	-	74	25
TKS1	75	75	75	75	74	74	74	26
TKS2	75	76	75	75	75	75	75	26
TKS3	81	81	80	79	79	78	78	26
TKS4	78	78	78	77	77	77	77	26
TKS5	76	76	76	76	76	76	76	27
TKS6	78	79	78	78	77	77	76	27
HC1	68	76	76	-	-	-	76	11
HC2	70	78	78	78	77	76	76	28
HC3	70	78	77	77	76	76	75	28
FG1	82	81	79	78	77	-	76	23
FG2	82	81	79	78	77	-	76	23
FG3	78	78	77	76	75	-	75	23
LKW1	77	77	76	76	-	-	76	18
LKW2	72	72	73	73	-	-	73	18
LKW3	69	70	73	73	-	-	74	18
LKW4	75	77	76	76	-	-	76	18
LKW5	72	72	72	73	-	-	74	18

NSR	Facade Noise Levels L_{10}(1-hr) dB(A)		
	1/F	3/F	5/F
CWC1	71	71	71
CWC2	67	67	68
CC1	69	69	69
CC2	73	73	73
CC3	69	71	72

Appendix D Breakdown of Traffic Noise Contributions from Existing Roads and New Roads (Unmitigated)

NSR	Floor	Facade Noise Levels in L_{10}(1-hr)dB(A)		
		Exist roads	New roads	Overall
NPE1	1/F	73.5	64.6	74
	5/F	80.1	64.5	80
	Top	79.8	66.7	80
NPE2	1/F	78.7	63.8	79
	5/F	78.1	63.9	78
	Top	77.7	65.0	78
NPE3	1/F	71.8	50.6	72
	5/F	81.8	46.7	82
	Top	81.7	55.7	82
KFB	1/F	81.9	54.9	82
	5/F	79.4	58.6	79
	10/F	77.6	59.1	78
	15/F	78.4	61.6	78
	20/F	77.9	61.6	78
	Top	77.8	61.8	78
HG1	1/F	83.2	63.1	83
	5/F	81.3	63.4	81
	10/F	80.0	64.7	80
	15/F	78.9	65.2	79
	20/F	78.5	65.3	79
	Top	78.3	65.3	79
HG2	1/F	83.5	64.8	84
	5/F	81.4	65.7	82
	10/F	80.5	67.7	81
	15/F	79.7	67.7	80
	20/F	79.0	67.8	79
	Top	78.7	68.0	79
KR1	1/F	82.8	62.6	83
	5/F	82.7	63.9	83
	10/F	81.2	67.8	81
	Top	81.0	68.5	81
KR2	1/F	81.1	62.7	81
	5/F	81.1	66.3	81
	10/F	80.1	67.7	80
	Top	79.9	68.2	80
HV1	1/F	82.3	63.1	82
	5/F	80.7	63.3	81
	10/F	79.4	63.7	80
	15/F	78.5	63.7	79
	20/F	77.8	63.9	78
	25/F	77.2	64.6	77
	Top	77.0	64.7	77
HV2	1/F	79.0	64.5	79
	5/F	78.4	64.7	79
	10/F	77.8	65.2	78
	15/F	77.3	65.4	78
	20/F	76.9	65.6	77
	25/F	76.4	65.5	77
	Top	76.2	65.4	77
HV3	1/F	72.9	63.0	73
	5/F	72.7	63.3	73
	10/F	73.1	64.4	74
	15/F	73.9	64.5	74
	20/F	74.0	64.8	74
	25/F	75.0	64.7	75
	Top	74.8	64.7	75
HV4	1/F	69.1	60.3	70
	5/F	68.3	60.6	69
	10/F	68.4	61.6	69
	15/F	69.8	62.7	71
	20/F	70.6	62.8	71
	25/F	70.7	63.1	71
	Top	70.9	63.1	72
FSDSQ	1/F	64.0	70.4	71
	5/F	68.5	75.7	76
	10/F	70.1	80.0	80
	Top	70.1	80.0	80
MHE	1/F	85.6	65.5	86
	5/F	83.0	66.9	83
	10/F	80.8	67.5	81
	15/F	79.3	68.0	80
	Top	78.5	68.2	79
	5/F	77.3	67.0	78
	10/F	77.0	67.1	77
	15/F	76.8	67.0	77
HCS1	1/F	71.7	67.5	73
	5/F	71.4	69.5	74
	10/F	71.4	69.6	74
	Top	71.3	69.7	74
HCS2	1/F	71.4	65.7	72
	5/F	71.1	67.2	73
	10/F	72.4	68.0	74
	15/F	72.4	68.1	74
	20/F	72.6	68.1	74
	Top	72.9	68.1	74
HCS3	1/F	71.7	59.1	72
	5/F	70.4	59.5	71
	10/F	71.5	64.9	72
	15/F	72.7	66.2	74
	20/F	73.3	66.3	74
	Top	73.4	66.3	74
TPM1	1/F	72.5	62.0	73
	5/F	70.9	62.1	71
	8/F	71.2	63.0	72
DVH1	1/F	72.0	60.9	72
	5/F	71.8	61.7	72
	10/F	73.6	64.8	74
	15/F	73.9	66.0	75
	20/F	74.5	66.1	75
	25/F	74.2	66.1	75
RM1	1/F	73.5	61.4	74
	5/F	75.4	62.3	76
	10/F	76.1	65.0	76
	15/F	76.1	66.2	77
	20/F	75.9	66.2	76
	25/F	75.9	66.3	76
TKS1	1/F	74.8	67.2	75
	5/F	74.9	67.4	76
	10/F	75.3	67.1	76
	15/F	75.4	67.2	76
	20/F	75.2	67.2	76
	25/F	75.0	67.2	76
	Top	75.2	67.2	76
TKS2	1/F	75.0	67.8	76
	5/F	76.0	68.0	77
	10/F	76.0	67.6	77
	15/F	75.8	67.3	76
	20/F	75.6	67.2	76
	25/F	75.4	66.8	76
	Top	75.3	66.8	76
TKS3	1/F	81.8	65.9	82
	5/F	81.3	65.5	81
	10/F	80.5	64.8	81
	15/F	79.7	64.1	80
	20/F	79.0	63.4	79
	25/F	78.4	62.8	79
	Top	78.3	62.7	78
TKS4	1/F	77.5	73.6	79
	5/F	77.9	73.4	79
	10/F	77.7	72.8	79
	15/F	77.3	72.1	78
	20/F	77.0	71.4	78
	25/F	76.8	70.8	78
	Top	76.9	70.7	78
TKS5	1/F	76.9	71.8	78
	5/F	75.9	72.8	78
	10/F	76.2	71.9	78
	15/F	76.3	71.2	78
	20/F	75.5	71.2	77
	25/F	75.6	70.7	77
	Top	75.9	69.9	77
TKS6	1/F	78.8	72.3	80
	5/F	79.0	73.1	80
	10/F	78.8	72.3	80
	15/F	78.1	71.4	79
	20/F	77.5	70.4	78
	25/F	76.9	69.7	78
	Top	76.7	69.2	77
LKW1	1/F	76.8	66.2	77

	Top	76.7	66.9	77
LKW2	1/F	71.4	62.4	72
	5/F	72.1	62.8	73
	10/F	73.1	63.5	74
	15/F	73.2	63.7	74
	Top	73.2	63.8	74
LKW3	1/F	69.9	60.0	70
	5/F	71.5	62.1	72
	10/F	73.6	64.2	74
	15/F	73.9	64.5	74
	Top	75.0	64.4	75
LKW4	1/F	75.9	50.9	76
	5/F	78.0	58.0	78
	10/F	77.7	58.2	78
	15/F	77.3	59.3	77
	Top	77.0	60.7	77
LKW5	1/F	73.6	34.5	74
	5/F	73.6	38.7	74
	10/F	73.6	46.4	74
	15/F	74.2	59.3	74
	Top	75.3	61.7	75
HC1	1/F	68.6	57.2	69
	5/F	77.6	63.8	78
	10/F	76.9	61.4	77
	Top	76.7	61.2	77
HC2	1/F	72.5	30.8	73
	5/F	79.6	35.7	80
	10/F	79.3	53.8	79
	15/F	78.9	56.9	79
	20/F	78.2	58.0	78
	25/F	77.6	57.1	78
	Top	77.2	56.9	77
HC3	1/F	71.8	48.9	72
	5/F	79.3	56.1	79
	10/F	79.0	55.7	79
	15/F	78.3	55.4	78
	20/F	77.6	55.7	78
	25/F	77.0	56.1	77
	Top	76.6	56.7	77
FG1	1/F	83.8	57.0	84
	5/F	82.1	55.9	82
	10/F	80.5	56.7	81
	15/F	79.3	57.2	79
	20/F	78.4	56.7	78
	Top	77.9	56.7	78
FG2	1/F	83.9	58.1	84
	5/F	82.2	57.1	82
	10/F	80.6	58.1	81
	15/F	79.4	57.7	79
	20/F	78.5	57.6	79
	Top	78.0	57.5	78
FG3	1/F	79.7	56.8	80
	5/F	79.1	55.3	79
	10/F	78.1	56.7	78
	15/F	77.2	56.2	77
	20/F	76.5	56.2	77
	Top	76.1	55.9	76
CWC1	1/F	73.7	62.3	74
	3/F	73.7	60.1	74
	5/F	73.7	62.5	74
CWC2	1/F	71.4	61.8	72
	3/F	71.5	59.3	72
	5/F	71.9	62.0	72
CC1	1/F	69.0	67.3	71
	3/F	69.0	68.6	72
	5/F	69.8	68.7	72
CC2	1/F	70.4	69.4	73
	3/F	71.8	70.3	74
	5/F	73.1	70.7	75
CC3	1/F	70.6	56.0	71
	3/F	72.3	55.1	72
	5/F	73.5	55.3	74

Appendix E Breakdown of Traffic Noise Contributions from Existing Roads and New Roads for Additional Barriers Examined

