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West Kowloon Corridor – Yau Ma Tei Section Phase II Traffic Review and Environmental Assessment Study

Final Report – Volume 3 Environmental Assessment



March 1992

Maunsell Consultants Asia Ltd
in association with
MVA (Asia) Ltd
CES (Asia) Ltd
Clouston



Hong Kong Government
Highways Department
Kowloon Region

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1. Introduction

1.1 Background

- 1.1.1 The West Kowloon Reclamation Transport Study (WKRTS) identified the need to construct the Yau Ma Tei and Mongkok sections of the West Kowloon Corridor (WKC) to provide a free flow route between the Gascoigne Road flyover and Tai Kok Tsui. The upgrading of this route was regarded as very essential to cope with the traffic associated with the Western Harbour Crossing (WHC) and the West Kowloon Expressway (WKE), both of which are scheduled for completion in 1996.
- 1.1.2 The WKC Yau Ma Tei Section (Phase II) comprises two parts, namely IIA and IIB. Phase IIA involves connecting the Ferry Street northbound carriageway to the existing elevated road at Tai Kok Tsui Road. The existing ramp at Tai Kok Tsui Road at the ground level junction with Cherry Street will be modified to allow access for traffic coming from the reclamation area via the Cherry Street Extension. This existing ramp modifications will be undertaken as part of the West Kowloon Reclamation Project after the completion of the WKC Phase IIA Section.
- 1.1.3 Phase IIB involves the extension of the existing Gascoigne Road Flyover over Waterloo Road to join Ferry Street at ground level. Ramps are to be provided for Ferry Street traffic to overpass Waterloo Road while maintaining the connections between Waterloo Road and the existing flyover.
- 1.1.4 The WKRTS Report recommended a traffic layout for Phase IIB which involved the demolition and reconstruction of a portion of the existing Gascoigne Road flyover and the provision of a future long term widening line to cater for dual two lanes on the flyover west of the Yau Ma Tei carpark building.
- 1.1.5 Since the completion of the WKRTS, various changes have taken place. These include revisions to the transport and land use assumptions for the West Kowloon Reclamation and the implementation of the drainage upgrading works in the hinterland area. As all of these have implications on the traffic layouts for Phase II, it was considered necessary to undertake a review of the layouts to take into account these changes and to determine a layout for Phase IIB to satisfy the traffic, environmental and structural requirements.

1.2 The Study Objectives

- 1.2.1 This volume of the Report considers two separate aspects of the Phase II road improvement scheme;
- (i) an environmental assessment of the Phase IIA flyover
 - (ii) an environmental assessment of the Phase IIB works

1.2.2 The objectives of the environmental assessment of both the Phase IIA and Phase IIB works as contained in Chapters 3 and 4 of this report are as follows :

- (a) To identify those aspects of the corridor likely to cause a detrimental effect on existing and proposed land uses
- (b) To quantify the extent of those impacts
- (c) To identify those sensitive receivers that will be affected
- (d) To identify and recommend amelioration techniques to reduce visual and landscape impacts
- (e) To identify and recommend methods to mitigate identified impacts
- (f) To assess the noise and air quality impacts arising from the construction and operational phases.
- (g) To recommend environmental monitoring and audit requirements as necessary to ensure that mitigation methods are successfully implemented

2. The Site

2.1 General

The Yau Ma Tei Phase II section of the West Kowloon Corridor is located in the northwest Kowloon area covering Yau Ma Tei, Mong Kok and Tai Kok Tsui. The area comprises a mixture of different natures of developments including very old buildings, fruit market, industrial areas and school.

2.2 The Road Network

2.2.1 The roads in the study area are laid out in a grid system. The main north-south routes are Nathan Road, Tong Mi Road and Ferry Street. Mong Kok Road, Argyle Street, Waterloo Road, Jordan Road and Austin Road are the main east-west routes providing connections to east and central Kowloon area.

2.2.2 The existing traffic along Cherry Street, Tong Mi Road and Ferry Street is very busy. During the construction of the WKC, construction works for the WHC, the WKE and the WKR will be carried out concurrently on the reclamation area. In addition the drainage improvement works, the sewerage upgrading works and other utilities installations will also be implemented in the West Kowloon hinterland. These construction works will have significant impact on the traffic conditions in the West Kowloon.

2.2.3 The Mong Kok Traffic Management Scheme (MK01) recommended by the North West Kowloon Traffic Study will commence in November 1991 and be completed in October 1992. The scheme will improve the traffic conditions within the Mong Kok area and provide a scope for the local traffic diversions, thus permitting the construction of the WKC Phase I. However, any major increase in the traffic within the Mong Kok area associated with the traffic diversions from the existing Gascoigne Road flyover onto Ferry Street would be extremely difficult to handle.

2.2.4 The completion of the WKE, the Central Kowloon Route (CKR) and the WHC will form strategic links to serve the major North-South, East-West and Hong Kong Island traffic. The WKC will remain as an urban primary distributor linking Northwest Kowloon with Yau Ma Tei, Hung Homg and East Kowloon.

3. Environmental Assessment of Phase IIA

3.1 Introduction

3.1.1 The Phase IIA section of the West Kowloon Corridor involves the construction of a single 2-lane carriageway connecting the Ferry Street northbound carriageway to the existing elevated road at Tai Kok Tsui Road. About 320m long of the carriageway will be elevated to cross Cherry Street. The general road layout of the Phase IIA section is given on Drawing 12 contained in Volume I of the Report.

3.1.2 This chapter describes the environmental assessment that has been undertaken for Phase IIA. The assessment has been conducted in accordance with Chapter 9 of the HKPSG and the statutory provisions of various Ordinances and related legislation. Each of the relevant sections contains a description of the approach and methodology, a listing of the assumptions made and a discussion of the results. Necessary mitigation measures and requirements for the environmental or audit monitoring have also been included in the relevant sections.

3.2 Air Quality Impacts from Construction

3.2.1 General Impacts

3.2.1.1 The major air quality impact during the construction of Phase IIA will result from dust emissions. Vehicle and plant exhaust emissions are not considered to constitute a significant source of air pollutants.

3.2.1.2 Possible dust sources are:

- site preparation;
- excavations;
- wind erosion of work areas;
- material transfer to and from trucks;
- vehicle/plant movements on unpaved roads and over the site;

3.2.2 Sensitive Receivers

3.2.2.1 Sensitive receivers 24, 28 29 and 30 were used for the assessment of dust impacts. See Figure 3.4.1. for their location.

3.2.3 Background Dust Levels

3.2.3.1 The major source of background dust levels will arise from the formation of the West Kowloon Reclamation (WKR). The West Kowloon Reclamation, Construction Environmental Impact Assessment Report, 1991, indicates potential high dust levels in the area. The levels are given in Table 3.2.1. Within this report concrete batching was assumed to have dust control measures in place.

Table 3.2.1 Predicted Dust Levels from the WKR ($\mu\text{g m}^{-3}$)

Down Wind Distance (m)	Dust Concentration at Wind Speed 2 ms ⁻¹
50	1631
100	1065
200	503
300	299
400	177
500	122

3.2.4 Assessment Methodology of Construction Dust Impacts

3.2.4.1 Dust levels arising from construction work may be estimated using USEPA Compilation of Air Pollutant Emission Factors (AP-42). In order to make predictions of air quality impacts the following information is required; site area, nature of activity, quantities of stockpiled materials, vehicle movements to and from the site, vehicle speed over the site, silt content of excavated material and rainfall data. The basic emission categories are; dust from vehicles movements on unpaved roads, dust from material movement, dust from the erosion of the site. The PAL2.1 dispersion model was used for the dispersion modelling to assess the effects on the sensitive receivers.

3.2.4.2 Meteorological conditions of wind speed 2ms⁻¹, stability category D and a mixing layer height of 500m were adopted for the analysis. Selection of wind speed represents a compromise between low speed (and hence decreased dispersion but possible settling of particulates), and a higher wind speed which will result in greater dispersion of particulates and increased dust generation.

3.2.4.3 The dust emissions were calculated using the methodology in AP-42. The major dust sources were considered to arise from truck movements on unpaved surfaces and erosion of the site area. The construction site was considered as a 30m wide strip, running the length of the proposed road. It was assumed that the whole area would be worked simultaneously. However, since this will not occur in practice, the results will be conservative. Dust emission factors are given in Table 3.2.2.

Table 3.2.2 Construction Dust Emission Factors

Activity	Emission (kg day ⁻¹)
Dust from Unpaved Roads	3.3
Erosion of Site	4.0

3.2.5 Construction Impact on Sensitive Receivers

3.2.5.1 Table 3.2.3 shows the worst case 1-hourly TSP concentrations at the sensitive receivers.

Table 3.2.3 Worst Case 1-hour TSP Concentrations

Receiver	TSP μgm^{-3}
24	11
28	23
29	15
30	28

3.2.5.2 There are unlikely to be adverse impacts from dust at the sensitive receivers as a direct result of the construction of the Cherry Street flyover. The TSP concentrations are in compliance with the acceptable limit of $500 \mu\text{gm}^{-3}$ at the receivers. These levels are insignificant in comparison with the levels predicted for the formation of the WKR. The worst case 1-hour average is also well below the 24-hour average AQO of $260 \mu\text{gm}^{-3}$, and also below the annual average AQO of $80 \mu\text{gm}^{-3}$, hence it is concluded that the construction of the WKC Phase IIA will have minimal effect on long term average dust concentrations in the area.

3.2.5.3 Dust reduction measures for construction work, however, should be adopted as a matter of good working practice.

3.2.6 Construction Dust Control Measures

General Construction

3.2.6.1 Watering of exposed site surfaces is the most commonly selected dust control method but its effectiveness depends on the degree of coverage and frequency of application. Up to 50% reduction in dry dust emissions can be achieved by twice daily watering with complete coverage. Other methods which can be employed include screening and enclosure of particularly dusty work areas, where this is practical. However, this can only apply to work within building shells or small external site areas.

Unpaved Site Roads

3.2.6.2 Common control methods employed include coverage with hard-core, watering and traffic speed control regulations.

Recommended Dust Control Measures

3.2.6.3 The following measures should be adopted where applicable:

- use of regular watering, with complete coverage, in dry periods to reduce dust emissions from unpaved roads;
- imposition of speed controls for vehicles on unpaved site roads, 8 kmh-1 being the limit recommended by EPD;
- use of frequent watering for particularly dusty static construction areas;
- tarpaulin covering of all dusty vehicle loads transported to, from and between site locations;
- establishment and use of vehicle wheel and body washing stations at exit point of site and public roads, combined with cleaning of public roads where necessary and practical;
- where feasible, routing of vehicles and positioning of construction plant at maximum possible separation distance from sensitive receptors;

3.2.6.4 It is not considered that a regular dust monitoring program is undertaken, due to the low predicted dust levels in relation to the WKR formation. Dust minimisation could be accomplished by regular visual inspection by the Engineer or representative. Should there appear to be a dust nuisance, discussions should be held with the contractor to establish the cause of the nuisance and to find ways of preventing future occurrences.

3.3 Noise Impacts from Construction

3.3.1 Legislation

3.3.1.1 The Noise Control Ordinance (NCO), enacted in 1988, provides powers for the control of noise from general construction works, piling and noise from places other than construction sites, public places or domestic premises. Technical Memoranda on noise from piling and general construction works provide specific criteria and procedures for assessing noise during the construction phase of a development.

3.3.1.2 The procedures encourage the use of quiet machinery by permitting longer working hours if noise levels are acceptable in relation to local background conditions. Noise emissions from a site must be proven to comply with acceptable noise levels (ANLs) (taking into account influencing factors such as busy roads and the airport) during restricted periods (evenings, night-time, Sundays and public holidays) before a Construction Noise Permit will be issued to enable working during these restricted hours.

3.3.1.3 While there is no statutory control on construction noise during the day-time limitations are frequently imposed through the form of contract clauses. Recent construction works have involved imposition of control levels of 5 dB(A) above background. This has resulted in levels of up to 85 dB(A) being permitted in the vicinity of very busy roads. Other sites have been restricted to 75 dB(A) as a result of being located in a quieter area.

3.3.2 Existing Conditions

3.3.2.1 Yau Ma Tai and Tai Kok Tsui are typical well developed urban areas in Hong Kong. The noise environment in these areas is dominated by traffic noise. Due to close proximity to Kai Tak International Airport, aircraft noise can be heard intermittently for most of the day. Apart from these, within the neighbourhood of schools, break times activities also represent a noise source.

3.3.2.2 During this study, ambient noise levels were measured at the facade of four noise sensitive receivers. The locations of the noise monitoring programme had previously been agreed with EPD and are as follows:

- top floor of 23-25 Tai Kok Tsui Road overlooking Tai Kok Tsui Road;
- the second floor of Ming Kei College facing Cherry Street;
- top floor of 18 Shan Tung Street overlooking Ferry Street;
- first floor outside window at south end of Yau Ma Tei Catholic Primary School facing Ching Ping Street.