Table E1 - Comparison of Barrier Effectiveness for TKS3 - TKS6

Floor	Floor	Scenario 1			Scenario 2		
		Facade Noise Levels L_{10}(1-hr)dB(A)			Facade Noise Levels L_{10}(1-hr)dB(A)		
		Exist roads	New roads	Overall	Exist roads	New roads	Overall
TKS3	1/F	76.1	43.8	76	76.1	43.3	76
	5/F	78.3	46.0	78	78.3	45.5	78
	10/F	79.7	48.5	80	79.7	47.9	80
	15/F	79.5	50.5	80	79.5	49.9	80
	20/F	79.0	52.3	79	79.0	51.7	79
	25/F	78.4	56.2	78	78.4	55.9	78
	Top	78.3	56.3	78	78.3	55.8	78
TKS4	1/F	66.2	54.4	66	65.4	51.4	66
	5/F	74.9	59.4	75	74.6	54.0	75
	10/F	76.7	62.4	77	76.4	55.9	76
	15/F	76.7	62.6	77	76.4	57.6	76
	20/F	76.5	62.9	77	76.2	59.3	76
	25/F	76.4	63.0	77	76.3	60.3	76
	Top	76.5	63.0	77	76.4	60.4	77
TKS5	1/F	73.6	66.1	74	73.5	63.8	74
	5/F	74.5	68.3	75	73.1	65.2	74
	10/F	75.9	67.9	77	75.8	63.2	76
	15/F	76.1	68.6	77	75.4	65.2	76
	20/F	75.4	68.0	76	75.0	64.6	75
	25/F	75.5	67.7	76	74.8	64.6	75
	Top	75.8	67.5	76	75.4	64.5	76
TKS6	1/F	78.6	71.3	79	78.0	66.6	79
	5/F	79.0	72.8	80	78.9	72.7	80
	10/F	78.7	71.9	80	78.6	71.6	80
	15/F	78.0	71.2	79	78.0	71.0	79
	20/F	77.5	70.4	78	77.5	70.2	78
	25/F	76.9	69.6	78	76.9	69.5	78
	Top	76.6	69.1	77	76.6	68.9	77

Scenario 1 - 5m Inverted-L Barrier & 5m Vertical Barrier at Kornhill Flyover
Scenario 2 - 5m Inverted-L Barrier & Partial Enclosure at Kornhill Flyover

Table E2 - 5m Vertical Barrier & Partial Enclosure in front of Cityplaza4

NSR	Floor	Facade Noise Levels L_{10}(1-hr)dB(A)		
		Exist roads	New roads	Overall
TKS2	1/F	71.6	62.6	72
	5/F	74.0	63.9	74
	10/F	74.4	62.9	75
	15/F	75.3	62.6	76
	20/F	75.2	62.4	75
	25/F	74.9	62.1	75
	Top	74.9	62.1	75
TKS3	1/F	76.1	43.3	76
	5/F	78.3	45.5	78
	10/F	79.7	47.9	80
	15/F	79.4	49.9	79
	20/F	79.0	51.7	79
	25/F	78.3	55.9	78
	Top	78.2	55.8	78
TKS4	1/F	65.6	52.7	66
	5/F	74.8	55.1	75
	10/F	76.4	57.8	76
	15/F	76.7	58.6	77
	20/F	76.5	60.1	77
	25/F	76.4	61.0	77
	Top	76.5	61.1	77
TKS5	1/F	73.5	64.3	74
	5/F	73.3	67.2	74
	10/F	75.8	66.0	76
	15/F	75.6	67.0	76
	20/F	75.4	66.4	76
	25/F	75.5	66.4	76
	Top	75.8	66.8	76
TKS6	1/F	78.0	67.4	78
	5/F	78.9	72.7	80
	10/F	78.7	71.9	80
	15/F	78.0	71.2	79
	20/F	77.5	70.4	78
	25/F	76.9	69.6	78
	Top	76.6	69.1	77

Table E3 - 2m Vertical Barrier parallel to Hong Cheung Street

NSR	Floor	Facade Noise Levels L_{10}(1-hr)dB(A)		
		Exist roads	New roads	Overall
HC2	1/F	72.5	29.4	73
	5/F	79.6	33.6	80
	10/F	79.3	51.3	79
	15/F	78.9	55.9	79
	20/F	78.1	56.9	78
	25/F	77.5	56.1	78
	Top	77.1	55.4	77
HC3	1/F	71.7	46.1	72
	5/F	79.3	55.7	79
	10/F	78.9	55.1	79
	15/F	78.2	54.2	78
	20/F	77.5	54.5	78
	25/F	76.9	55.1	77
	Top	76.5	55.4	77

Appendix F Breakdown of Traffic Noise Contributions from Existing Roads and New Roads (Mitigated)

NSR	Floor	Facade Noise Levels in L_{10}(1-hr) dB(A)		
		Exist roads	New roads	Overall
NPE1	1/F	73.5	64.6	74
	5/F	80.1	64.5	80
	Top	79.8	66.7	80
NPE2	1/F	78.7	63.8	79
	5/F	78.1	63.9	78
	Top	77.7	65.0	78
NPE3	1/F	71.8	50.6	72
	5/F	81.8	46.7	82
	Top	81.7	55.7	82
KFB	1/F	81.9	54.9	82
	5/F	79.4	58.6	79
	10/F	77.6	59.1	78
	15/F	78.4	61.6	78
	20/F	77.9	61.6	78
	Top	77.8	61.8	78
HG1	1/F	83.2	63.1	83
	5/F	81.3	63.4	81
	10/F	80.0	64.7	80
	15/F	78.9	65.2	79
	20/F	78.5	65.3	79
	Top	78.3	65.3	79
HG2	1/F	83.5	64.8	84
	5/F	81.4	65.7	82
	10/F	80.5	67.7	81
	15/F	79.7	67.7	80
	20/F	79.0	67.8	79
	Top	78.7	68.0	79
KR1	1/F	82.8	62.6	83
	5/F	82.7	63.9	83
	10/F	81.2	67.8	81
	Top	81.0	68.5	81
KR2	1/F	81.1	62.7	81
	5/F	81.1	66.3	81
	10/F	80.1	67.7	80
	Top	79.9	68.2	80
HV1	1/F	82.3	63.1	82
	5/F	80.7	63.3	81
	10/F	79.4	63.7	80
	15/F	78.5	63.7	79
	20/F	77.8	63.9	78
	25/F	77.2	64.6	77
	Top	77.0	64.7	77
HV2	1/F	79.0	64.5	79
	5/F	78.3	64.7	78
	10/F	77.8	65.2	78
	15/F	77.3	65.4	78
	20/F	76.9	65.6	77
	25/F	76.4	65.5	77
	Top	76.2	65.4	77
HV3	1/F	72.9	63.0	73
	5/F	72.6	63.3	73
	10/F	73.1	64.4	74
	15/F	73.9	64.5	74
	20/F	74.0	64.8	74
	25/F	75.0	64.7	75
	Top	74.8	64.7	75
HV4	1/F	69.1	60.3	70
	5/F	68.3	60.6	69
	10/F	68.4	61.6	69
	15/F	69.8	62.7	71
	20/F	70.6	62.8	71
	25/F	70.7	63.1	71
	Top	70.9	63.1	72
FSDSQ	1/F	63.7	70.4	71
	5/F	68.6	75.7	76
	10/F	70.1	80.0	80
	Top	70.1	80.0	80
MHE	1/F	85.6	63.9	86
	5/F	83.0	64.3	83
	10/F	80.8	65.2	81
	15/F	79.3	66.1	80
	Top	78.5	66.4	79
	5/F	77.1	66.7	77
	10/F	76.9	66.8	77
	15/F	76.8	66.8	77
HCS1	1/F	70.9	60.9	71
	5/F	68.9	62.2	70
	10/F	69.7	63.4	71
	Top	69.7	63.4	71
HCS2	1/F	70.9	58.4	71
	5/F	69.3	59.7	70
	10/F	70.8	62.3	71
	15/F	71.3	62.5	72
	20/F	71.5	62.8	72
	Top	72.0	63.6	73
HCS3	1/F	71.6	56.3	72
	5/F	70.2	57.7	70
	10/F	71.3	61.1	72
	15/F	71.4	61.2	72
	20/F	72.4	61.3	73
	Top	72.7	61.5	73
TPM1	1/F	72.4	61.0	73
	5/F	70.7	61.6	71
	8/F	71.2	62.0	72
DVH1	1/F	72.0	59.6	72
	5/F	71.8	60.4	72
	10/F	73.0	61.9	73
	15/F	73.1	62.2	73
	20/F	73.9	62.3	74
	25/F	73.6	62.4	74
RM1	1/F	73.5	59.4	74
	5/F	75.2	60.4	75
	10/F	75.7	62.5	76
	15/F	75.6	62.6	76
	20/F	75.4	62.7	76
	25/F	75.5	62.8	76
TKS1	1/F	74.7	66.2	75
	5/F	74.6	66.2	75
	10/F	74.8	66.0	75
	15/F	75.0	66.0	76
	20/F	74.5	66.2	75
	25/F	74.6	66.2	75
	Top	74.5	66.2	75
TKS2	1/F	70.8	62.9	71
	5/F	73.9	64.0	74
	10/F	74.3	63.0	75
	15/F	75.4	62.8	76
	20/F	75.4	62.7	76
	25/F	75.2	62.6	75
	Top	75.1	62.5	75
TKS3	1/F	76.1	43.8	76
	5/F	78.3	46.0	78
	10/F	79.7	48.5	80
	15/F	79.5	50.5	80
	20/F	79.0	52.3	79
	25/F	78.4	56.2	78
	Top	78.3	56.3	78
TKS4	1/F	66.2	54.4	66
	5/F	74.9	59.4	75
	10/F	76.7	62.4	77
	15/F	76.7	62.6	77
	20/F	76.5	62.9	77
	25/F	76.4	63.0	77
	Top	76.5	63.0	77
TKS5	1/F	73.6	66.1	74
	5/F	74.5	68.3	75
	10/F	75.9	67.9	77
	15/F	76.1	68.6	77
	20/F	75.4	68.0	76
	25/F	75.5	67.7	76
	Top	75.8	67.5	76
TKS6	1/F	78.6	71.3	79
	5/F	79.0	72.8	80
	10/F	78.7	71.9	80
	15/F	78.0	71.2	79
	20/F	77.5	70.4	78
	25/F	76.9	69.6	78
	Top	76.6	69.1	77
LKW1	1/F	76.5	65.6	77

	Top	76.7	66.7	77
LKW2	1/F	70.8	61.6	71
	5/F	71.8	62.2	72
	10/F	72.9	63.3	73
	15/F	73.0	63.5	73
	Top	73.0	63.6	73
LKW3	1/F	69.8	59.7	70
	5/F	71.5	62.1	72
	10/F	73.4	64.1	74
	15/F	73.6	64.3	74
	Top	74.8	64.2	75
LKW4	1/F	75.9	49.7	76
	5/F	78.0	57.9	78
	10/F	77.7	58.1	78
	15/F	77.2	59.0	77
	Top	77.0	60.4	77
LKW5	1/F	73.6	34.5	74
	5/F	73.6	38.7	74
	10/F	73.6	46.4	74
	15/F	74.1	59.2	74
	Top	75.2	61.7	75
HC1	1/F	68.0	57.2	68
	5/F	77.6	63.8	78
	10/F	76.8	61.4	77
	Top	76.6	61.2	77
HC2	1/F	72.5	30.8	73
	5/F	79.6	35.7	80
	10/F	79.3	51.4	79
	15/F	78.9	55.9	79
	20/F	78.1	57.2	78
	25/F	77.5	56.1	78
	Top	77.1	55.9	77
HC3	1/F	71.7	46.4	72
	5/F	79.3	55.7	79
	10/F	78.9	55.2	79
	15/F	78.2	54.3	78
	20/F	77.5	54.6	78
	25/F	76.9	55.2	77
	Top	76.5	55.8	77
FG1	1/F	83.8	56.4	84
	5/F	82.1	55.5	82
	10/F	80.4	56.1	80
	15/F	79.2	56.7	79
	20/F	78.3	56.0	78
	Top	77.8	56.0	78
FG2	1/F	83.9	57.6	84
	5/F	82.0	56.8	82
	10/F	80.5	57.6	81
	15/F	79.4	57.1	79
	20/F	78.4	57.0	78
	Top	77.9	56.9	78
FG3	1/F	79.7	56.1	80
	5/F	79.1	54.8	79
	10/F	78.1	56.0	78
	15/F	77.2	55.4	77
	20/F	76.4	55.5	76
	Top	76.0	55.1	76
CWC1	1/F	73.7	62.3	74
	3/F	73.7	60.1	74
	5/F	73.7	62.5	74
CWC2	1/F	71.4	61.8	72
	3/F	71.5	59.3	72
	5/F	71.9	62.0	72
CC1	1/F	67.7	62.2	69
	3/F	67.4	62.9	69
	5/F	66.0	63.4	68
CC2	1/F	69.1	61.8	70
	3/F	67.7	62.9	69
	5/F	67.6	64.7	69
CC3	1/F	70.5	54.4	71
	3/F	72.2	54.1	72
	5/F	73.5	54.3	74

Appendix G Eligibility Assessment for Indirect Technical Remedies

NSR	Storey Assessed	Assessment Criterion L_{10}dB(A)	Prevailing Noise Level L_{10}dB(A)	Predicted Noise Level			Criteria 1 (5) > (1)	Criteria 2 (5)-(2)≥1.0	Criteria 3 (5)-(3)≥1.0	**Indirect Mitigation (Yes / No)**
				Existing Road	New Road	Overall				
(Column)		(1)	(2)	(3)	(4)	(5)				
NPE1	1	70	70.7	73.5	64.6	74.0	Yes	Yes	No	**No**
	5		77.2	80.1	64.5	80.2	Yes	Yes	No	**No**
	10		77.1	79.6	66.7	80.0	Yes	Yes	No	**No**
NPE2	1	70	74.4	78.7	63.8	78.8	Yes	Yes	No	**No**
	5		74.2	78.1	63.9	78.3	Yes	Yes	No	**No**
	10		74.3	77.7	65.0	77.9	Yes	Yes	No	**No**
NPE3	1	70	68.9	71.8	50.6	71.8	Yes	Yes	No	**No**
	5		78.9	81.8	46.7	81.8	Yes	Yes	No	**No**
	10		78.8	81.7	55.7	81.7	Yes	Yes	No	**No**
KFB	1	70	76.3	81.3	64.9	81.8	Yes	Yes	No	**No**
	5		73.9	79.4	58.6	79.4	Yes	Yes	No	**No**
	10		72.4	77.6	59.1	77.7	Yes	Yes	No	**No**
	15		74.4	78.4	61.6	78.5	Yes	Yes	No	**No**
	20		74	77.9	61.6	78.0	Yes	Yes	No	**No**
	21		73.9	77.8	61.6	77.9	Yes	Yes	No	**No**
HG1	1	70	81.0	83.2	63.1	83.2	Yes	Yes	No	**No**
	5		79.2	81.3	63.4	81.3	Yes	Yes	No	**No**
	10		77.8	80.0	64.7	80.1	Yes	Yes	No	**No**
	15		76.7	78.9	65.2	79.1	Yes	Yes	No	**No**
	20		76.2	78.6	66.3	78.7	Yes	Yes	No	**No**
	22		76	78.3	65.3	78.5	Yes	Yes	No	**No**
HG2	1	70	81.4	83.5	64.8	83.6	Yes	Yes	No	**No**
	5		79.3	81.4	65.7	81.5	Yes	Yes	No	**No**
	10		78.5	80.5	67.7	80.7	Yes	Yes	No	**No**
	15		77.5	79.7	67.7	80.0	Yes	Yes	No	**No**
	20		76.8	79.0	67.6	79.3	Yes	Yes	No	**No**
	22		76.6	78.7	68.0	79.1	Yes	Yes	No	**No**
KR1	1	70	80.7	82.8	62.6	82.8	Yes	Yes	No	**No**
	5		80.7	82.7	63.8	82.8	Yes	Yes	No	**No**
	10		79.3	81.2	67.5	81.4	Yes	Yes	No	**No**
	11		79.1	81.0	68.5	81.2	Yes	Yes	No	**No**
KR2	1	70	79.1	81.1	62.7	81.2	Yes	Yes	No	**No**
	5		79.2	81.1	66.3	81.2	Yes	Yes	No	**No**
	10		78.2	80.1	67.7	80.3	Yes	Yes	No	**No**
	11		78.0	79.9	68.2	80.2	Yes	Yes	No	**No**
HV1	1	70	80.3	82.3	63.1	82.4	Yes	Yes	No	**No**
	5		78.7	80.7	63.4	80.8	Yes	Yes	No	**No**
	10		77.3	79.4	63.7	79.5	Yes	Yes	No	**No**
	15		76.4	78.5	63.7	78.6	Yes	Yes	No	**No**
	20		75.6	77.8	63.9	78.0	Yes	Yes	No	**No**
	25		75.1	77.2	64.6	77.4	Yes	Yes	No	**No**
	27		74.9	77.0	64.7	77.3	Yes	Yes	No	**No**
HV2	1	70	77.2	79.0	64.5	79.2	Yes	Yes	No	**No**
	5		76.5	78.3	64.7	78.5	Yes	Yes	No	**No**
	10		75.7	77.8	65.2	78.0	Yes	Yes	No	**No**
	15		75.2	77.3	65.4	77.6	Yes	Yes	No	**No**
	20		74.7	76.9	65.6	77.2	Yes	Yes	No	**No**
	25		74.2	76.4	65.5	76.7	Yes	Yes	No	**No**
	27		74.1	76.2	65.4	76.5	Yes	Yes	No	**No**
HV3	1	70	71.6	72.9	63.0	73.3	Yes	Yes	No	**No**
	5		71.1	72.6	63.3	73.1	Yes	Yes	No	**No**
	10		71.4	73.1	64.4	73.6	Yes	Yes	No	**No**
	15		71.7	73.9	64.5	74.4	Yes	Yes	No	**No**
	20		71.9	74.0	64.8	74.5	Yes	Yes	No	**No**
	25		72.8	75.0	64.7	75.4	Yes	Yes	No	**No**
	27		72.7	74.8	64.7	75.2	Yes	Yes	No	**No**
HV4	15	70	68.1	69.8	62.7	70.6	Yes	Yes	No	**No**
	20		68.5	70.6	62.8	71.3	Yes	Yes	No	**No**
	25		68.7	70.7	63.1	71.4	Yes	Yes	No	**No**
	27		68.8	70.9	63.1	71.6	Yes	Yes	No	**No**