3.3.2.3 The third receiver was selected in place of Shun King Building at 317 Ferry Street. Property management of Shun King Building did not allow entry to their premises. Measurements recorded at Ming Kei College were made at the south wing of the building, which is nearer to Cherry Street. It should be noted that classrooms fronting Ferry Street have both double glazing and air conditioning fitted. For comparison with the noise levels at the location of the classrooms are some 30 m (and without a/c and double glazing) further back from Cherry Street, two half-hourly measurements were taken at their facade between 3:45 and 4:45 p.m. All results are presented in Appendix A. Figure A1 shows all the measurement locations. All measurements were made at the facade of the buildings.

not yet

3.3.2.4 For the purposes of predicting the noise impacts as a result of construction of the Phase IIA flyover, the existing conditions at the first two noise monitoring locations should be used. The latter two i.e. at Shun Tung Street and at the Yau Ma Tei Catholic Primary School reflect the ambient conditions near to the Phase IIB portion of the West Kowloon Corridor and as such this data will be used in detail during the more detailed environmental assessment of Phase IIB section.

3.3.2.5 The results obtained from the background noise survey indicate that Leq (1 hour) noise levels at the Tai Kok Tsui Road monitoring position were highest at 8 a.m. (72.3 dB(A)) and for the remainder of the day (until 6 p.m), noise levels averaged approximately 71 dB(A).

72.3

3.3.2.6 Noise levels at the facade of the schools on Cherry Street were higher than those recorded at Tai Kok Tsui Road, predominantly due to the close proximity to the road. It should be noted that the classrooms of Sharon Lutheran School directly adjacent to the road all have double glazing and air conditioning. Peak noise hours were noted around 8 a.m, 2 p.m and 4 p.m. Ambient noise levels at this location during the day ranged between 78.5 dB(A) and 80.5 dB(A) (1 hour Leq).

78.5
80.5

3.3.2.7 Noise monitoring was also undertaken outside the classrooms that are set back from the present position of Cherry Street. There is a certain amount of shielding of this school area from the road by the surrounding school buildings. The resulting noise level Leq (30 minutes) between 3.45 and 4.45 p.m varied between 75.3 and 77 dB(A).

75.3
77

3.3.2.8 The Environmental Impact Assessment (EIA) of the construction of the West Kowloon Reclamation (WKR) included a programme of background noise monitoring at a number of areas that will also be affected by the construction of the West Kowloon Corridor Phase IIA flyover. Two of the monitoring locations were very close to the background noise monitoring positions chosen for this study. The daytime background noise levels recorded for the WKR report indicated ambient noise in the vicinity of Wong Tai Street (adjacent to Tai Kok Tsui Road) as being between 62 and 65 dB(A) while on Cherry Street recorded daytime noise levels were between 63 and 73 dB(A). It should be noted however that the results from the former location reflect noise levels at the top a 13 storey building so there will have been considerable distance attenuation.

3.3.2.9 The WKR EIA Construction report concluded that background noise levels would be exceeded by upto 17 dB(A) for some periods between August 1992 and July 1994 in the vicinity of Wong Tai Street, while in Hoi King Street background noise levels may be exceeded by upto 20 dB(A) for some periods. The Ming Kei College on Cherry Street would be affected by noise levels predicted at 8-14 dB(A) above background. It is expected therefore that background noise levels on Tai Kok Tsui Road could be upto 85 dB(A) while background noise levels on Cherry Street could be upto between 71 dB(A) and 87 dB(A) as a result of the construction activities related to the WKR. It is understood that the WKR programme may slip by few months.

3.3.2.10 It is possible to conclude from examination of the WKR Construction EIA report that background noise levels will be increased (significantly so for some periods) as a result of the construction activities relation to the WKR. As the Tai Kok Tsui and Cherry Street areas are likely to be affected by increased background noise levels as a result of the WKR, until January 1995 (perhaps later) it will be important to determine as early as possible the programme for the construction of the WKC Phase IIA flyover.

3.3.3 Sensitive Receivers

3.3.3.1 For the purposes of the assessment of noise impacts during the construction of the Phase IIA flyover, seven noise sensitive receivers (NSR's) were selected in the vicinity of the proposed development. As the construction of the flyover has been divided into 7 stages, an NSR has been identified for each of the work stages. The source of noise arising from each work stage has been taken as the mid point of each stage. The locations of all NSR's and NNS's are illustrated in Figure 3.3.1. The distances between the NNS and the respective NSR are shown below in Table 3.3.1.

Table 3.3.1 Measured Distance between NSR and Relevant NNS

Stage	NSR	Distance (m)
I	1	27
II north	2	27
II south	3	38
III north	4	36
III south	5	52
IV north	6	43
IV north	7	78

3.3.4 Assessment Procedure

- 3.3.4.1 Noise prediction calculations have been undertaken in accordance with the methodology given in the "Technical Memorandum on Noise from Construction Work other than Percussive Piling". Additional information was obtained from "A Practical Guide to the Reduction of Noise from Construction Works", EPD 1989 and British Standard 5228 Part 1 : 1984, "Noise Control on Construction and Open Sites."
- 3.3.4.2 Construction noise will result from a variety of activities that have been identified for each of the stages of the Phase IIA flyover. While it should be noted that the construction programme and prediction of plant usage has been estimated for the purposes of this assessment and should be considered as preliminary, it is not expected that the real situation will vary significantly from that adopted here. Construction schedules and equipment usage data for the work site is given in Appendices B and C. It should be noted at this stage that all the plant have been assumed to be working all the time at each site. In reality this is very unlikely to occur and it is considered that the noise levels predicted during the scope of this assessment will not be produced throughout the 8 hour working period, for example, the concrete vibrators will operate for approximately 2 hours per day. However, it is only possible to estimate the extent of worst case impact by adopting this procedure.
- 3.3.4.3 A number of assumptions have been adopted during the calculations; the following represent those made that are common to all stages of the flyover construction:
- Sound power levels used for identified plant are as contained in the "Technical Memorandum on Noise from Construction Work other than Percussive Piling"
 - One number concrete mixer lorry is operating at all times
 - Lorries rather than dump trucks are utilised for the handling of excavated material
 - Piling is assumed to take 3 weeks per stage
 - Column construction will take 2 weeks per stage
 - Excavation and stripping of the pile head take 2 weeks
 - 1 no paver and roller is used for 3 weeks per stage
 - The equipment required for each stage is assumed to be divided equally between the north and south portions of that stage. Where an add number of plant have been predicted for a particular month i.e. 3 dump trucks, 2 have been assumed to be operating at both the north and south stages.
 - The Notional Noise Source (NNS) for each stage is assumed to be the midpoint of each stage.
 - The start date of construction work is taken as April 1994.
- 3.3.4.4 The basic noise level (BNL) for each stage/site has been calculated based upon the above assumptions and the equipment schedules as shown in Appendix D.
- 3.3.4.5 In order to determine the noise impacts from construction activities on each of the NSR's during the whole construction period, the distance between the NNS for each stage and the NSR's must be taken into account. Some NSR's will be shielded from construction activities at some of the stages due to the presence of buildings or from the previously constructed flyover. The distances assumed for the purpose of the calculations are shown in Table 3.3.2.

Table 3.3.2 Distance (m) to Each NSR from Each of the Work Stages

Stage	NSR						
	1	2	3	4	5	6	7
I	27	46	46	0	0	158	0
II north	54	27	0	32	0	114	0
II south	47	86	38	0	37	0	0
III north	82	45	0	36	0	81	0
III south	77	0	57	0	52	0	0
IV north	0	86	0	72	0	43	0
IV south	118	0	96	0	88	0	78

Note: Where zero distance is indicated, the NSR is assumed to be shielded from the NNS, e.g. NSR 4 will be affected by construction activities at stages IIN, IIN and IVN.

3.3.4.6 The distance corrected noise level at each NSR from each work stage has been combined in order to produce the predicted noise levels at each of the NSR's. A facade correction of +3 dB(A) is also added. Tables 3.3.3 to 3.3.9 below illustrate the predicted noise levels at each of the NSR's resulting from construction activities.

Table 3.3.3 Noise Level at NSR 1 from Construction Activities

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
85.87	85.87	85.87	81.50	81.50	81.50	78.71	77.51	90.21	91.44	86.04	82.25	85.32	84.35	79.4	0	88.75	90.14	84.31	84.31	83.57	83.57	83.57	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
81.90	81.90	81.90	81.90	81.90	81.90	81.90	0	0	79.31	79.31	79.31	79.31	79.31	79.31	79.31	0	0	72.86	72.86	72.86	72.86	72.86	72.86	72.86
51	52	53	54	55	56	57	58	59	60	61	62													
75.37	75.37	75.37	73.00	73.00	73.00	69.01	69.01	69.01	62.56	62.56	62.56													

Table 3.3.4 Noise Level at NSR 2 from Construction Activities

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
81.24	81.24	81.24	84.28	84.28	84.28	80.63	79.43	86.33	90.43	88.82	84.24	85.56	84.52	82.18	0	87.16	88.97	81.68	81.68	78.94	78.94	78.94	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
84.68	84.68	84.68	84.68	84.68	84.68	84.68	0	0	81.23	81.23	81.23	81.23	81.23	81.23	81.23	0	0	75.61	75.61	75.61	75.61	75.61	75.61	75.61
51	52	53	54	55	56	57	58	59	60	61	62													
70.74	70.74	70.74	75.78	75.78	75.78	70.93	70.93	70.93	65.31	65.31	65.31													

Table 3.3.5 Noise Level at NSR 3 from Construction Activities

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
81.24	81.24	81.24	80.90	80.90	80.90	78.58	77.38	85.98	88.45	85.54	82.30	84.07	82.57	78.80	0	85.62	87.26	80.93	80.93	78.94	78.94	78.94	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
81.30	81.30	81.30	81.30	81.30	81.30	81.30	0	0	79.18	79.18	79.18	79.18	79.18	79.18	79.18	0	0	74.65	74.65	74.65	74.65	74.65	74.65	74.65
51	52	53	54	55	56	57	58	59	60	61	62													
70.74	70.74	70.74	72.40	72.40	72.40	68.88	68.88	68.88	64.35	64.35	64.35													

Table 3.3.6 Noise Level at NSR 4 from Construction Activities

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0	0	0	82.39	82.39	82.39	82.57	81.37	81.37	87.09	87.09	86.15	86.74	83.04	80.29	0	84.68	86.88	80.24	80.24	0	0	0	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
82.79	82.79	82.79	82.79	82.79	82.79	82.79	0	0	83.17	83.17	83.17	83.017	83.17	83.17	83.17	0	0	77.15	77.15	77.15	77.15	77.15	77.15	77.15
51	52	53	54	55	56	57	58	59	60	61	62													
0	0	0	73.89	73.89	73.89	72.87	72.87	72.87	66.85	66.85	66.85													

Table 3.3.7 Noise Level at NSR 5 from Construction Activities

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0	0	0	81.13	81.13	81.13	79.37	78.17	78.17	85.80	85.80	83.09	83.88	81.56	79.03	0	82.69	84.89	77.38	77.38	0	0	0	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
81.53	81.53	81.53	81.53	81.53	81.53	81.53	0	0	79.97	79.97	79.97	79.97	79.97	79.97	79.97	0	0	75.41	75.41	75.41	75.41	75.41	75.41	75.41
51	52	53	54	55	56	57	58	59	60	61	62													
0	0	0	72.63	72.63	72.63	69.67	69.67	69.67	65.11	65.11	65.11													

Table 3.3.8 Noise Level at NSR 6 from Construction Activities

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
70.52	70.52	70.52	71.36	71.36	71.36	75.53	74.33	77.49	82.11	81.26	82.32	85.36	84.43	69.26	0	81.24	83.32	79.17	79.17	68.22	68.22	68.22	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
71.76	71.76	71.76	71.76	71.76	71.76	0	0	76.13	76.13	76.13	76.13	76.13	76.13	76.13	76.13	0	0	81.63	81.63	81.63	81.63	81.63	81.63	81.63
51	52	53	54	55	56	57	58	59	60	61	62													
60.02	60.02	60.02	62.86	62.86	62.86	65.83	65.83	65.83	71.33	71.33	71.33													

Table 3.3.9 Noise Level at NSR 7 from Construction Activities

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0	0	0	0	0	0	0	0	0	0	74.65	74.65	74.65	79.05	79.05	0	0	73.95	76.15	72.55	72.55	0	0	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76.45	76.45	76.45	76.45	76.45	76.45	76.45
51	52	53	54	55	56	57	58	59	60	61	62													
0	0	0	0	0	0	0	0	0	0	66.15	66.15	66.15												

3.3.5 Discussion of Results

3.3.5.1 From the above Tables it can be seen that noise levels during the first half of the construction work are considerably worse than the latter; this is due to the use of mobile earthmoving equipment and excavators.

3.3.5.2 NSR 1 can be seen to be the most affected by the construction activities; noise levels exceed 90 dB(A) for three weeks and remain over 80 dB(A) for the majority of the first 32 weeks. Noise levels at NSR 2 are slightly less than at NSR 1 and only exceed 90 dB(A) on one occasion. On average however noise levels are below 83 dB(A) for the first 4 weeks and fall below 76 dB(A) thereafter.

3.3.5.3 Noise levels at NSR 3 are around 80-81 dB(A) for much of the first half but in weeks 9-10 and 11 they climb to between 85 and 88 dB(A). During weeks 17 and 18 noise levels increase to the same level, thereafter, the decrease and do not represent a problem.

3.3.5.4 The highest noise level recorded at NSR 4 is between 86 and 87 dB(A) during weeks 10 to 13 and 18. Otherwise, noise levels are fairly static around 83 dB(A) or below.

3.3.5.5 Noise levels exceed 85 dB(A) on two occasions at NSR 5 and one occasion at NSR 6 and for the rest of the construction period, the average 80 dB(A) or lower. the maximum noise level at NSR 7 resulting from the construction work is 76 dB(A).

3.3.6 Mitigation Measures

- 3.3.6.1 As stated in previous sections, it is not considered that these noise levels will be achieved in reality at the NSR's. It is probable that the operation of all plant scheduled to be operating at any one time in any week will not occur. However, given the possibility that they do operate all at one time, mitigation measures should be considered for inclusion if possible as the received noise levels exceed the predicted background noise level at the NSR's resulting from WKR construction activities.
- 3.3.6.2 It is very difficult to mitigate the noise emanating from mobile plant. While it is possible to fit super silencers and encourage vehicle maintenance, the majority of the noise is produced by the vehicles moving around on site and the loading/unloading of spoil etc. With such a relatively small work area it is also very difficult to achieve any reduction in noise levels through the positioning of plant as far away as possible from the NSR's or by placing them behind earth/spoil barriers.
- 3.3.6.3 Stationary sources of noise are significantly easier to mitigate as shrouding and the use of barriers can be adopted. However, it is not considered possible to reduce the noise level from the concrete vibrators through the erection of barriers. This is because while they are stationary items, they do not remain in the same location for more than one or two hours but are moved to the location of the most recently concrete pour.
- 3.3.6.4 The pneumatic drills and concrete pumps represent a significant noise source that can, however, be reduced by the erection of simple noise barriers around their point of work. Depending upon the type of material, its thickness, surface mass and most importantly, physical size, an acoustic barrier can provide a reduction in noise from a piece of equipment of upto 20 dB(A).
- 3.3.6.3 For the purposes of this noise assessment a conservative 10 dB(A) reduction has been assumed to be achievable at source for all pneumatic drills and concrete pumps. This mitigation measure is obviously only effective in those months where these equipment are scheduled to be operating.
- 3.3.6.6 The adoption of these measures is very successful in reducing noise levels at all NSR's to the extent that the maximum noise level experienced at any NSR is 88.71 dB(A) (including the +3 dB(A) for facade correction). This occurs at NSR 1 for one week only. Noise levels at all NSR's are reduced by the same order. All results are shown in Appendix E.
- 3.3.6.7 The maximum noise level for all NSR's is shown below in Table 3.3.10.

Table 3.3.10 Maximum Noise Levels with Attenuation

NSR	Max Sound Power Level (30 min L_{eq})	Week during which Noise Level Occurs	Duration
1	88.71	10	1 week
2	87.78	10	1 week
3	85.81	10	1 week
4	84.64	10	2 weeks
5	83.32	10	2 weeks
6	81.19	10	1 week
7	76.65	10	3 weeks

The above Table illustrates that for one week noise levels are relatively elevated. This is due to the operation of noisy plant along much of the flyover route. Noise levels in subsequent weeks are lower due to the reduction in the numbers of plant operating. The adoption of the mitigation measures (as long as they are correctly utilised) will result in noise levels for the remaining periods not being excessively greater than the background noise level that is likely as a result of WKR construction work.

3.4 Air Quality Impacts from Road Traffic

3.4.1 Introduction

3.4.1.1 The air quality assessment was undertaken for the 2011 design year traffic flows/vehicle composition, and for the existing conditions. For the Phase IIA assessment, pollutants from the IIB road network were included in the analysis, rather than considering Phase IIA in isolation.

3.4.2 Legislation and Assessment Criteria

3.4.2.1 The Air Pollution Control Ordinance (Cap. 311, 1983) provides powers for controlling air pollutants from a variety of sources and encompasses a number of Air Quality Objectives (AQOs), which stipulate the maximum concentrations for Carbon Monoxide (CO), Nitrogen Dioxide (NO₂) and Total Suspended Particulates (TSP) in ambient air over the territory. The AQOs are listed in Table 3.4.1

Table 3.4.1 Hong Kong Air Quality Objectives

Parameter	Average Concentration $\mu\text{g}/\text{m}^3$			
	1-Hour *	8-Hour	24-Hour **	Annual
CO	30000	10000		
NO ₂	300		150	80
TSP	500 ***		260	80

* Not to be exceeded more than three times per year

** Not to be exceeded more than once per year

*** In addition to the above established legislative controls, it is generally accepted that an hourly average TSP concentration of $500\mu\text{g}/\text{m}^3$ should not be exceeded. Such a control limit is normally applied to construction work rather than traffic particulate emissions.

3.4.2.2 Hong Kong Planning Standards and Guidelines, (HKPSG) provides guidelines for buffer distances between major roads and sensitive uses to minimise the adverse impacts. These guidelines are, however, intended for use during the planning process rather than the development stage. In the case of the West Kowloon Corridor (WKC), recommended buffer distances cannot be achieved due to the constraints on road alignment and the positions of existing buildings.

3.4.2.3 The Road Traffic Control Ordinance (Cap. 374, 1985) provides for the control of polluting emissions from motor vehicles in two ways:

- vehicles must be designed to meet emission standards;
- vehicles must be constructed and maintained so as not to emit excessive smoke.

3.4.3 Existing and Future Background Conditions

3.4.3.1 EPD undertake background air quality modelling at stations in Sham Shui Po and Tsim Sha Tsui. The results are summarised in Table 3.4.2

Table 3.4.2. Results of EPD Air Quality Monitoring (1990)

24-hour Max. ($\mu\text{g}/\text{m}^3$)	NO ₂	TSP
Sham Shui Po	>180 (3)	>270 (5)
Tsim Sha Tsui	NA	180 (0)
Annual Average ($\mu\text{g}/\text{m}^3$)	NO ₂	TSP
Sham Shui Po	55	100 (*)
Tsim Sha Tsui	NA	80

- (x) Number of exceedances of the 24-hour AQO
(*) Exceedance of the annual average AQO
NA Data not available

3.4.3.2 The TSP data will reflect traffic particulate emissions and general dust, such as that arising from construction activities. The NO₂ 24-hour average limit was exceeded on 3 occasions at Sham Shui Po, this constituted a failure to comply with the AQO. The NO₂ annual average was compliant with the AQO.

- 3.4.3.3 Future background pollutant levels for the year 2011 cannot practically be assessed. However, the West Kowloon Expressway (WKE) will be a major source of vehicle pollutants. Data from the 'West Kowloon Expressway Environmental Assessment', June 1991, indicated that NO₂ concentrations arising directly from expressway traffic will probably be less than 100 μgm^{-3} at the majority of receivers identified for this study. The WKE assessment used vehicle emission factors applicable to 1996, and the pollution contours represented concentrations based on worst case wind direction at each point, which would not necessarily correspond to the worst case wind direction for the pollutants generated from the WKE. The straight addition of 100 μgm^{-3} to the results of the WKE modelling would probably represent an overestimate of background levels. CO and vehicle generated particulates are not considered to be problematic.
- 3.4.3.4 In addition to these roads, the Central Kowloon Route will cross the study area in an east-west direction, between Waterloo Road and Public Square Street. Preliminary investigations indicate that the road may be underground through West Kowloon. If the road is elevated it would probably require coverage (to meet noise criteria), with consequent requirement for ventilation. It has hence been assumed, for the purposes of this study, that there will be no open road emissions from this source. This situation will be reviewed as the Central Kowloon Route Study progresses.
- 3.4.3.5 For a consideration of industrial background levels, data were taken from the PADS Study, Technical Paper No. 13, Fig. A22, which indicated a predicted 24-hour average NO_x level of 250 - 280 μgm^{-3} in West Kowloon. Industrial sources account for approximately 66% of NO_x on a territory wide basis. Assuming a 20% NO_x/NO₂ conversion ratio, it is estimated that background levels in the area due to industrial sources will be 33-37 μgm^{-3} . It should be noted that these are 1986 figures and are unlikely to be representative of 2011 pollutant levels.
- 3.4.4 Sensitive Receivers
- 3.4.4.1 A representative number of existing residential blocks, schools and recreational areas as well as analysis points on the proposed West Kowloon Reclamation (WKR) (selected to represent potential residential areas) were selected as sensitive receivers. These are shown in Figure 3.4.1. The receivers specific to Phase IIA are 6, 7, 8, 24, 28, 29 and 30. The height used for the analysis was based on the first floor level for buildings. Additional analyses were performed for a grid of points for the purpose of presenting pollutant contours.
- 3.4.5 Assessment Methodology
- 3.4.5.1 The air quality assessment was undertaken using an expanded version of the CALINE4 dispersion model, which allows a greater number of road links to be input, thus increasing the resolution of the model. Pollutants NO₂, CO and TSP were investigated, with particular emphasis on NO₂.
- 3.4.5.2 Vehicle emissions were based on USEPA AP-42, with the following assumptions:
- 1) By 2011 all light petrol vehicles will fitted with catalytic converters. Estimated average mileage is 50000 miles. A basic NO_x emission level of 1.02 $\text{gveh}^{-1}\text{mile}^{-1}$ was used for vehicles fitted with catalytic converters. 1975-76 (pre-catalytic converter) emission levels were used for the remainder of the light petrol fleet.

- 2) Light diesel vehicles will be on average 7 years old with an average mileage of 50000 miles. 1985+ data were used.
- 3) Heavy diesel vehicles will be on average 10 years old with an average mileage of 200000 miles. 1987-92 figures were used.
- 4) Only speed correction was applied. No other adjustments were made eg. extra load, humidity etc due to lack of available data.
- 5) 20% NO_x to NO₂ conversion was assumed.

3.4.5.3 Peak hour traffic flow predictions for the design year 2011 were provided, these are shown in Figure 3.4.2. The vehicle composition used for the assessment is given in Table 3.4.3

Table 3.4.3 Traffic Composition (%)

Year	Light Petrol	Light Diesel	Heavy Diesel	Motor cycle
2011	28	61	8	3
Existing	24	66	10	*

* Not itemised

3.4.5.4 Composite vehicle emission factors for the existing and 2011 traffic compositions were calculated. The emissions are given in Table 3.4.4. For all Phase IIA roads, a traffic speed of 50 kmh⁻¹ was assumed.

Table 3.4.4 Vehicle Emission Factors

	50 kmh ⁻¹ (gvch ⁻¹ mile ⁻¹)		
	CO	NO _x	TSP
2011	3.1	1.7	0.7
Existing	5.2	3.1	0.7

3.4.5.5 Meteorological conditions of wind speed 1 ms⁻¹, stability class D, mixing height of 500 m, horizontal standard deviation of 12 deg. and worst case wind direction were considered to represent realistic worst case 1-hour conditions, and were used for the dispersion modelling for the existing situation and for the 2011 traffic flows. Additionally, an annual average for NO₂ was calculated for the 2011 scenario, based on 5-years meteorological statistics from the Royal Observatory. For this assessment, the peak hour traffic flows were assumed to represent 5% of the 24-hour flow, hence the hourly average over the day was calculated to be 0.83 times the peak hour flow.

3.4.5.6 A 'do nothing' option was not considered as the road has been designed and will be constructed.

3.4.6 Impacts on Receivers

3.4.6.1 The calculated pollutant concentrations at sensitive receivers are shown in Table 3.2.5 All predicted levels are within the AQOs. Even with the addition of background concentrations (in particular those from the WKE) it is not expected that there would be exceedance of the AQOs. NO₂ concentration contours for the area (including contribution from the Phase IIB road network) for the 2011 traffic flows are shown in Figure 3.4.3.

Table 3.4.5 Pollutant Concentrations at Sensitive Receivers ($\mu\text{g}/\text{m}^3$)

Receiver	CO		NO ₂			TSP	
	Worst Case 1-Hour Av. Existing	Worst Case 1-Hour Av. 2011	Worst Case 1-Hour Av Existing	Worst Case 1-Hour Av. 2011	Annual Average 2011	Worst Case 1-Hour Av. Existing	Worst Case 1-Hour Av. 2011
6	897	688	147	102	16	128	159
7	715	709 3000	117	105	9 300	102	163 500
8	732	665	120	99	9	104	154
24	306	305	50	45	10	44	71
28	1031	472 3000	169	69	14	147	108
29	469	355	77	52	8	67	81
30	669	374	110	55	10	95	85

709/3000

3.4.7 Summary

3.4.7.1 Under worst case 2011 conditions, the maximum CO, NO₂ and TSP concentrations arising directly as a result of the WKC are 3%, 35%, and 33% of the respective AQOs. It is concluded that the Cherry Street flyover will not cause unacceptable air quality impacts.