NSR	Storey Assessed	Assessment Criterion L_{10}dB(A)	Prevailing Noise Level L_{10}dB(A)	Predicted Noise Level			Criteria 1 (5) > (1)	Criteria 2 (5)-(2)≥1.0	Criteria 3 (5)-(3)≥1.0	Indirect Mitigation (Yes / No)
				Existing Road	New Road	Overall				
(Column)		(1)	(2)	(3)	(4)	(5)				
FSDSQ	1	70	68.6	65.7	70.4	71.2	Yes	Yes	Yes	Yes
	5		74.0	68.6	75.1	76.5	Yes	Yes	Yes	Yes
	10		77.2	70.1	80.0	80.4	Yes	Yes	Yes	Yes
	11		77.3	70.1	80.0	80.4	Yes	Yes	Yes	Yes
MHE	1	70	83.3	85.6	83.9	86.6	Yes	Yes	No	No
	5		80.7	83.0	84.3	83.1	Yes	Yes	No	No
	10		78.6	80.8	85.2	80.9	Yes	Yes	No	No
	15		77.2	79.3	66.1	79.5	Yes	Yes	No	No
	19		76.5	76.5	66.4	76.8	Yes	Yes	No	No
HCS1	1	70	71.7	70.9	60.9	71.3	Yes	No	No	No
	10		71.2	69.7	63.4	70.6	Yes	No	No	No
	11		71.1	69.7	63.4	70.6	Yes	No	No	No
HCS2	1	70	71.0	70.9	58.4	71.1	Yes	No	No	No
	10		71.5	70.8	62.3	71.4	Yes	No	No	No
	15		71.7	71.3	62.5	71.8	Yes	No	No	No
	20		71.8	71.5	62.9	72.0	Yes	No	No	No
	24		72.0	72.0	63.5	72.5	Yes	No	No	No
HCS3	1	70	70.3	71.6	56.3	71.7	Yes	Yes	No	No
	10		70.2	71.3	61.1	71.7	Yes	Yes	No	No
	15		71.5	71.4	61.2	71.8	Yes	No	No	No
	20		71.9	72.4	61.3	72.7	Yes	No	No	No
	24		72.2	72.7	61.5	73.0	Yes	No	No	No
TPM1	1	70	71.4	72.4	61.0	72.7	Yes	Yes	No	No
	5		69.8	70.7	61.6	71.2	Yes	Yes	No	No
	8		69.9	71.2	62.0	71.7	Yes	Yes	No	No
DVH1	1	70	71.1	72.0	59.6	72.2	Yes	Yes	No	No
	5		70.5	71.6	60.4	72.1	Yes	Yes	No	No
	10		71.9	73.0	61.9	73.3	Yes	Yes	No	No
	15		72.5	73.1	62.2	73.4	Yes	No	No	No
	20		73.1	73.8	62.3	74.2	Yes	Yes	No	No
	25		72.9	73.6	62.4	73.9	Yes	Yes	No	No
RM1	1	70	72.7	73.5	59.4	73.7	Yes	Yes	No	No
	5		73.8	75.2	60.4	75.3	Yes	Yes	No	No
	10		74.6	75.7	62.5	75.9	Yes	Yes	No	No
	15		74.7	75.6	62.6	75.8	Yes	Yes	No	No
	20		74.5	75.4	62.7	75.6	Yes	Yes	No	No
	25		74.6	75.5	62.8	75.7	Yes	Yes	No	No
TKS1	1	70	73.7	74.7	66.2	75.3	Yes	Yes	No	No
	5		74.0	74.5	66.2	75.2	Yes	Yes	No	No
	10		74.3	74.8	66.0	75.3	Yes	Yes	No	No
	15		74.5	75.0	66.0	75.5	Yes	Yes	No	No
	20		74.4	74.5	66.2	75.1	Yes	No	No	No
	25		74.1	74.6	66.2	75.2	Yes	Yes	No	No
	26		74.1	74.5	66.2	75.1	Yes	Yes	No	No
TKS2	1	70	74.6	70.8	62.9	74.5	Yes	No	No	No
	5		75.4	73.9	64.5	74.3	Yes	No	No	No
	10		75.4	74.3	65.0	74.6	Yes	No	No	No
	15		75.2	75.4	62.8	75.5	Yes	No	No	No
	20		75.0	75.4	62.7	75.5	Yes	No	No	No
	25		74.8	75.2	62.6	75.4	Yes	No	No	No
	26		74.7	75.1	62.5	75.3	Yes	No	No	No
TKS3	1	70	81.4	76.1	43.8	76.1	Yes	No	No	No
	5		80.9	78.3	46.0	78.3	Yes	No	No	No
	10		80.0	79.7	48.5	79.7	Yes	No	No	No
	15		79.3	79.5	50.5	79.5	Yes	No	No	No
	20		78.5	79.0	52.3	79.0	Yes	No	No	No
	25		77.9	78.4	56.2	78.4	Yes	No	No	No
	26		77.8	78.3	56.3	78.3	Yes	No	No	No
TKS4	5	70	78.0	74.9	59.4	75.0	Yes	No	No	No
	10		77.6	76.7	62.4	76.9	Yes	No	No	No
	15		77.3	76.7	62.6	76.9	Yes	No	No	No
	20		76.9	76.5	62.9	76.7	Yes	No	No	No
	25		76.6	75.4	63.0	76.6	Yes	No	No	No
	26		76.7	75.5	63.0	76.7	Yes	No	No	No

NSR	Storey Assessed	Assessment Criterion L_{10}dB(A)	Prevailing Noise Level L_{10}dB(A)	Predicted Noise Level			Criteria 1 (5) > (1)	Criteria 2 (5)-(2)≥1.0	Criteria 3 (5)-(3)≥1.0	Indirect Mitigation (Yes / No)
				Existing Road	New Road	Overall				
(Column)		(1)	(2)	(3)	(4)	(5)				
TKS5	1	70	76.5	73.6	66.1	74.3	Yes	No	No	**No**
	5		76.4	74.5	68.3	75.4	Yes	No	No	**No**
	10		76.2	75.9	67.9	76.5	Yes	No	No	**No**
	15		76.2	76.1	68.6	76.8	Yes	No	No	**No**
	20		76.1	75.4	68.0	76.1	Yes	No	No	**No**
	25		75.6	75.5	67.7	76.2	Yes	No	No	**No**
	27		75.7	75.8	67.5	76.4	Yes	No	No	**No**
TKS6	1	70	78.8	76.9	71.3	79.6	Yes	No	No	**No**
	5		78.7	79.0	72.9	79.9	Yes	Yes	No	**No**
	10		78.2	78.7	71.9	79.5	Yes	Yes	No	**No**
	15		77.6	78.0	71.3	78.8	Yes	Yes	No	**No**
	20		77.2	77.5	70.4	78.3	Yes	Yes	No	**No**
	25		76.6	76.9	69.6	77.6	Yes	Yes	No	**No**
	27		76.3	76.8	68.1	77.3	Yes	Yes	No	**No**
LKW1	1	70	76.1	78.5	65.8	76.8	Yes	No	No	**No**
	5		76.7	77.1	66.7	77.5	Yes	No	No	**No**
	10		76.5	76.9	66.5	77.3	Yes	No	No	**No**
	15		76.4	76.8	66.6	77.2	Yes	No	No	**No**
	18		76.2	76.7	66.7	77.1	Yes	No	No	**No**
LKW2	1	70	70.9	70.8	61.6	71.8	Yes	No	No	**No**
	5		71.6	71.8	62.2	72.3	Yes	No	No	**No**
	10		72.6	72.9	63.3	73.4	Yes	No	No	**No**
	15		72.7	73.0	63.5	73.5	Yes	No	No	**No**
	18		72.7	73.0	63.6	73.5	Yes	No	No	**No**
LKW3	5	70	70.9	71.5	62.1	72.0	Yes	Yes	No	**No**
	10		73.2	73.4	64.1	73.9	Yes	No	No	**No**
	15		73.4	73.6	64.3	74.1	Yes	No	No	**No**
	18		74.3	74.3	64.2	75.2	Yes	No	No	**No**
LKW4	1	70	74.5	75.9	49.7	75.9	Yes	Yes	No	**No**
	5		76.6	78.0	57.9	78.0	Yes	Yes	No	**No**
	10		76.5	77.7	58.1	77.7	Yes	Yes	No	**No**
	15		76.0	77.2	59.0	77.3	Yes	Yes	No	**No**
	18		75.8	77.0	60.4	77.1	Yes	Yes	No	**No**
LKW5	1	70	72.1	73.6	34.5	73.6	Yes	Yes	No	**No**
	5		72.1	73.6	38.7	73.6	Yes	Yes	No	**No**
	10		72.2	73.6	46.4	73.6	Yes	Yes	No	**No**
	15		73.1	74.1	59.2	74.2	Yes	Yes	No	**No**
	18		74.3	75.2	61.7	75.4	Yes	Yes	No	**No**
HC1	5	70	77.1	77.6	63.5	77.8	Yes	No	No	**No**
	10		76.3	76.6	61.4	76.9	Yes	No	No	**No**
	11		76.1	76.6	61.2	76.7	Yes	No	No	**No**
HC2	1	70	78.6	72.5	30.9	72.5	Yes	No	No	**No**
	5		78.5	79.6	35.7	79.6	Yes	Yes	No	**No**
	10		78.0	79.3	51.4	79.3	Yes	Yes	No	**No**
	15		77.7	78.9	53.9	78.9	Yes	Yes	No	**No**
	20		77.0	78.1	57.2	78.1	Yes	Yes	No	**No**
	25		76.4	77.5	58.1	77.5	Yes	Yes	No	**No**
	28		76.0	77.1	55.9	77.1	Yes	Yes	No	**No**
HC3	1	70	78.2	71.7	46.4	71.7	Yes	No	No	**No**
	5		78.1	79.3	55.7	79.3	Yes	Yes	No	**No**
	10		77.6	78.9	53.2	78.9	Yes	Yes	No	**No**
	15		76.9	78.2	54.3	78.2	Yes	Yes	No	**No**
	20		76.2	77.5	54.6	77.5	Yes	Yes	No	**No**
	25		75.7	76.9	55.2	76.9	Yes	Yes	No	**No**
	28		75.3	76.5	55.8	76.5	Yes	Yes	No	**No**
FG1	1	70	82.2	53.8	56.4	83.8	Yes	Yes	No	**No**
	5		80.5	82.0	55.5	82.0	Yes	Yes	No	**No**
	10		79.0	80.4	56.1	80.4	Yes	Yes	No	**No**
	15		77.8	79.2	56.7	79.2	Yes	Yes	No	**No**
	20		76.9	78.3	56.0	78.3	Yes	Yes	No	**No**
	23		76.4	77.8	56.0	77.8	Yes	Yes	No	**No**
FG2	1	70	82.4	83.9	57.6	83.9	Yes	Yes	No	**No**
	5		80.7	82.1	56.8	82.1	Yes	Yes	No	**No**
	10		79.1	80.5	57.6	80.6	Yes	Yes	No	**No**
	15		77.9	79.4	57.1	79.4	Yes	Yes	No	**No**
	20		77.0	78.4	57.0	78.4	Yes	Yes	No	**No**
	23		76.5	77.9	56.9	77.9	Yes	Yes	No	**No**