3.5 Road Traffic Noise

3.5.1 Introduction

This section examines the possible impact of the road traffic noise from the proposed Phase IIA of the West Kowloon Corridor.

3.5.2 Methodology

The possible noise impacts from road traffic were assessed on the basis of 2011 traffic flows and the method adopted in the calculation of Road Traffic Noise, 1988 Version, Department of Transport Welsh Office, United Kingdom. The major assumptions used in the noise prediction procedures are summarised below :

- i) Speeds of traffic on the main elevated carriageway are assumed to be 70 km/hr. On the slip roads and on those sections at ground level, traffic speeds are assumed to be 50 km/hr.
- ii) Percentages of heavy vehicles are assumed to be 47%. Vehicles over 1525 kg of unladen weight are classified as heavy vehicles.
- iii) Traffic flows used for assessment are an average of a.m. and p.m. peak flows, are given in Figure 3.5.1

3.5.3 Noise Sensitive Receivers

The residential blocks affected by the proposed Phase IIA flyover include Fu Tor Loy Sun Chuen, King Wing Heights and Cherry Mansion at No. 22-24A Cherry Street. Nine facades at these residential blocks are chosen as sensitive receivers and their locations are given in Figure 3.5.1. In addition Facades 10 and 11, as indicated on Figure 3.5.1, were also considered. Facade 10 is at Tai Kok Tsui Road and is facing the existing up ramp to the WKC which will be modified under the West Kowloon Reclamation Project. Facade 11 is a typical facade for the proposed residential development on the West Kowloon reclamation.

3.5.4 Noise Measurements

Noise levels have been measured at the identified receivers along Ferry Street, Cherry Street and Tai Kok Tsui Road over a 12 hour period (7 am to 7 pm). An average L_{10} (1 hour) noise level of 83.5 dB(A) was recorded during the evening peak period. Throughout the day, however, L_{10} (1 hour) noise levels did not fall below 77 dB(A).

In general, the building facades immediately adjacent to the corridor are exposed to a relatively high level of road traffic noise. Details of the noise measurements at the selected receivers are included in the Appendix A.

3.5.5 Assessment

3.5.5.1 Traffic noise calculations were carried out for these sensitive receivers. The effect of the various noise mitigatory options were also assessed. Details of each option are described as follows.

- Option 1 Do nothing scheme, assuming no flyover is constructed on Cherry Street.
- Option 2 With the proposed phase IIA flyover, with porous friction course as the bridge surfacing, no other noise mitigation measures are provided.
- Option 3 With a 3m barrier and the application of porous friction course surfacing on the flyover.
- Option 4 As for Option 3, but with the barrier height increased to 5 metres plus 2 metres sloping cantilever.
- Option 5 With a noise enclosure and the application of friction course surfacing on the flyover.

The diagrammatic arrangements for the 3m and 5m barriers are given in Figures 3.5.2 and 3.5.3.

For Options 3 to 5, a widening of about 3 metres to the inner curve of the elevated road has been assumed to meet the sightline requirements.

3.5.5.2 There are 4 residential blocks affected by the proposed road corridor. They are Blocks 1 and 2 of Fu Tor Loy Sun Chuen, King Wing Heights and Cherry Mansion. Both the Fu Tor Loy Sun Chuen and King Wing Heights have a podium at the lower floors with residential blocks (14 to 15 storey high) situated above. The height of the podium is about 6 metres. Cherry Mansion does not have a podium and is a 14 storey high residential building.

3.5.5.3 Fu Tor Loy Sun Chuen Block 1, King Wing Heights and Cherry Mansion are the residential blocks most affected as they are closest to the elevated road. The investigation has included a detailed assessment of those facades less severely affected, and facades have been numbered 1 to 7. To give a fuller picture of the effect of the traffic noise in the area, Fu Tor Loy Sun Chuen Block 2 is also included. This block was not originally included as a critical noise sensitive receiver as it is partly shielded by the adjacent buildings and is not directly exposed to the corridor; its facades have been numbered 8 and 9.

3.5.5.4 The number of residential units on each facade, as given in Figure 3.5.1, are :-

<u>Facade No.</u>	<u>No. of Household Units Per Floor</u>
1 - Cherry Mansion	3
2)	1
3) King Wing Heights	1
4)	1
5)	1
6) Fu Tor Loy Block 1	2
7)	1
8)	1
9) Fu Tor Loy Block 2	2

3.5.5.5 For the purpose of the traffic noise assessment, a floor height of 3 metres has been assumed.

3.5.6 Results

The predicted noise levels at these identified facades, expressed in dB(A)_{L₁₀}1.hr, are tabulated below.

Facade 1 (representing a total of 42 residential units)

Receiver Location (No. of Floors Above Podium)	Total No. of Units	Average Receiver Height (m)	Options				
			1	2	3	4	5
1	3	6	84.2	82.0	81.9	81.9	81.9
2-5	12	12	83.5	81.5	81.1	81.1	81.1
6-9	12	24	81.7	80.4	79.4	79.3	79.3
10-14	15	42	79.7	78.8	78.1	77.5	77.3

Facade 2 (representing a total of 15 residential units)

Receiver Location (No. of Floors Above Podium)	Total No. of Units	Average Receiver Height (m)	Options				
			1	2	3	4	5
1-4	4	12	76.9	75.6	74.5	74.3	74.3
5-8	4	24	76.0	75.2	74.2	73.6	73.6
9-15	7	42	74.5	73.9	73.7	72.3	72.1

Facade 3 (representing a total of 15 residential units)

Receiver Location (No. of Floors Above Podium)	Total No. of Units	Average Receiver Height (m)	Options				
			1	2	3	4	5
1-4	4	12	80.0	79.0	77.4	77.3	77.2
5-8	4	24	79.1	78.7	77.1	77.0	76.4
9-15	7	42	77.7	77.6	76.9	76.0	75.3

Facade 4 (representing a total of 15 residential units)

Receiver Location (No. of Floors Above Podium)	Total No. of Units	Average Receiver Height (m)	Options				
			1	2	3	4	5
1-4	4	12	78.0	77.0	75.1	74.7	74.6
5-8	4	24	77.5	77.3	75.5	75.1	74.5
9-15	7	42	76.4	76.3	75.6	74.4	74.0

Facade 5 (representing a total of 14 residential units)

Receiver Location (No. of Floors Above Podium)	Total No. of Units	Average Receiver Height (m)	Options				
			1	2	3	4	5
1-4	4	12	78.0	77.0	75.0	74.7	74.6
5-8	4	24	77.3	77.3	75.5	75.1	74.5
9-14	6	42	76.4	76.3	76.0	74.4	74.0

Facade 6 (representing a total of 28 residential units)

Receiver Location (No. of Floors Above Podium)	Total No. of Units	Average Receiver Height (m)	Options				
			1	2	3	4	5
1-4	8	12	80.0	79.0	77.4	77.3	77.2
5-8	8	24	79.1	78.7	77.1	77.0	76.4
9-14	12	42	77.7	77.6	77.0	76.0	75.3

Facade 7 (representing a total of 14 residential units)

Receiver Location (No. of Floors Above Podium)	Total No. of Units	Average Receiver Height (m)	Options				
			1	2	3	4	5
1-4	4	12	76.4	76.1	71.8	70.8	70.5
5-8	4	24	76.0	76.2	73.1	72.2	72.0
9-14	6	42	75.1	75.8	75.8	73.5	71.7

Facade 8 (representing a total of 14 residential units)

Receiver Location (No. of Floors Above Podium)	Total No. of Units	Average Receiver Height (m)	Options				
			1	2	3	4	5
1-4	4	12	72.9	75.4	67.0	63.4	63.4
5-8	4	24	73.5	76.9	73.1	68.9	68.9
9-14	6	42	73.3	75.4	74.6	73.2	71.7

Facade 9 (representing a total of 28 residential units)

Receiver Location (No. of Floors Above Podium)	Total No. of Units	Average Receiver Height (m)	Options				
			1	2	3	4	5
1-4	8	12	73.5	73.0	66.8	63.9	63.9
5-8	8	24	73.5	75.2	71.1	68.8	68.1
9-14	12	42	73.9	74.7	74.3	72.3	71.0

3.5.7 Discussion of the Results

3.5.7.1 Option 2 - With no enclosures and barriers

Facades 1, 3 and 6 represent the sensitive receivers closest to the elevated road. For the lower floor levels on these facades, the proposed flyover would reduce the anticipated traffic noise levels by 1 to 2 dB(A) over the case with no flyover (option 1) due to the shielding effect of the flyover on ground level traffic noise and the use of porous friction course on the flyover to reduce the flyover traffic noise. The predicted noise levels range from 75 to 82 dB(A). The existing noise level measured at the facade of the adjacent Ming Kei College is in the order of 81 dB(A) at the second floor level.

3.5.7.2 Options 3, 4 and 5 - Facades 1 to 7

The provisions of direct mitigatory measures on the elevated road will benefit the residential units at facades 1 to 7 by reducing the noise level by 1 to 6 dB(A), however the noise levels are still generally significantly in excess of the HKPS & G, and in the range 72 to 82 dB(A). The number of residential units which will experience reduced noise levels as compared with option 2 are given below :-

Facades 1 to 7

Reduction In Noise Level (dB(A))	No. of Household Units To Be Benefited		
	Option 3	Option 4	Option 5
0-1	91	15	15
1-2	44	91	54
2-3	0	29	60
3-4	4	4	0
> 4	4	4	14
Total	143	143	143

3.5.7.3 Options 3, 4 and 5 - Facades 8 and 9

The provision of mitigatory measures on the elevated road will be effective in bringing down the noise levels at facades 8 and 9 to generally below the HKPSG. For these facades the traffic noise from the flyover is found to be the dominant noise source and the ground level road is relatively distant.

The number of residential units which will experience reduced noise levels as compared with option 2 are given below :-

Facades 8 and 9

Reduction In Noise Level (dB(A))	No. of Household Units To Be Benefited		
	Option 3	Option 4	Option 5
0-1	18	-	-
1-2	-	-	-
2-3	-	18	-
3-4	4	-	18
> 4	20	24	24
Total	42	42	42

3.5.7.4 The total number of residential units which will experience reduced noise levels as compared with option 2 are summarised below :-

Reduction In Noise Level (dB(A))	No. of Household Units To Be Benefited		
	Option 3	Option 4	Option 5
0-1	109	15	15
1-2	44	91	54
2-3	0	47	60
3-4	8	4	18
> 4	24	28	38
Total	185	185	185

3.5.7.5 The provision of a noise enclosure will eliminate the noise generated from traffic on the flyover, however, the effect will only be marginally better than that with a 5m high barrier. Benefits brought by a 5m high noise barrier to the higher floor are greater than those with a 3m barrier; there will be little difference to the lower floors. The detailed assessment also indicates that the ground level noise is the dominant noise source to facades 1 to 7. As for facades 8 and 9, the ground level roads are away from these facades; the dominant noise source is from the flyover.

3.5.7.6 The predicted noise levels in dB(A) L_{10} 1. hr for facades 10 and 11 are summarised as follows :-

Facade 10 - Tai Kok Tsui Road (No. 23-25)

	Receiver Height (m)					
	6	12	18	50	70	100
Without barriers	77.4	77.7	77.5	74.6	73.5	72.0
With barriers*	77.1	77.3	76.7	73.9	73.1	71.7

Facade 11 - West Kowloon Reclamation residential site :-

	Receiver Height (m)					
	6	12	18	50	70	100
Without barriers	74.3	75.4	75.6	75.3	74.0	72.9
With barriers*	71.6	72.1	72.5	74.0	73.5	72.5

* - 3 metre high barriers assumed.

3.5.8 Costing for the Provisions

3.5.8.1 The Phase IIA flyover can be divided into 3 segments for considerations. The extent of these segments are given in Figure 3.5.1. The estimated costs for provision of different mitigatory measures for each of these segments are summarised in the following table.

Location	Segment	3m Barrier	5m Barrier	Noise Enclosure
Northern Curve	A-B	\$2.3 M	\$3.6 M	\$ 9.0 M
	B-C	\$4.1 M	\$6.5 M	\$16.2 M
Southern Curve	C-D	\$3.4 M	\$6.8 M	\$19.6 M

These costs are inclusive of 15% project contingencies and 20% contract preliminaries and contingencies.

3.5.8.2 The estimated costs for provision of various options of the direct mitigatory measures on the elevated roads are :-

- (i) Option 3 - Provision of 3m high noise barrier on the northern and southern curves of the elevated road as shown in Figure 3.5.1.

Estimated Cost : \$6.4 Million (northern curve)
\$3.4 Million (southern curve)

Total : \$9.8 Million
R3/3-23

- (ii) Option 4 - Provision of 5m high noise barrier on the north curve and 3m barrier on the southern curve.

Estimated Cost : \$10.1 Million (northern curve)
\$ 3.4 Million (southern curve)

\$13.5 Million

- (iii) Option 5 - Provision of noise enclosure to the extent as shown in Figure 3.5.1.

Estimated Cost = \$44.8 Million

These costs have taken into account the additional costs of the structures, due to the widening and the additional loads imposed by the noise barrier/enclosure, and include allowances for preliminaries and contingencies.

3.5.9 Discussions and Conclusion

Fu Tor Loy Sun Cheun Block 1, King Wing Heights and Cherry Mansion

- 3.5.9.1 The total number of residential units affected by the traffic noise from Cherry Street and the proposed flyover is in the order of 185, with 85 units more severely affected than the remainder. The do nothing situation (option 1) has indicated that these units would experience a very high traffic noise level without the flyover in place and this is confirmed by the existing noise levels. The noise from the ground level road is the dominant noise source.
- 3.5.9.2 The provision of direct mitigatory measures on the inner curve of the flyover reduces the noise level, by 1 to 3 dB(A) but at the critical facades, 1, 3 and 6, the noise level is still well in excess of the levels given in the planning guidelines, while at the other facades, 2, 4, 5 and 7 it is less so. It is concluded that the planning guidelines cannot be met by mitigation measures on the flyover alone due to the prominent ground level noise source. It is also concluded that a total enclosure does not offer any material additional benefits than the noise barriers.
- 3.5.9.3 Should it be desired to bring the noise level down to the planning guideline figures then it will be necessary to consider whether features such as flexible pavements, profile barriers and landscape features at ground level, would be effective in reducing the noise from the ground level traffic. With these or similar features it may be possible to reduce the ground level noise to an extent when measures on the flyover are not appropriate bearing in mind the overall effects.
- 3.5.9.4 A barrier on the flyover will have a significant visual impact on the lower residential units and concerns have been expressed that one form of mitigatory measure can produce another adverse impact. The relative locations of the residential units and the proposed 5m high barrier is shown on figure 3.5.4. It is concluded that the 3 metre high noise barrier will be visually more acceptable than the 5 metre barrier.

Fu Tor Loy Sun Chuen, Block 2

- 3.5.9.5 The consideration of this block as a separate sensitive receiver was requested subsequent to the Environmental Working Group meeting. The analysis has considered two facades 8 and 9. This block is not subject to the same noise as block 1 since it is set back on the podium and partially screened by adjacent developments. Also noise from the ground level roads is not dominant on this block.
- 3.5.9.6 The provision of mitigatory measures on the flyover will reduce the noise level at these facades to levels generally consistent with the planning guidelines. A 3 metre high barrier will be adequate to protect the lower floors but a 5 metre high barrier would be required if the noise level at the upper floors is to be brought down to near the guideline values.

Existing Buildings along Tai Kok Tsui Road

- 3.5.9.7 The existing buildings along Tai Kok Tsui Road are mainly affected by noise from the existing up ramp in front of the buildings. As this up ramp will be modified by the West Kowloon Reclamation Project, it is considered that the provision of the mitigation measures be provided when the ramp is modified.

New Development on the West Kowloon Reclamation

- 3.5.9.8 Facade 11 represents the possible facades for the proposed development. The residential development on the reclamation is indicated on the draft outline development plan which has yet to be endorsed and as a result no details are available of the form that these proposed buildings will take. The effect of noise mitigatory measures can therefore only be indicative and based upon an assumed building form there would be significant reductions in the noise level at lower floors 3 dB(A) but minimal at upper floor levels. Noise levels would still exceed the HK Planning Standards and Guidelines. Accordingly other means would need to be investigated in the building layout and design to achieve acceptable standards. As determination of these means is premature it is not known whether they would supersede the need for noise protection measures adjacent to the flyover.
- 3.5.10 Recommendation
- 3.5.10.1 Fu Tor Loy Sun Chuen King Wing Heights and Cherry Mansion
- 3.5.10.1.1 The noise from the ground level Cherry Street is the dominant noise source at these buildings and the current noise level far exceeds the HKSPG figures. It is therefore recommended that, in accordance with Clause B.2.1 (viii) of the Brief, additional studies are undertaken to assess how the noise level from ground level traffic can be reduced by the adoption of appropriate civil engineering and landscaping designs.
- 3.5.10.1.2 Taking into considerations the cost, the effectiveness and the visual impact of the various direct mitigatory measures, it is considered that the provision of a 3 metre high noise barrier on the north edge of the flyover between points B and C on Figure 3.5.1 is the desirable solution to give protection to the existing buildings. As this barrier will be visible, it is recommended that the visual aspect of the noise barriers should be carefully designed in the detailed design of the flyover.

3.5.10.2 Existing Buildings along Tai Kok Tsui Road

It is recommended that no direct mitigatory measures be provided at this time in respect of these buildings, but that the detailed requirements are assessed as part of the detailed design of the replacement up ramp and any necessary provisions be included with the ramp reconstruction.

3.5.10.3 New Development on West Kowloon Reclamation

It is understood that it is not Highways Department's practice to incorporate noise mitigatory measures in highway structures to cater for possible future developments. However as provision of noise measures on the flyover, if required in the future, would be difficult to provide if appropriate provisions are not included in the flyover design, it is recommended that the flyover be designed to accommodate future noise barriers along the southern side. The timing for installation of this noise barrier should tie in with the proposed residential development programme.

3.5.10.4 In addition to the provision of noise barriers on the flyover, it is recommended that porous friction course as the road surface of the corridor should also be implemented to reduce the road traffic noise.

3.6 **Visual and Landscape Impact**

3.6.1 Introduction

A preliminary visual impact and landuse assessment of Phase IIA has been undertaken and the details are contained in Working Paper No.4 issued in November 1991. It concluded that the construction of the elevated section of the corridor would generally have a high impact upon the existing sensitive receivers in terms of the visual intrusion and the obstruction and will affect the proposed areas of Amenity/District Open Space on the reclamation. The opportunities to include usable areas of space beneath the flyover would be limited and opportunities to incorporate planting as a landscape mitigation measure would only exist on the West Kowloon Reclamation.

3.6.2 Site Evaluation and Urban Landscape Character

3.6.2.1 Site Evaluation

3.6.2.1.1 The areas adjacent to the road corridor consist of a dense line of buildings to the east and the PCWA to the west. The colourful and bustling cargo working area provides a rich visual scene for residents, pedestrians and road users to the east. Views to the sea are possible across Ferry Street and the PWCA. It should be noted however that at the time of construction for the road corridor work on the West Kowloon Reclamation will have begun and the sea front and PWCA will no longer be adjacent to the road.

3.6.2.1.2 Mixed light industrial, residential and commercial buildings comprise the predominant landuses of the study area which is characterised by the close proximity of roads carrying heavy traffic, the poor condition and high density of buildings adjacent to the road corridor and the significant lack of quality open space and landscape features.

3.6.2.2 Urban Landscape Character and Existing Vegetation

A survey and analysis of the existing conditions including the urban landscape character and vegetation have been undertaken and the details are given in Appendix G.

3.6.3 Visual Quality and Visibility

3.6.3.1 The purpose of establishing visual quality is to determine the sensitivity of an area to change or modification. Visual quality is a subjective evaluation of the quality of urban character areas. An area of high visual quality is likely to be particularly sensitive to changes resulting from the roadworks, whereas an area of low visual quality will be less sensitive. In the case of areas of low visual quality, works associated with the new road alignment may result in visual improvement or upgrading of the existing view. In order to assess the future visual impact of the proposed roadworks it is necessary to determine the extent of visibility, to establish from where the road can be seen and what can be seen.

3.6.3.2 Visibility determines the visual prominence of an area and takes into account the nature of sensitive receivers and their position and distance from the road.

3.6.3.3 The majority of the study area has been classified as low in terms of visual quality due to the dense hard character of the built form, significant lack of 'green areas', poor condition of most building facades and close proximity of roads carrying heavy traffic. The visual amenity of many areas is also lowered by on street storage and dumping. There is a localised increase in visual quality where areas of open space or significant amounts of planting do exist and in the general area of the PWCA which provides an interesting and colourful scene for views to the west.

3.6.3.4 In terms of visibility the road corridor has generally been classified as medium to high due to the close proximity and large number of sensitive receivers which include the densely populated residential buildings (to the east), the existing waterfront and proposed residential areas on the West Kowloon Reclamation (to the west). The majority of existing views (except those from high level floors) towards what is currently the waterfront (to be developed as DOS and residential areas on the WKR) will unfortunately be blocked by the new elevated sections of the WKC.

3.6.4 Project Characteristics

3.6.4.1 The project characteristics include any works undertaken as part of the construction phase and all elements of the new roadworks which will remain during the operational phase.

- 3.6.4.2 An assessment of the works for both the operational and construction phases will take into account the nature and extent of the works in order to establish their likely impact on the existing urban landform.
- 3.6.4.3 Phase IIA comprises predominantly an elevated ramp which diverges from northbound Ferry Street and connects with the existing elevated road at Tai Kok Tsui Road.
- 3.6.4.4 Table 3.6.1 expands upon this brief description and describes the project characteristics associated with the Phase IIA for both the construction and operational phases.

Table 3.6.1 Project Characteristics for Phase IIA

OPERATIONAL PHASE - PHASE IIA	
PROJECT CHARACTERISTICS	PHASE IIA
Realignment of existing road	<ul style="list-style-type: none"> - Removal of existing left turn movement from Ferry Street northbound onto Cherry Street westbound - The ground level junction of the up ramp at Tai Kok Tsui Road and Cherry Street will be modified to allow access for traffic coming from the reclamation area via the Cherry Street extension - A 90⁰ turn is required at the junction of Ferry Street and Cherry Street for the WKC
Road at grade	
Elevated ramp	<ul style="list-style-type: none"> - Slip road diverges from at grade northbound Ferry Street to link with the existing elevated road at Tai Kok Tsui Road
Elevated road	
Walls	<ul style="list-style-type: none"> - Abutment and wing walls where the elevated ramp diverges from Ferry Street at grade
Noise barrier	<ul style="list-style-type: none"> - Possible 3m high noise barrier to be constructed at the northern edge of the elevated carriageway to protect new residential areas on the future WKR
Loss of vegetation and areas of open space	<ul style="list-style-type: none"> - Area of dense roadside planting in front of the PCWA area where the northbound, at grade Ferry Street is realigned - Land take to the proposed district open space at the corner of Cherry Street/Ferry Street by approximately 10 metres - The usable area of open space is reduced in the Tong Mi Road Sitting Out area and Cherry Street playground where ramps for the proposed footbridge will be constructed
Footbridge	<ul style="list-style-type: none"> - New footbridge with links over Ferry Street and Argyle Street to be constructed with access ramps located in the Cherry Street playground, Tong Mi Road Sitting Out Area and the current site of Argyle Street temporary market
CONSTRUCTION PHASE - PHASE IIA	
PROJECT CHARACTERISTICS	PHASE IIA
Demolition of existing structures	
Temporary access road	
At grade road construction	
Construction of elevated roads and footbridges	<ul style="list-style-type: none"> - Construction of the elevated ramp from northbound Ferry Street which crosses above an area of proposed DOS on the WKR to link with the existing elevated road at Tai Kok Tsui Road
Walls construction	<ul style="list-style-type: none"> - Abutment and wing walls where the elevated northbound slip road ramps up from Ferry Street
Noise barrier construction	<ul style="list-style-type: none"> - Possible 3m high noise barrier to be constructed at the northern edge of the elevated carriageway to protect new residential development on WKR
Works areas	<ul style="list-style-type: none"> - Construction site, 30 metre wide strip running the length of the proposed road

3.6.5 Visual Impact Assessment

3.6.5.1 Visual Impact

- 3.6.5.1.1 The visual impact assessment appraises the effect of the road works both during the construction and operational phases. This involves assessing those activities and landuses at the construction stage which may affect the visual resources in the area and assessing the visual impact of the completed road. Areas where further visual improvement or mitigation may be appropriate will also be identified.
- 3.6.5.1.2 Having established the sensitivity of an area to future changes through first evaluating the visual quality and visibility it is possible to combine these results with an assessment of the project characteristics in order to determine the degree of visual impact.
- 3.6.5.1.3 Table 3.6.2 gives a summary of the visual impact on the existing and future sensitive receivers associated with the Phase IIA works. The visual impact resulting from the road works associated with Phase IIA of the WKC is generally low to moderate for the northern section due to the existing poor visual quality of the area. However views for lower floors from existing buildings adjacent to the road will be affected by the elevated ramp. It is also noted that undesirable spaces below flyovers will be created by the overhead structures. These spaces are sterilised and aesthetically unacceptable and can contribute very little but degrade the general urban character.
- 3.6.5.1.4 West of Palm Street the degree of visual impact increases where the elevated ramp crosses above areas of DOS on the reclamation, intruding into views to and from the area and moving closer to the future residential developments.
- 3.6.5.1.5 The impact of the Phase IIA ramp between Argyle Street and Shantung Street is generally expected to be high. However the visual impact for the area was likely to be high anyway due to the construction of the Phase I elevated WKC (not included in this study). The footbridge system will block the visual corridor of Argyle Street and the ramp will further aggravate the blockage effect of Phase I to Nelson Street and Shantung Street view corridors. Nevertheless, there already is a substantial obstruction to views caused by the existing advertising sign boards in many of these streets.
- 3.6.5.1.6 It should also be noted that the WKC has not yet been incorporated into Draft ODP for the reclamation and it is understood that the new road corridor will be taken into account in future proposals. Consequently the visual impact of the ramp may be less significant for areas where designated areas of DOS and residential development are located further away from the road.
- 3.6.5.1.7 Although there will not be a net loss in the number of local open space, in terms of area some LOS will be affected by the placement of structures within the open space. Nevertheless all LOS (including those in the hinterland) will be affected by the corridor in environmental terms, especially those directly facing the corridor.