NSR	Storey Assessed	Assessment Criterion L_{10}dB(A)	Prevailing Noise Level L_{10}dB(A)	Predicted Noise Level			Criteria 1 (5) > (1)	Criteria 2 (5)-(2)≥1.0	Criteria 3 (5)-(3)≥1.0	Indirect Mitigation (Yes / No)
				Existing Road	New Road	Overall				
(Column)		(1)	(2)	(3)	(4)	(5)				
FG3	1	70	78.4	79.7	55.1	79.7	Yes	Yes	No	**No**
	5		77.7	79.1	54.8	79.1	Yes	Yes	No	**No**
	10		76.7	78.1	56.0	78.1	Yes	Yes	No	**No**
	15		75.9	77.2	55.4	77.2	Yes	Yes	No	**No**
	20		75.1	76.4	55.5	76.4	Yes	Yes	No	**No**
	23		74.8	76.0	55.1	76.0	Yes	Yes	No	**No**
CWC1	1	65	71.6	73.7	52.4	74.0	Yes	Yes	No	**No**
	3		71.4	73.7	50.1	73.9	Yes	Yes	No	**No**
	5		71.6	73.7	52.5	74.0	Yes	Yes	No	**No**
CWC2	1	65	68.3	71.4	51.3	71.9	Yes	Yes	No	**No**
	3		68.1	71.5	49.3	71.8	Yes	Yes	No	**No**
	5		68.8	71.9	52.0	72.3	Yes	Yes	No	**No**
CC1	1	65	70.1	67.7	62.2	69.8	Yes	No	Yes	**No**
	3		70.0	67.4	62.8	69.7	Yes	No	Yes	**No**
	5		69.9	66.0	63.4	67.9	Yes	No	Yes	**No**
CC2	1	65	71.8	69.1	51.5	69.8	Yes	No	No	**No**
	3		71.9	67.7	62.9	68.9	Yes	No	Yes	**No**
	5		72.2	67.6	64.7	69.4	Yes	No	Yes	**No**
CC3	1	65	69.7	70.5	54.4	70.6	Yes	No	No	**No**
	3		71.0	72.2	54.1	72.3	Yes	Yes	No	**No**
	5		72.1	73.5	54.3	73.5	Yes	Yes	No	**No**

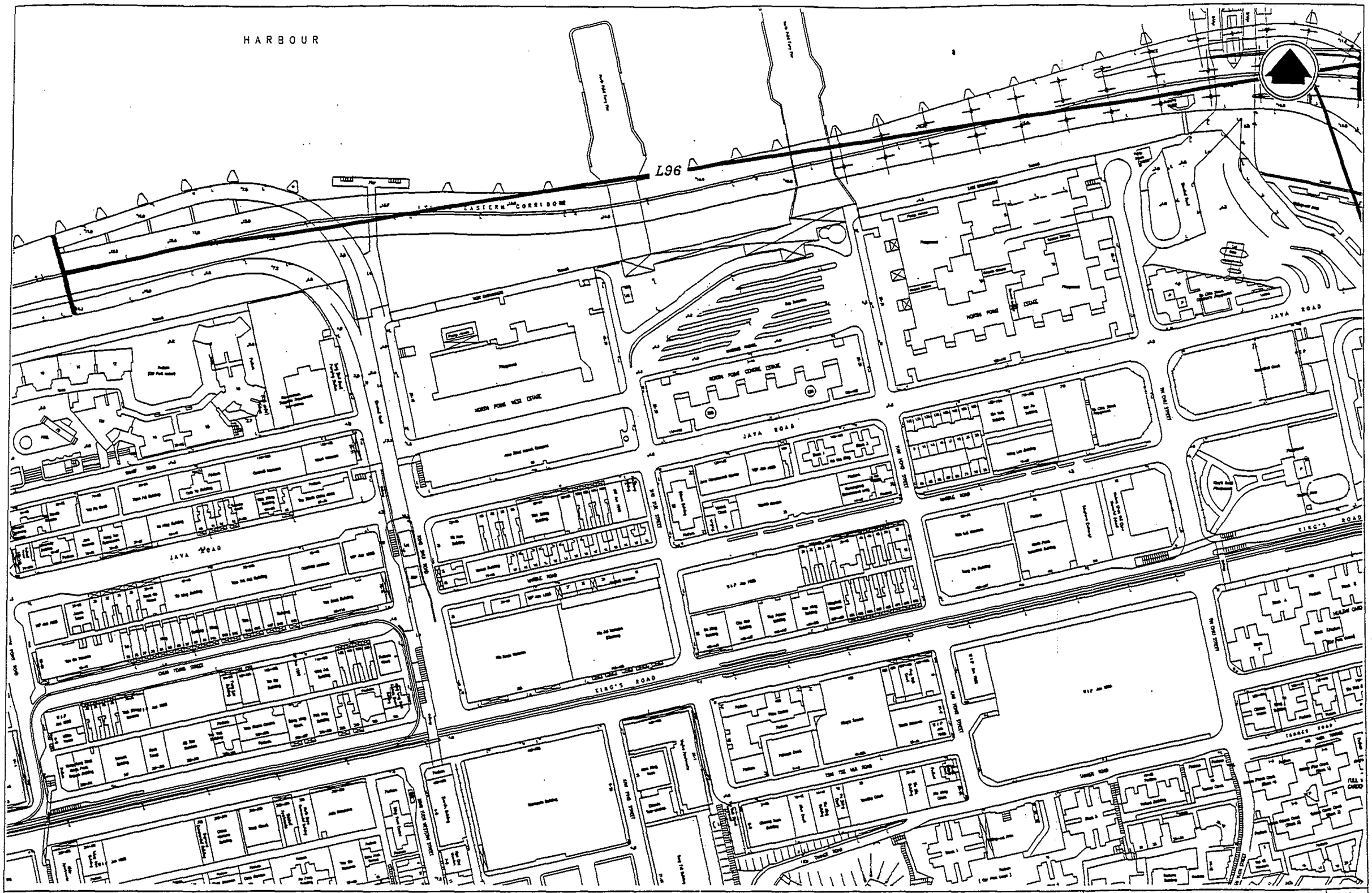
APPENDIX H ROAD LINKS AND TRAFFIC COMPOSITIONS FOR 2018 - UNMITIGATED

Figure H1 presents the road links used in the CALINE4 calculations. Traffic compositions and the composite emission factors for the road links are given in the following table.

Table H1

Link	Peak Hour Traffic Volume (Veh/hr)	Vehicle Composition (%)							Emission Factor (gm/veh.-mil)
		PC	Taxi	PV	PLB	LGV	HGV	Buses	
1	15500	21	23	2	22	7	6	18	5.17
2	15500	21	23	2	22	7	6	18	5.17
3	15500	21	23	2	22	7	6	18	5.17
4	15500	21	23	2	22	7	6	18	5.17
5	6500	21	23	2	22	7	6	18	5.17
6	3300	21	23	2	22	7	6	18	5.17
7	3300	21	23	2	22	7	6	18	5.17
8	400	21	23	2	22	7	6	18	5.17
9	400	21	23	2	22	7	6	18	5.17
10	400	21	23	2	22	7	6	18	5.17
11	7700	21	23	2	22	7	6	18	5.17
12	3200	21	23	2	22	7	6	18	5.17
13	3200	21	23	2	22	7	6	18	5.17
14	5100	21	23	2	22	7	6	18	5.17
15	5100	21	23	2	22	7	6	18	5.17
16	5100	21	23	2	22	7	6	18	6.19
17	2900	21	23	2	22	7	6	18	5.17
18	5200	21	23	2	22	7	6	18	5.17
19	5200	21	23	2	22	7	6	18	5.17
20	1200	21	23	2	22	7	6	18	5.17
21	1200	21	23	2	22	7	6	18	5.17
22	1200	21	23	2	22	7	6	18	5.17
23	500	21	23	2	22	7	6	18	5.17
24	500	21	23	2	22	7	6	18	5.17
25	1600	21	23	2	22	7	6	18	5.17
26	1175	21	23	2	22	7	6	18	5.17
27	500	21	23	2	22	7	6	18	5.17
28	500	21	23	2	22	7	6	18	5.17
29	500	21	23	2	22	7	6	18	5.17
30	500	21	23	2	22	7	6	18	5.17
31	500	21	23	2	22	7	6	18	5.17
32	4400	21	23	2	22	7	6	18	5.17
33	4400	21	23	2	22	7	6	18	5.17
34	4400	21	23	2	22	7	6	18	5.17
35	4400	21	23	2	22	7	6	18	5.17
36	4400	21	23	2	22	7	6	18	5.17
37	1600	21	23	2	22	7	6	18	5.17
38	1600	21	23	2	22	7	6	18	5.17
39	700	21	23	2	22	7	6	18	5.17
40	5800	21	23	2	22	7	6	18	5.17
41	4200	21	23	2	22	7	6	18	5.17
42	4200	21	23	2	22	7	6	18	5.17
43	4200	21	23	2	22	7	6	18	5.17
44	900	21	23	2	22	7	6	18	5.17
45	900	21	23	2	22	7	6	18	5.17
46	1500	21	23	2	22	7	6	18	5.17
47	1500	21	23	2	22	7	6	18	5.17
48	1500	21	23	2	22	7	6	18	5.17
49	1500	21	23	2	22	7	6	18	5.17
50	5700	21	23	2	22	7	6	18	5.17
51	5700	21	23	2	22	7	6	18	5.17
52	1900	21	23	2	22	7	6	18	5.17
53	1900	21	23	2	22	7	6	18	5.17
54	1900	21	23	2	22	7	6	18	5.17
55	600	21	23	2	22	7	6	18	5.17