The following table summarises the effect due to the overhead structures on the areas of the open spaces which directly face the corridor :

<u>Open Space</u>	<u>Original Area</u>	<u>Area Lost Due to Overhead Structures</u>
Tak Cheong Street Playground	720 m ²	nil
Argyle Street Sitting Out Area	642 m ²	240 m ²
Cherry Street Playground	1025 m ²	275 m ²

It is noted that the Tong Mi Road Temporary Market is proposed to be converted into a LOS with an area of 870 m² and this includes the 235 m² which would be lost due to the overhead structures. However, it is possible that the overhead structures like these could be incorporated into the open space design as feature elements.

From a landscape point of view, the enjoyment in these Open Spaces will be reduced. Within the context of insufficient provision in the highly congested districts of Yau Ma Tei and Mong Kok, this effect constitutes a high impact. Therefore it is proposed that considering the adverse constraints, any affected LOS should be re-designed with a robust and high quality treatment.

3.6.5.1.8 In conclusion, the future West Kowloon Corridor will further reduce the visual quality of the area and create an adverse impact on visibility by obstructing views.

3.6.5.2 View from the road

3.6.5.2.1 The visual impact assessment also takes into account the view from the road for motorists travelling along the new sections of the road. Along the Phase IIA section of the WKC the views to the north will be closed generally extending no further than the adjacent building facades. To the south motorists should have views into the adjacent DOS on the reclamation or will be bounded by screen planting undertaken in the amenity area. A long view towards the harbour should also be possible to the west along the proposed Cherry Street extension.

Table 3.6.2 Visual Impact Assessment for Phase II A

SENSITIVE RECEIVERS		ROAD WORKS	VISUAL IMPACT
Tai Kok Tsui Road - Beech Street		<ul style="list-style-type: none"> Elevated ramp from northbound Ferry Street links with the existing elevated road above Tai Kok Tsui Road. Noise barrier 3 metres high on northern edge of elevated carriageway. 	<p>VISUAL IMPACT - LOW</p> <p>Existing visual quality low due to proximity of the elevated road above Tai Kok Tsui Road. The multi storey carpark adjacent to the road is not a sensitive landuse and the residential buildings above should not be affected by the elevated road or proposed noise barrier. The ramp crosses above a planted traffic island which will require the removal of some vegetation however the majority of the planting will be retained.</p>
<p>EXISTING</p> <ul style="list-style-type: none"> Multi storey car park with residential above. Area of Amenity and roadside planting. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and private residential. 		
Beech Street - Oak Street		<ul style="list-style-type: none"> Elevated ramp 8 metres above ground level, approximately 20 metres away from facade of Fu Tor Loy Sun Cheun and 30 metres away from Cherry Mansion. Noise barrier 3 metres high on both sides of elevated road. 	<p>VISUAL IMPACT - LOW TO MODERATE</p> <p>The existing visual quality of the area is low but views towards the reclamation will be obstructed for low level floors of the adjacent residential buildings. The ramp will also cross above Amenity areas on the reclamation restricting planting in these areas and decreasing the screening effect for the adjacent DOS.</p>
<p>EXISTING</p> <ul style="list-style-type: none"> Residential buildings:-Fu Tor Loy Sun Cheun, King Wang Heights and Cherry Mansion. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and private residential. 		
Oak Street - Palm Street		<ul style="list-style-type: none"> Elevated ramp 8 metres above ground level, approximately 40 metres away from building facade. Noise barrier 3 metres high on southern edge of elevated ramp. 	<p>VISUAL IMPACT - MODERATE</p> <p>The existing visual quality of the area is generally low however there will be an increase in visual impact due to the low height of the adjacent school buildings (existing open views to the south will be blocked) and the elevated ramp will begin to cross areas of designated DOS on the reclamation.</p>
<p>EXISTING</p> <ul style="list-style-type: none"> Schools:- Ming Kei College and Sharon Lutheran School. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and private residential. 		
Palm Street - Tong Mi Road		<ul style="list-style-type: none"> Elevated ramp 8 metres above ground level and approximately 70 metres away from boundary of playground. Access ramp for proposed footbridge over Ferry Street located in Cherry Street playground. 	<p>VISUAL IMPACT - HIGH</p> <p>The elevated ramp will cross directly over designated areas of DOS on the reclamation resulting in a high degree of visual intrusion.</p>
<p>EXISTING</p> <ul style="list-style-type: none"> Cherry Street playground, existing LOS (includes basketball court play equipment and planting). 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and private residential. 		
Tong Mi Road - Argyle Street		<ul style="list-style-type: none"> Elevated ramp 8 metres above ground level and approximately 100 metres away from market boundary. Access ramps for new footbridge located in market site. Footbridge connection to the podium level of the proposed WKR residential development crosses above existing traffic island with planting. 	<p>VISUAL IMPACT - HIGH</p> <ul style="list-style-type: none"> The existing visual quality varies from low to moderate with a localised increase close to existing areas of LOS of phase IIA. The elevated ramp of phase IIA will cross directly above a designated area of DOS on the reclamation resulting in a high degree of visual intrusion and the proposed new footbridge connections across Ferry Street and Argyle Street will obstruct views from the area.
<p>EXISTING</p> <ul style="list-style-type: none"> Tong Mi Road temporary market to the east and existing traffic island with planting to the west. Existing areas of LOS adjacent to both Tong Mi Road and Argyle Street. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and private residential. 		
Argyle Street - Nelson Street		<ul style="list-style-type: none"> Elevated ramp 8 metres above ground level and approximately 80 metres away from playground boundary and 40 metres away from building facades. Access ramp for proposed new footbridge across Argyle Street and Ferry Street located in Sitting Out Area. 	<p>VISUAL IMPACT - HIGH</p> <p>The visual quality of the area is generally low however the visual impact resulting from the roadworks will be high due to the the location of the elevated ramp above an area of designated DOS on the reclamation and the proposed new footbridge connections obstructing views from the area. The location of the footbridge access ramp in Tong Mi Road Sitting Out Area will also intrude upon views of the area and have a significant effect on views from the park. It should be noted however that views both of and from the area will already be affected by the elevated carriageway of WKC Phase 1.</p>
<p>EXISTING</p> <ul style="list-style-type: none"> Tong Mi Road Sitting Out Area and residential buildings with commercial uses at ground level (Chun On Mansion and Yuen Fat Building). 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and private residential. 		
Nelson Street - Shantung Street		<ul style="list-style-type: none"> Slip road from southbound Ferry Street ramping up to link with elevated road above Tai Kok Tsui Road, abutment and wing walls at this location. 	<p>VISUAL IMPACT - MODERATE</p> <p>The ramp from Ferry Street will require removal of existing vegetation reducing the visual quality of the area and will be located adjacent to an area of DOS on the reclamation effecting views from the area. However the elevated carriageway of Phase I will also block views from the east reducing the overall effect of the Phase II A ramp.</p>
<p>EXISTING</p> <ul style="list-style-type: none"> Residential buildings with commercial uses at ground level and DOS behind. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS, private residential and public rental housing. 		

WKR - West Kowloon Reclamation

3.6.5.2.2 A noise barrier has been proposed for the edges of the elevated road. To avoid blocking the views described above, the design of the noise barrier needs to be given careful consideration in the detailed design.

3.6.5.2.3 The construction stage impacts are likely to be similar to those described for the operational phase but slightly more severe as the proposed planting will not yet be implemented and there will be additional visual impact associated with road construction vehicles, equipment and the construction site.

3.6.6 Advice on Structures and Landuses Beneath Elevated Roads

3.6.6.1 Structural Finishes and Forms

The visual appearance of structural finishes and forms needs to be given careful consideration during the design process to ensure the new roadworks will have a positive rather than negative impact on the surrounding urban landform and to help ameliorate any adverse impacts that do remain. Aspects to consider should include the following: deck width and shape, the number and shape of columns, finishes to parapets, soffits, columns and abutment walls, the junction between elevated roads and those at grade and the interface between new and existing structures.

3.6.6.2 Treatment of Spaces Beneath Elevated Roads and Flyovers

Spaces beneath the Phase IIA flyover are predominantly within areas of Amenity or DOS on the reclamation. The flyover is approximately 8m above ground level except where it ramps up from Ferry Street and it would be possible to extend low planting connected to adjacent areas of Amenity or DOS beneath the ramp. However if a more suitable landuse such as storage or service areas associated with the DOS could be located in these areas then the land could be designated for such use. This would be subject to the design of the DOS. In areas where a suitable landuse cannot be found and where planting is not possible or appropriate landscape hardworks which require little maintenance should be recommended. Proper access to the proposed open space beneath the flyover should be provided.

3.6.6.3 The visual appearance of any noise mitigation measures should be carefully considered as a part of the total urban environment. For instance, placing noise barriers on the inside curve of an elevated road may involve increasing the width of the deck, thus making the entire corridor much more dominant and aggravating the sterilising influence of spaces at-grade.

3.6.7 Landscape Strategy

3.6.7.1 The Landscape Strategy describes the landscape proposals associated with the road scheme and incorporates a range of mitigation measures appropriate for the specific areas. The Strategy for Phase IIA will comprise predominantly planting proposals for roadside spaces and recommendations on the treatment of areas below the elevated ramp. Areas where planting is practicable are extremely limited. However where planting is possible opportunities will be maximised. It is emphasized that the opportunity identified should be given a high priority, in light of the existing landscape conditions which can only be classified as low in terms of character of the area.

3.6.7.2 Proposals for Phase IIA are summarised below and illustrated on Drawing 23 in Volume 1 of the Report.

- **Landlocked space at the junction of Tai Kok Tsui Road and Cherry Street:** Existing planting can be strengthened with tall trees to screen elevated ramp and areas below the new ramps reinstated with low shrubs to match existing species.
- **Traffic island in front of Fu Tor Loy Sun Chuen:** Using low shrub planting to preserve sightlines will introduce some planting into this area.
- **Elevated ramp above designated areas of Amenity and DOS on the reclamation:** Extending planting beneath the ramp where it is high enough to accommodate shrub planting will provide some visual interest and visual linkages. Planting will match proposals for adjacent areas of the reclamation.

Amenity or DOS planting proposals for areas adjacent to the ramp should incorporate tall, dense trees and shrub to screen views of the road. Wherever possible, service or storage areas associated with the DOS should be located beneath the ramp. Landscape hardworks have been proposed for areas where the ramp is not high enough to allow planting. These will need to be of high quality to create some visual interest in the DOS.

- **Roadside planting:** Roadside planting will be possible on the reclamation where an Amenity strip has been proposed adjacent to the existing road corridor. At present there is no available space for street trees adjacent to the road to the north of Cherry Street or east of Ferry Street. Future redevelopment proposals for the existing areas of Tai Kok Tsui and Yau Ma Tei should allow for an approximate minimum set-back of 15-20 metres from the road edge to adjacent building facades to accommodate effective street tree planting.

It should also be noted that the height of planting will be limited in the amenity areas on the reclamation where the elevated Phase IIA ramp passes above. This will occur between Nelson Street and Soy Street.

- **Proposed footbridge and associated areas of LOS:** Three footbridge landings will be located in the Tong Mi Road Sitting Out Area, the Cherry Street Playground and the temporary market site.

Conceptual designs for the areas of LOS surrounding the access ramps include sitting out areas, children's playground, shade structures, screen walls and shrub and tree planting. It is also envisaged that the footbridges will be designed as feature elements for the LOS.

A traffic island below the footbridge connection to the podium level of the proposed residential development on the reclamation will also incorporate shrub and tree planting.

- **Median strip/Cherry Street:** Street tree planting is proposed.
- **Subway entrance:** Title graphics on the subway wall can be implemented.

3.7 Landuse Impact

3.7.1 Future Landuse

Future landuses adjacent to the road corridor include existing areas to be redeveloped to the east of the road and proposed areas to be developed on the West Kowloon Reclamation to the west of the road. The relevant Outline Development Plans for Mongkok and Tai Kok Tsui and the Draft ODP for the West Kowloon Reclamation were examined and the landuses are summarised as follows:-

Mongkok and Tai Kok Tsui ODP

- Future land use plans for Mongkok and Tai Kok Tsui retain the existing areas of residential/commercial, institutional(schools) and local open space or district open space adjacent to the road corridor.
- Areas of proposed change to existing landuses are located further north or east away from the road corridor.

West Kowloon Reclamation, Draft ODP

- Future landuse proposals for the WKR adjacent to Phase IIA of the road corridor include large residential areas, several community centres, a secondary school and home for the aged. A linear band of district open space and a amenity strip of approximately 15 metres separate the residential areas from the road. A linear park (LOS) links the areas of DOS with residential areas and open space further east.
- The WKR Draft ODP does not yet take into account the WKC which will intrude into the proposed areas of Amenity and DOS on the reclamation bringing the road corridor closer to future residential areas. However it is understood that the West Kowloon Reclamation ODP will include the WKC alignment.

3.7.2 Landuse Impact

3.7.2.1 The degree of the impact affecting existing and future landuses as a result of the proposed roadworks varies from low in the Tai Kok Tsui - Palm Street section of Phase IIA to predominantly high east of Palm Street and south of the Cherry Street/Ferry Street junction.

3.7.2.2 Between Tai Kok Tsui Road and Oak Street the Phase II elevated ramp does not significantly affect existing or future landuses; however beyond Oak Street the degree of impact increases as the elevated ramp crosses above designated areas of Amenity and DOS on the reclamation limiting planting in these areas and reducing the overall quality of the DOS.

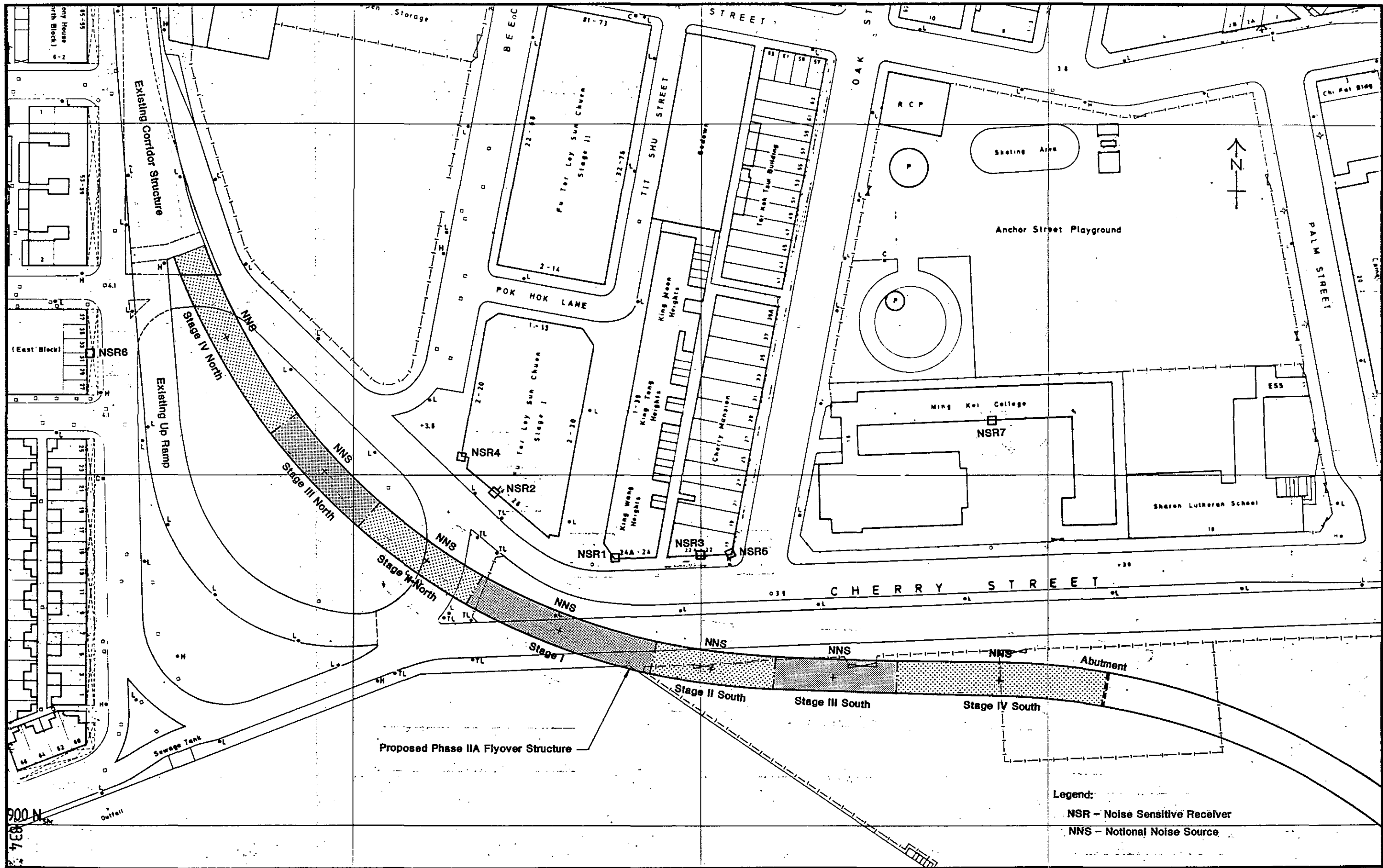
3.7.2.3 At the junction of Argyle Street and Ferry Street the impact on surrounding landuses is also expected to be high due to a proposed new footbridge at this location. The footbridge which will provide links across Argyle Street, Tong Mei Road, Ferry Street and connect to the podium level of future residential development on the reclamation will have access ramps located in the Cherry Street Playground, Tong Mi Road Sitting Out Area and the temporary market site on Argyle Street.

- 3.7.2.4 The access ramps will reduce the amount of usable space in the playground and sitting out area and result in the closure of the temporary market. The area surrounding the access ramp in the temporary market site will be redeveloped as LOS allowing for reprovisioning of some of the open space lost from the playground and sitting out area.
- 3.7.2.5 The impact for designated areas of DOS on the reclamation may be reduced once current proposals for the WKR take into account the WKC alignment.
- 3.7.2.6 Table 3.7.1 describes the impact of the Phase IIA roadworks on existing and future landuses surrounding the road.

Table 3.7.1 Landuse Impact Assessment for Phase II A

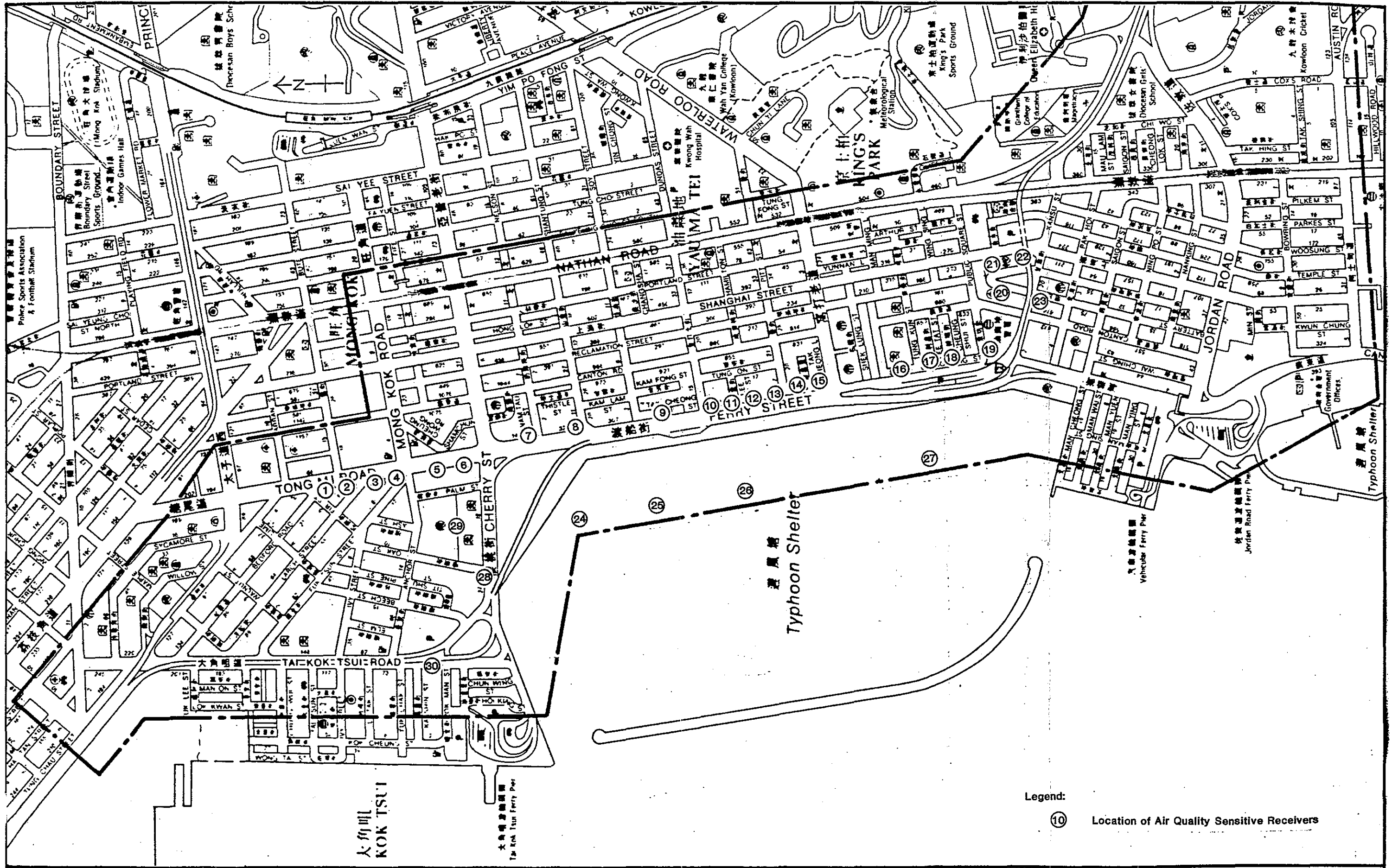
SENSITIVE RECEIVERS		ROAD WORKS	LANDUSE IMPACT
Tai Kok Tsui Road - Beech Street		<ul style="list-style-type: none"> Elevated ramp from northbound Ferry Street links with the existing elevated road above Tai Kok Tsui Road. Noise barrier 3 metres high on northern edge of the elevated carriageway. 	<p>LANDUSE IMPACT - LOW</p> <ul style="list-style-type: none"> Ramp affects small area of existing vegetation requiring removal of vegetation however most planting in the area will be retained. This area has been designated as LOS in the Tai Kok Tsui ODP but is surrounded by existing roads and should be categorised as Amenity only because of its limited accessibility.
<p>EXISTING</p> <ul style="list-style-type: none"> Multi storey car park with residential above. Area of Amenity and roadside planting. 			
Beech Street - Oak Street		<ul style="list-style-type: none"> Elevated ramp 8 metres above ground level, approximately 20 metres away from facade of Fu Tor Loy Sun Cheun and 30 metres away from Cherry Mansion. Noise barrier 3 metres high on both sides of elevated road. 	<p>LANDUSE IMPACT - LOW</p> <ul style="list-style-type: none"> For the most part the elevated ramp in this section crosses above existing roads and does not create unusable areas of space.
<p>EXISTING</p> <ul style="list-style-type: none"> Residential buildings:- Fu Tor Loy Sun Cheun, King Wang Heights and Cherry Mansion. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and private residential. 		
Oak Street - Palm Street		<ul style="list-style-type: none"> Elevated ramp 8 metres above ground level, approximately 40 metres away from building facade. Noise barrier 3 metres high on southern edge of elevated ramp. 	<p>LANDUSE IMPACT - MODERATE</p> <ul style="list-style-type: none"> The elevated ramp will cross above areas designated as Amenity on the reclamation approximately 8 metres above ground level limiting planting in these areas and reducing the screening effect for adjacent areas of DOS. Suitable land use will need to be allocated to the areas created beneath the flyover where planting would not be desirable.
<p>EXISTING</p> <ul style="list-style-type: none"> Schools:- Ming Kei College and Sharon Lutheran School. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and private residential. 		
Palm Street - Tong Mi Road		<ul style="list-style-type: none"> Elevated ramp 8 metres above ground level and approximately 70 metres away from boundary of playground. Access ramp for proposed footbridge over Ferry Street located in Cherry Street playground. 	<p>LANDUSE IMPACT - HIGH</p> <ul style="list-style-type: none"> The impact of the elevated ramp for this section of the alignment is likely to be high because the road passes above areas of DOS on the reclamation limiting uses in the areas beneath and adjacent to the road and reducing the overall quality of the site as an area of open space.
<p>EXISTING</p> <ul style="list-style-type: none"> Cherry Street playground, existing LOS (includes basketball court play equipment and planting). 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and private residential. 		
Tong Mi Road - Argyle Street		<ul style="list-style-type: none"> Elevated ramp 8 metres above ground level and approximately 100 metres away from market boundary. Access ramps for new footbridge located in market site. Footbridge connection to the podium level of the proposed WKR residential development crosses above existing traffic island with planting. 	<p>LANDUSE IMPACT - HIGH</p> <ul style="list-style-type: none"> Elevated ramp crosses above designated areas of DOS on the reclamation and market site will be closed to allow for proposed new footbridge access ramp. Existing planting will be removed from traffic island where footbridge connection to WKR will cross above.
<p>EXISTING</p> <ul style="list-style-type: none"> Tong Mi Road temporary market to the east and existing traffic island with planting to the west. Existing areas of LOS adjacent to both Tong Mi Road and Argyle Street. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and private residential. 		
Argyle Street - Nelson Street		<ul style="list-style-type: none"> Elevated ramp 8 metres above ground level and approximately 80 metres away from playground boundary and 40 metres away from building facades. Access ramp for proposed new footbridge links across Argyle Street and Ferry Street located in Sitting Out Area. 	<p>LANDUSE IMPACT - HIGH</p> <ul style="list-style-type: none"> Elevated ramp crosses above designated areas of DOS on the reclamation affecting use of these areas and reducing the overall quality of the DOS.
<p>EXISTING</p> <ul style="list-style-type: none"> Tong Mi Road Sitting Out Area and residential buildings with commercial uses at ground level (Chun On Mansion and Yuen Fat Building). 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and private residential. 		
Nelson Street - Shantung Street		<ul style="list-style-type: none"> Slip road from southbound Ferry Street ramping up to link with elevated road above Tai Kok Tsui Road, abutment and wing walls at this location. 	<p>LANDUSE IMPACT - MODERATE</p> <ul style="list-style-type: none"> Ramp diverges from at grade Ferry Street through a designated area of Amenity on the reclamation restricting planting and reducing the screening effect of this area.
<p>EXISTING</p> <ul style="list-style-type: none"> Residential buildings with commercial uses at ground level and DOS behind. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS, private residential and public rental housing. 		