Road Link	Peak Hour Traffic Volume (Veh/hr)	Vehicle Composition (%)							Emission Factor (gm/veh.-mil)
		PC	Taxi	PV	PLB	LGV	HGV	Buses	
56	600	21	23	2	22	7	6	18	5.17
57	600	21	23	2	22	7	6	18	5.17
58	825	21	23	2	22	7	6	18	5.17
59	825	21	23	2	22	7	6	18	5.17
60	2425	21	23	2	22	7	6	18	5.17
61	2425	21	23	2	22	7	6	18	5.17
62	5700	21	23	2	22	7	6	18	5.17
63	600	21	23	2	22	7	6	18	5.17
64	600	21	23	2	22	7	6	18	5.17
65	600	21	23	2	22	7	6	18	5.17
66	600	21	23	2	22	7	6	18	5.17
67	1600	21	23	2	22	7	6	18	5.17
68	1600	21	23	2	22	7	6	18	5.17
69	675	21	23	2	22	7	6	18	5.17
70	675	21	23	2	22	7	6	18	5.17
71	675	21	23	2	22	7	6	18	5.17
72	3600	21	23	2	22	7	6	18	5.17
73	4200	21	23	2	22	7	6	18	5.17
74	1600	21	23	2	22	7	6	18	5.17
75	1600	21	23	2	22	7	6	18	5.17
76	1600	21	23	2	22	7	6	18	5.17
77	1600	21	23	2	22	7	6	18	5.17
78	1600	21	23	2	22	7	6	18	5.17
79	10900	21	23	2	22	7	6	18	7.07
80	5800	21	23	2	22	7	6	18	6.07
81	3500	21	23	2	22	7	6	18	5.17
82	3500	21	23	2	22	7	6	18	5.17
83	3500	21	23	2	22	7	6	18	5.17
84	3500	21	23	2	22	7	6	18	5.17
85	2300	21	23	2	22	7	6	18	5.17
86	2300	21	23	2	22	7	6	18	5.17
87	2300	21	23	2	22	7	6	18	5.17
88	2300	21	23	2	22	7	6	18	5.17
89	2300	21	23	2	22	7	6	18	5.17
90	2300	21	23	2	22	7	6	18	5.17
91	4400	21	23	2	22	7	6	18	5.17
92	4400	21	23	2	22	7	6	18	5.17
93	10200	21	23	2	22	7	6	18	5.17
94	5800	21	23	2	22	7	6	18	5.17
95	5800	21	23	2	22	7	6	18	5.17
96	12358	21	23	2	22	7	6	18	5.17
97	13900	21	23	2	22	7	6	18	5.17
98	4600	21	23	2	22	7	6	18	5.17
99	2000	21	23	2	22	7	6	18	5.17

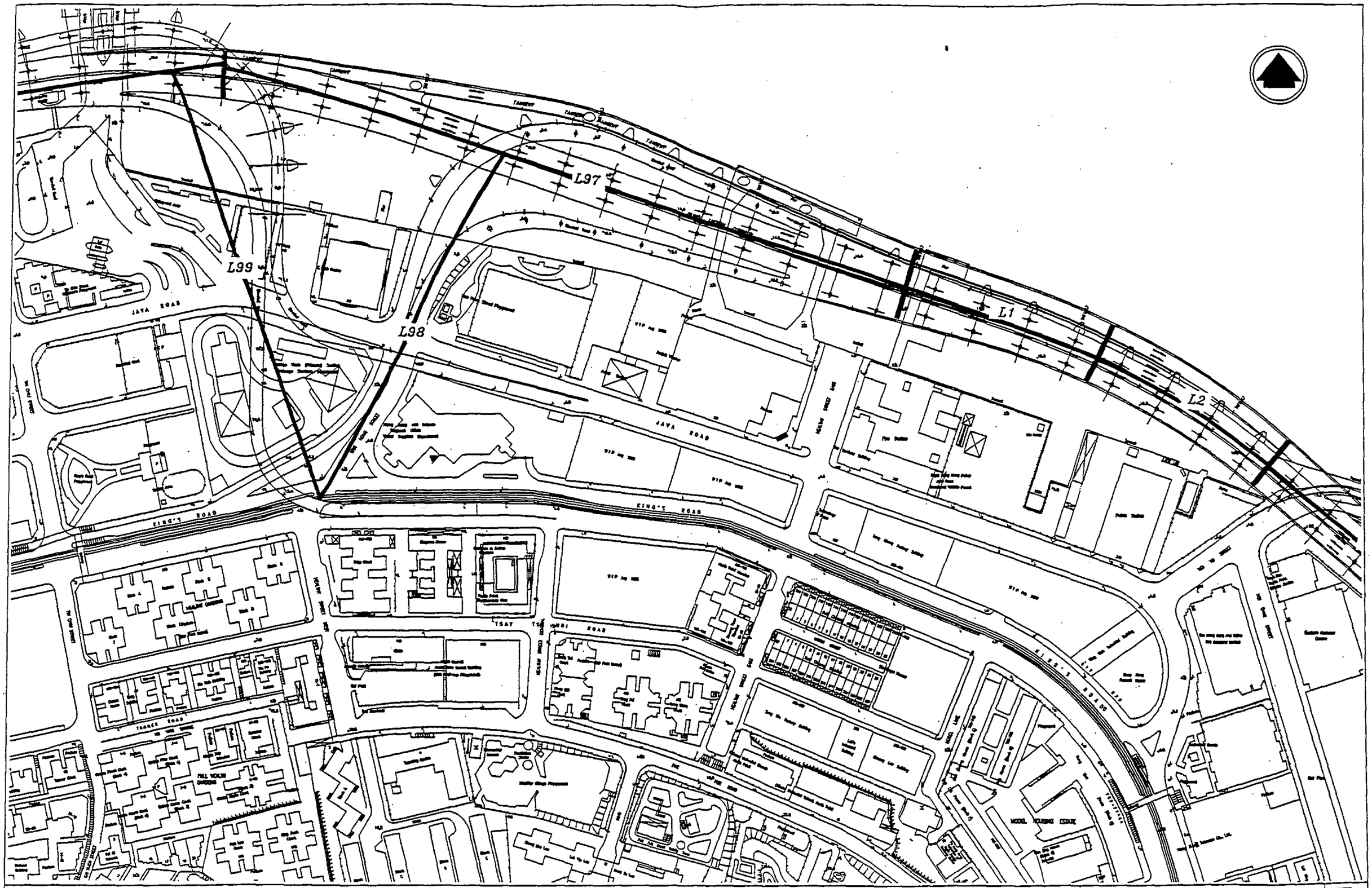


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

ROAD LINKS AND DESIGNATIONS FOR MODELLING CALINE4 (SHEET 1 OF 5)

FIGURE NO	
H-1	
SCALE: 1 : 2000	DATE: JANUARY 98

Maunsell

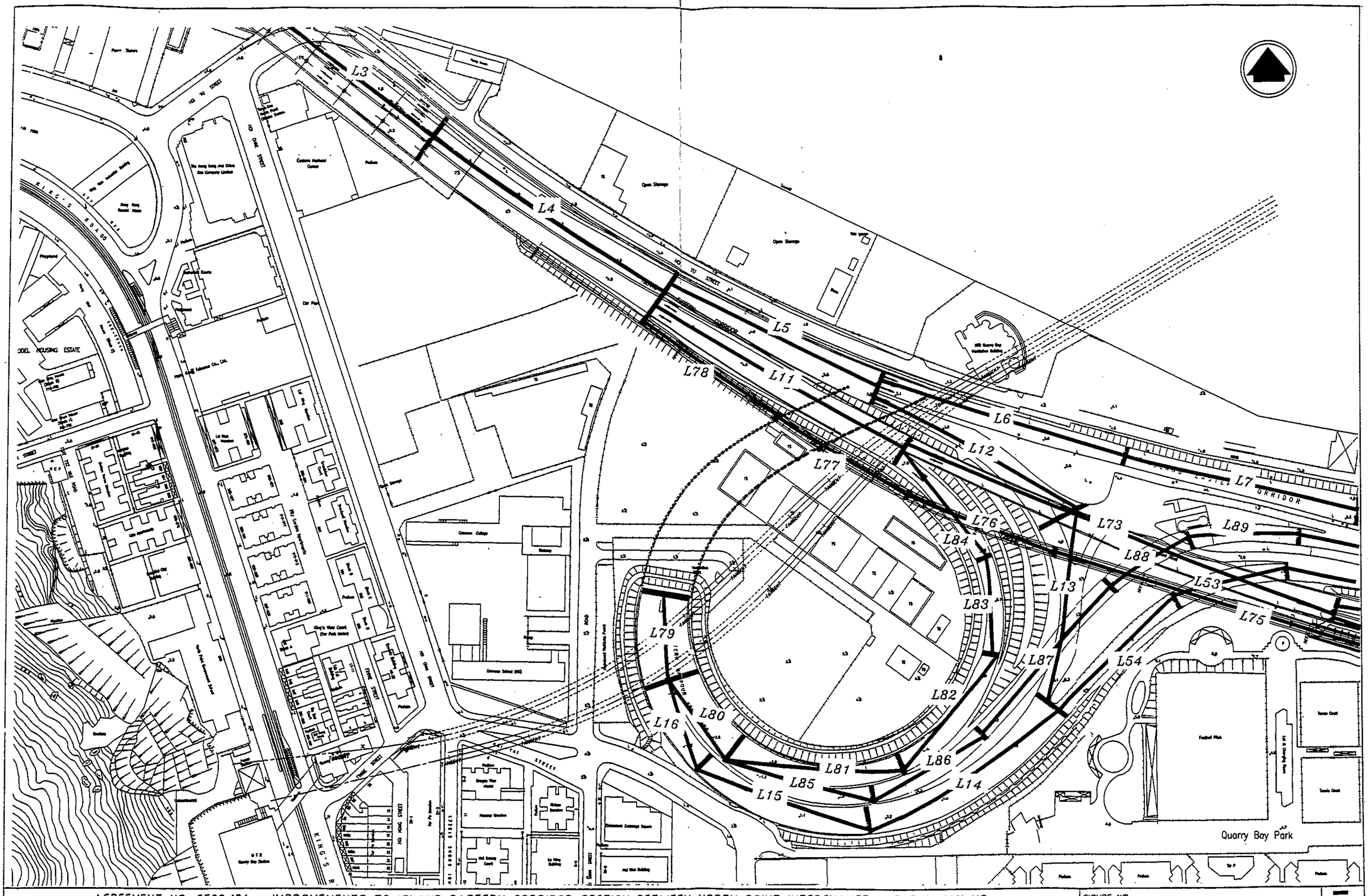


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

ROAD LINKS AND DESIGNATIONS FOR MODELLING CALINE4 (SHEET 2 OF 5)

FIGURE NO	
H-1	
SCALE. 1 : 2000	DATE JANUARY 98

Maunsell

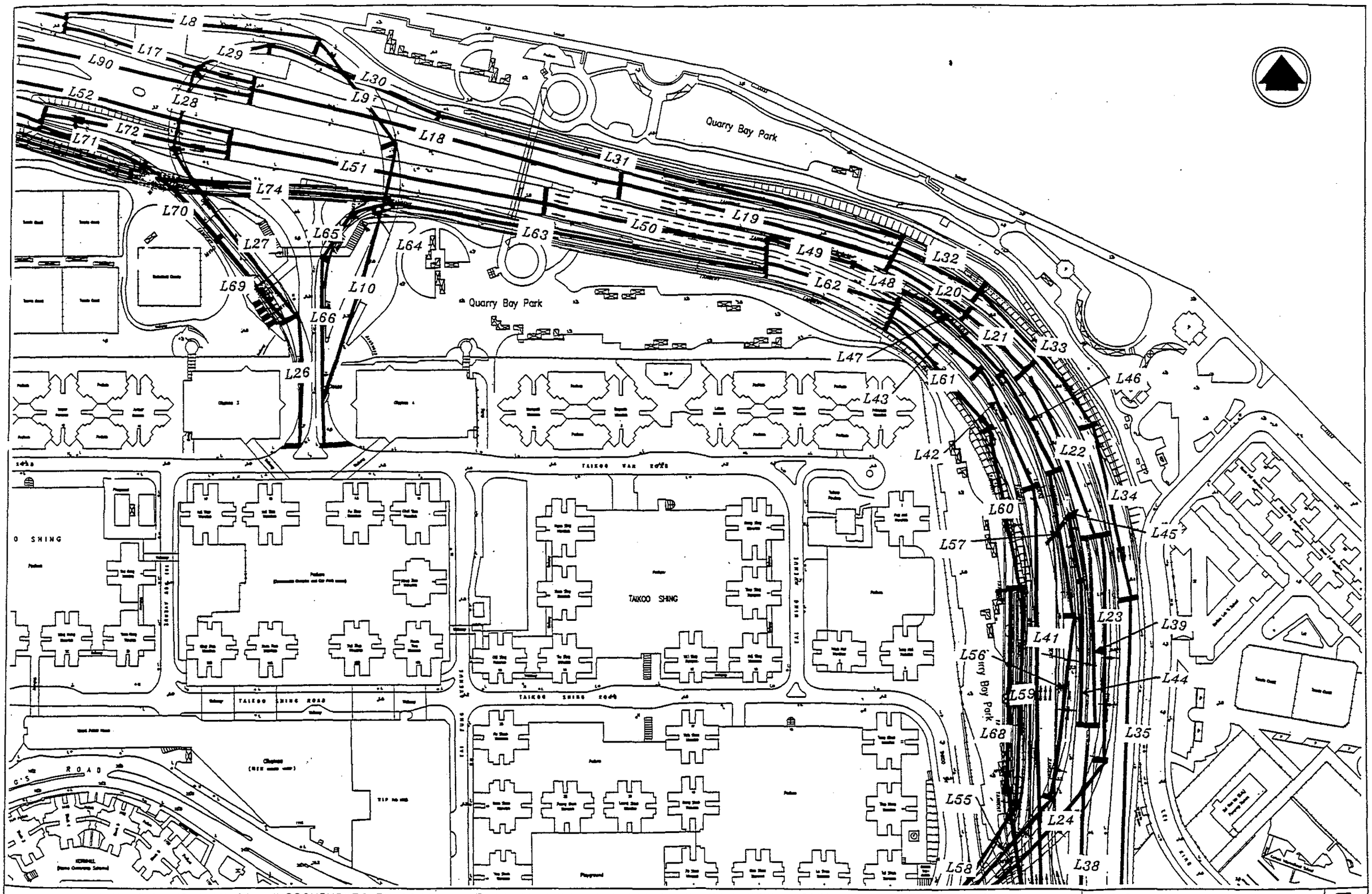


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

ROAD LINKS AND DESIGNATIONS FOR MODELLING CALINE4 (SHEET 3 OF 5)

FIGURE NO.	H-1
SCALE: 1 : 2000	DATE: JANUARY 98

Maunsell

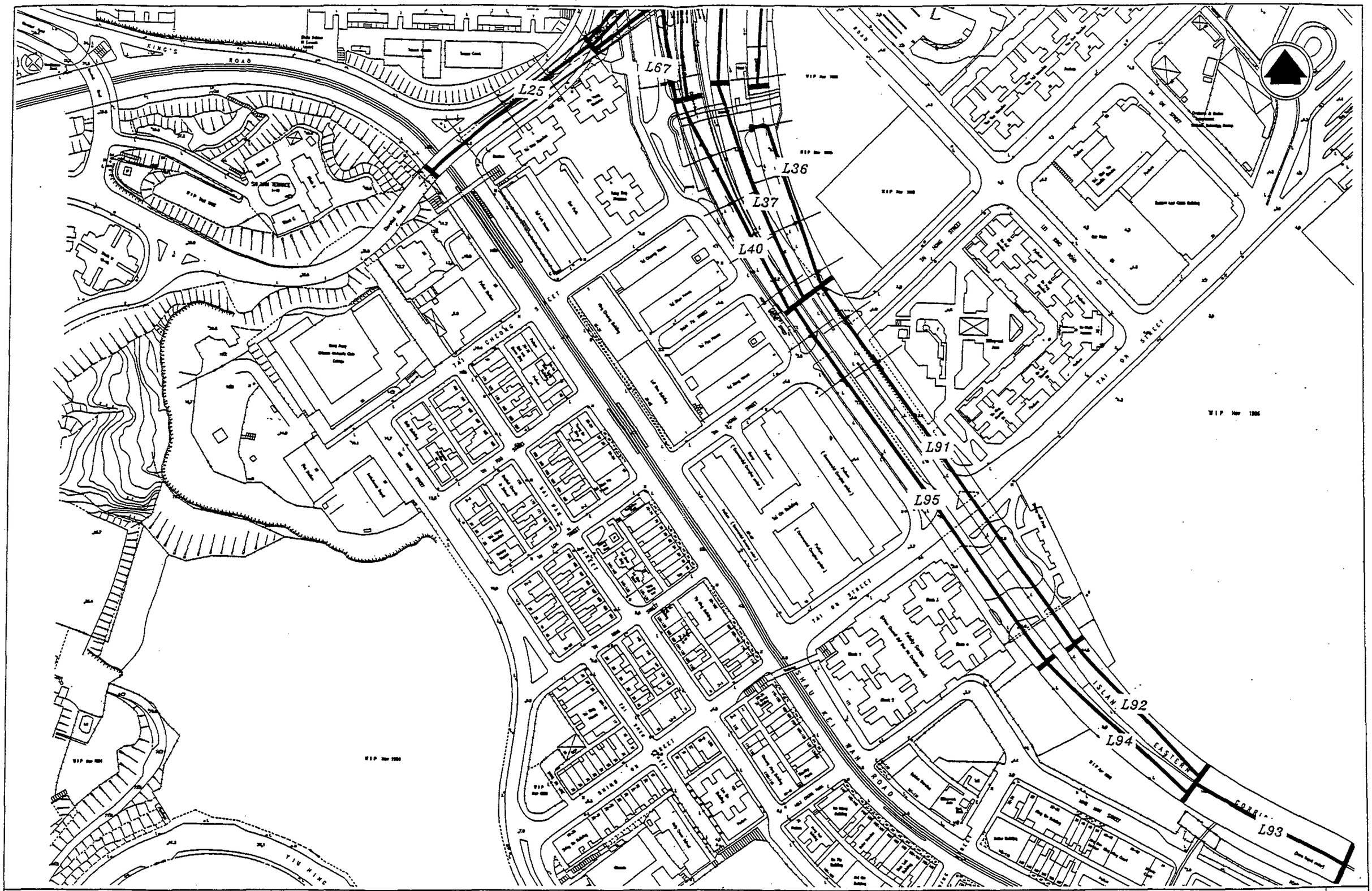


AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

ROAD LINKS AND DESIGNATIONS FOR MODELLING CALINE4 (SHEET 4 OF 5)

FIGURE NO.	
H-1	
SCALE: 1 : 2000	DATE: JANUARY 98

Maunsell



AGREEMENT NO CE82/96 - IMPROVEMENTS TO ISLAND EASTERN CORRIDOR SECTION BETWEEN NORTH POINT INTERCHANGE AND SAI WAN HO

ROAD LINKS AND DESIGNATIONS FOR MODELLING CALINE4 (SHEET 5 OF 5)

FIGURE NO.	
H-1	
SCALE	DATE
1 : 2000	JANUARY 98

Maunsell

Appendix I Breakdown of Traffic Noise Contributions from Existing Roads and New Roads (Mitigated + Partial Enclosure)

NSR	Floor	Facade Noise Levels in L_{10}(1-hr) dB(A)		
		Exist roads	New roads	Overall
NPE1	1/F	73.5	64.6	74
	5/F	80.1	64.5	80
	Top	79.8	66.7	80
NPE2	1/F	78.7	63.8	79
	5/F	78.1	63.9	78
	Top	77.7	65.0	78
NPE3	1/F	71.8	50.6	72
	5/F	81.8	46.7	82
	Top	81.7	55.7	82
KFB	1/F	81.9	54.9	82
	5/F	79.4	58.6	79
	10/F	77.6	59.1	78
	15/F	78.4	61.6	78
	20/F	77.9	61.6	78
	Top	77.8	61.8	78
HG1	1/F	83.2	63.1	83
	5/F	81.3	63.4	81
	10/F	80.0	64.7	80
	15/F	78.9	65.2	79
	20/F	78.5	65.3	79
	Top	78.3	65.3	79
HG2	1/F	83.5	64.8	84
	5/F	81.4	65.7	82
	10/F	80.5	67.7	81
	15/F	79.7	67.7	80
	20/F	79.0	67.8	79
	Top	78.7	68.0	79
KR1	1/F	82.8	62.6	83
	5/F	82.7	63.9	83
	10/F	81.2	67.8	81
	Top	81.0	68.5	81
KR2	1/F	81.1	62.7	81
	5/F	81.1	66.3	81
	10/F	80.1	67.7	80
	Top	79.9	68.2	80
HV1	1/F	82.3	63.1	82
	5/F	80.7	63.3	81
	10/F	79.4	63.7	80
	15/F	78.5	63.7	79
	20/F	77.8	63.9	78
	25/F	77.2	64.6	77
	Top	77.0	64.7	77
HV2	1/F	79.0	64.5	79
	5/F	78.3	64.7	78
	10/F	77.8	65.2	78
	15/F	77.3	65.4	78
	20/F	76.9	65.6	77
	25/F	76.4	65.5	77
	Top	76.2	65.4	77
HV3	1/F	72.9	63.0	73
	5/F	72.6	63.3	73
	10/F	73.1	64.4	74
	15/F	73.9	64.5	74
	20/F	74.0	64.8	74
	25/F	75.0	64.7	75
	Top	74.8	64.7	75
HV4	1/F	69.1	60.3	70
	5/F	68.3	60.6	69
	10/F	68.4	61.6	69
	15/F	69.8	62.7	71
	20/F	70.6	62.8	71
	25/F	70.7	63.1	71
	Top	70.9	63.1	72
FSDSQ	1/F	63.7	70.4	71
	5/F	68.6	75.7	76
	10/F	70.1	80.0	80
	Top	70.1	80.0	80
MHE	1/F	85.6	63.9	86
	5/F	83.0	64.3	83
	10/F	80.8	65.2	81
	15/F	79.3	66.1	80
	Top	78.5	66.4	79
	5/F	77.1	66.7	77
	10/F	76.9	66.8	77
	15/F	76.8	66.8	77
HCS1	1/F	70.9	59.5	71
	5/F	68.9	61.3	70
	10/F	69.7	62.9	71
	Top	69.5	63.0	70
HCS2	1/F	70.9	58.4	71
	5/F	69.3	59.7	70
	10/F	70.8	61.4	71
	15/F	71.3	61.7	72
	20/F	71.5	62.0	72
	Top	72.0	63.0	73
HCS3	1/F	71.6	56.2	72
	5/F	70.2	57.7	70
	10/F	71.3	59.4	72
	15/F	71.4	59.6	72
	20/F	72.4	59.8	73
	Top	72.7	60.1	73
TPM1	1/F	72.3	60.4	73
	5/F	70.7	60.2	71
	8/F	71.1	60.6	71
DVH1	1/F	71.9	58.7	72
	5/F	71.8	57.8	72
	10/F	72.9	60.2	73
	15/F	73.1	60.7	73
	20/F	73.9	60.9	74
	25/F	73.6	61.1	74
RM1	1/F	73.4	58.2	74
	5/F	75.2	56.9	75
	10/F	75.7	60.7	76
	15/F	75.6	60.9	76
	20/F	75.4	61.0	76
	25/F	75.4	61.2	76
TKS1	1/F	74.4	61.5	75
	5/F	74.5	61.7	75
	10/F	74.6	61.9	75
	15/F	74.7	62.1	75
	20/F	74.5	62.1	75
	25/F	74.5	62.4	75
	Top	74.5	61.9	75
TKS2	1/F	70.7	62.9	71
	5/F	73.9	61.5	74
	10/F	74.2	62.7	74
	15/F	75.4	62.5	76
	20/F	75.4	62.3	76
	25/F	75.2	62.3	75
	Top	75.1	62.2	75
TKS3	1/F	76.1	43.6	76
	5/F	78.3	45.8	78
	10/F	79.7	48.2	80
	15/F	79.5	50.3	80
	20/F	79.0	52.0	79
	25/F	78.4	56.1	78
	Top	78.3	56.0	78
TKS4	1/F	66.2	54.4	66
	5/F	74.9	59.4	75
	10/F	76.7	62.4	77
	15/F	76.7	62.6	77
	20/F	76.5	62.9	77
	25/F	76.4	63.0	77
	Top	76.5	63.0	77
TKS5	1/F	73.6	66.1	74
	5/F	74.5	68.3	75
	10/F	75.9	67.9	77
	15/F	76.1	68.6	77
	20/F	75.4	68.0	76
	25/F	75.5	67.7	76
	Top	75.8	67.5	76
TKS6	1/F	78.6	71.3	79
	5/F	79.0	72.8	80
	10/F	78.7	71.9	80
	15/F	78.0	71.2	79
	20/F	77.5	70.4	78
	25/F	76.9	69.6	78
	Top	76.6	69.1	77
LKW1	1/F	76.5	65.6	77

	Top	76.7	66.7	77
LKW2	1/F	70.8	61.6	71
	5/F	71.8	62.2	72
	10/F	72.9	63.3	73
	15/F	73.0	63.5	73
	Top	73.0	63.7	73
LKW3	1/F	69.8	59.7	70
	5/F	71.5	61.9	72
	10/F	73.4	63.9	74
	15/F	73.6	64.2	74
	Top	74.8	64.1	75
LKW4	1/F	75.9	49.3	76
	5/F	78.0	57.6	78
	10/F	77.7	57.5	78
	15/F	77.2	58.5	77
	Top	77.0	60.2	77
LKW5	1/F	73.6	34.4	74
	5/F	73.6	38.6	74
	10/F	73.6	46.0	74
	15/F	74.1	58.8	74
	Top	75.2	61.5	75
HC1	1/F	68.0	57.2	68
	5/F	77.6	63.8	78
	10/F	76.8	61.4	77
	Top	76.6	61.2	77
HC2	1/F	72.5	30.8	73
	5/F	79.6	35.6	80
	10/F	79.3	51.4	79
	15/F	78.9	55.9	79
	20/F	78.1	57.2	78
	25/F	77.5	56.1	78
	Top	77.1	55.9	77
HC3	1/F	71.7	46.4	72
	5/F	79.3	55.7	79
	10/F	78.9	55.2	79
	15/F	78.2	54.3	78
	20/F	77.5	54.6	78
	25/F	76.9	55.2	77
	Top	76.5	55.8	77
FG1	1/F	83.8	56.4	84
	5/F	82.0	55.5	82
	10/F	80.4	56.1	80
	15/F	79.2	56.7	79
	20/F	78.3	56.0	78
	Top	77.8	56.0	78
FG2	1/F	83.9	57.6	84
	5/F	82.1	56.8	82
	10/F	80.5	57.6	81
	15/F	79.4	57.1	79
	20/F	78.4	57.0	78
	Top	77.9	56.9	78
FG3	1/F	79.7	56.1	80
	5/F	79.1	54.8	79
	10/F	78.1	56.0	78
	15/F	77.2	55.4	77
	20/F	76.4	55.5	76
	Top	76.0	55.1	76
CWC1	1/F	73.7	62.3	74
	3/F	73.7	60.1	74
	5/F	73.7	62.5	74
CWC2	1/F	71.4	61.8	72
	3/F	71.5	59.3	72
	5/F	71.9	62.0	72
CC1	1/F	67.7	62.2	69
	3/F	67.4	62.9	69
	5/F	66.0	63.4	68
CC2	1/F	69.1	61.7	70
	3/F	67.7	62.3	69
	5/F	67.6	64.3	69
CC3	1/F	70.4	49.6	70
	3/F	72.1	49.6	72
	5/F	73.4	49.6	73

Recommendations	Responsible Part	Locations	Timing
110m of 5m inverted L-shaped barrier adjoining 560m of 5m high plain barrier for mitigation of traffic noise impact	HyD	670m long westbound lane between Hoi Yu Street and Tai Koo Shing Interchange	In conjunction with improvement works to IEC.
540m of 5m high inverted L-shaped barrier for mitigation of traffic noise impact	HyD	540m long westbound lane between Taikoo shing Interchange and Kornhill flyover	In conjunction with improvement works to IEC.
Indirect Technical Remedies for traffic noise impact	HyD	Fire Services Department Staff Quarters at North Point Fire Station	In conjunction with improvement works to IEC
Extending 130m of 5m high vertical noise barrier at top horizontally by about 6m to cover carriageway for mitigation of air quality impact	HyD	130m stretch of the westbound additional traffic lane fronting Quarry Bay Park Sports Ground.	In conjunction with improvement works to IEC.
Noise Reducing Highway Surfacing (NRHS)	HyD	Applicable to carriageways with the project limit with posted speed 70kph or above	In conjunction with improvement works to IEC.
Set back of facilities which are sensitive to air quality impact away from new carriageways	USD/Plan D	Quarry Bay Park Stages II and III	During detailed design of Quarry Bay Park Stages II and III
Environmental pollution control measures for construction impacts	HyD	Applicable to the construction works within the site boundary	During construction of the project
Detailed landscape and visual impact mitigation measures	HyD/Plan D	Applicable to the construction works within the site boundary	During detailed design stage of the project.