WKR = West Kowloon Reclamation



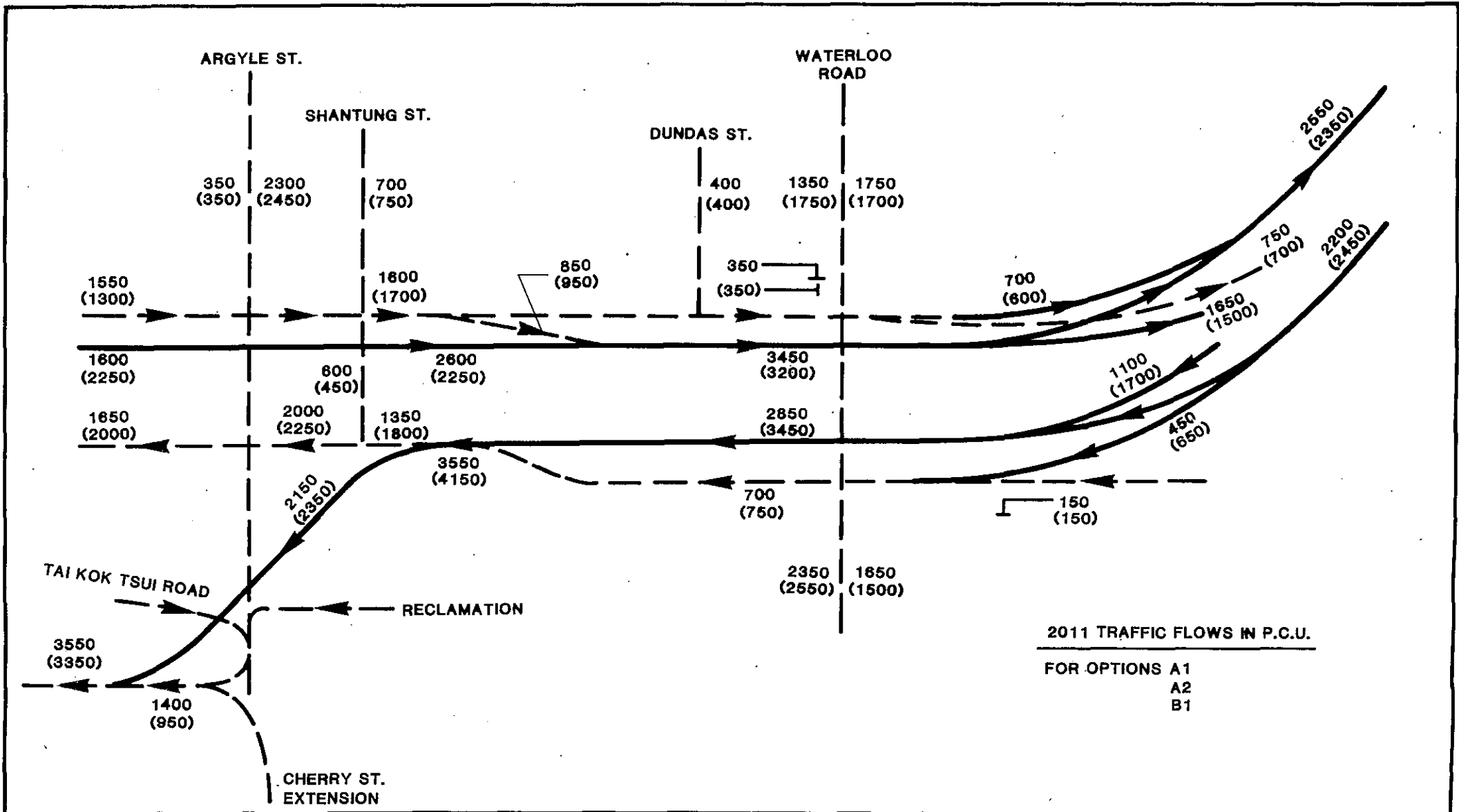
Location of Noise Sensitive Receivers and Construction Phase Notional Noise Source Points for Phase IIA Flyover

Figure 3.3.1



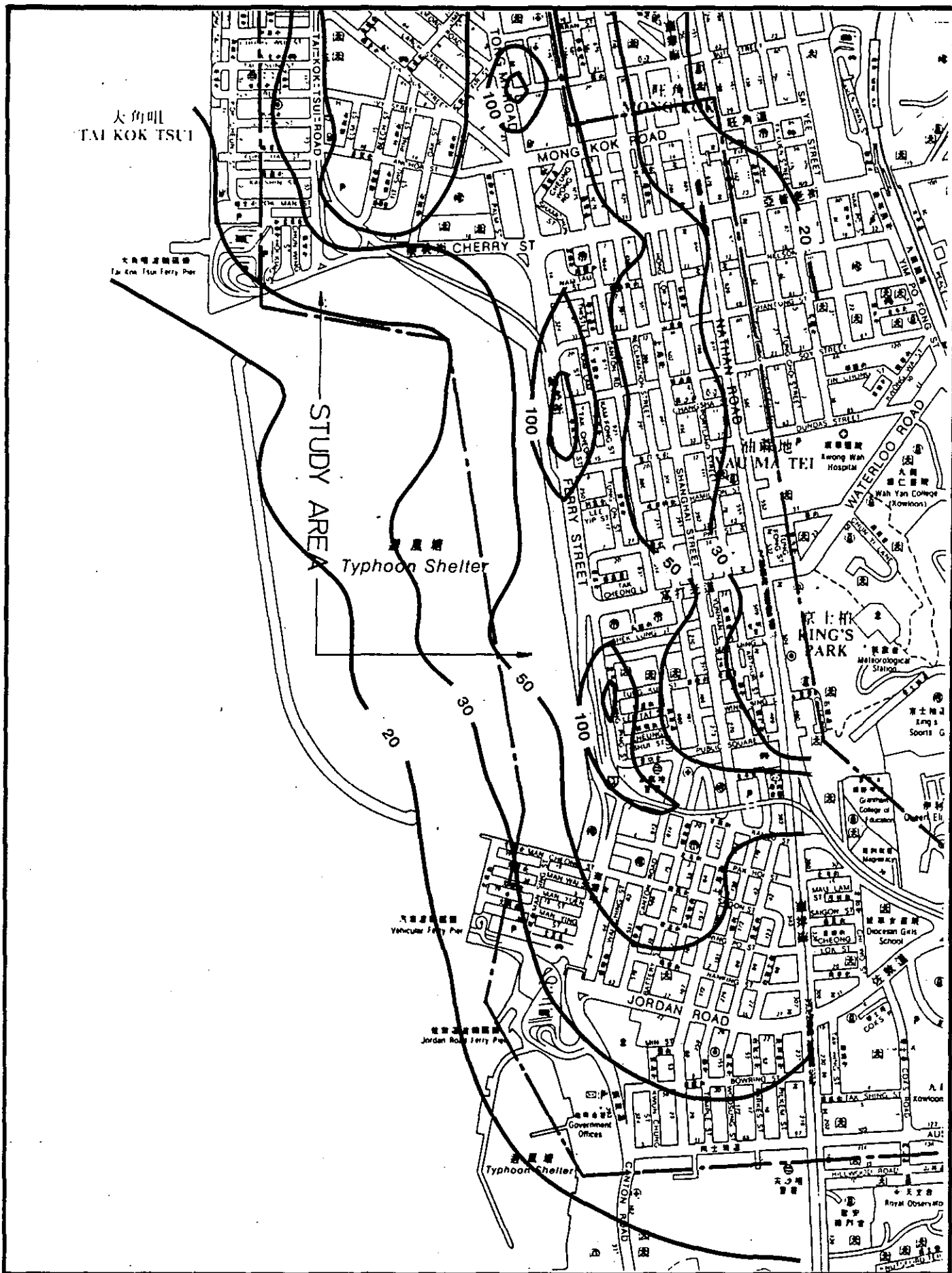
Location of Air Quality Sensitive Receivers

Figure 3.4.1



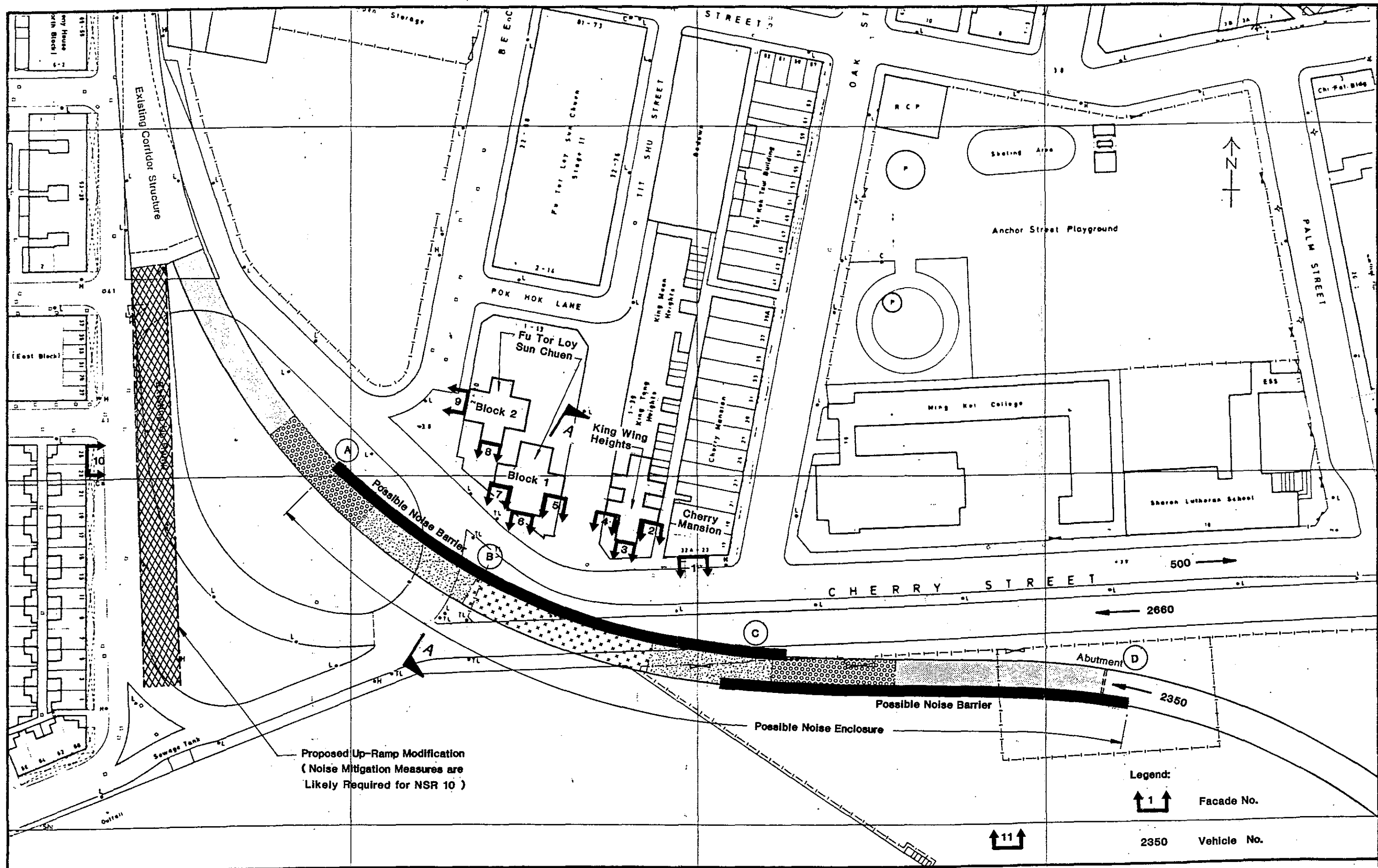
Traffic Flows Used for Air Quality Modelling

Figure 3.4.2



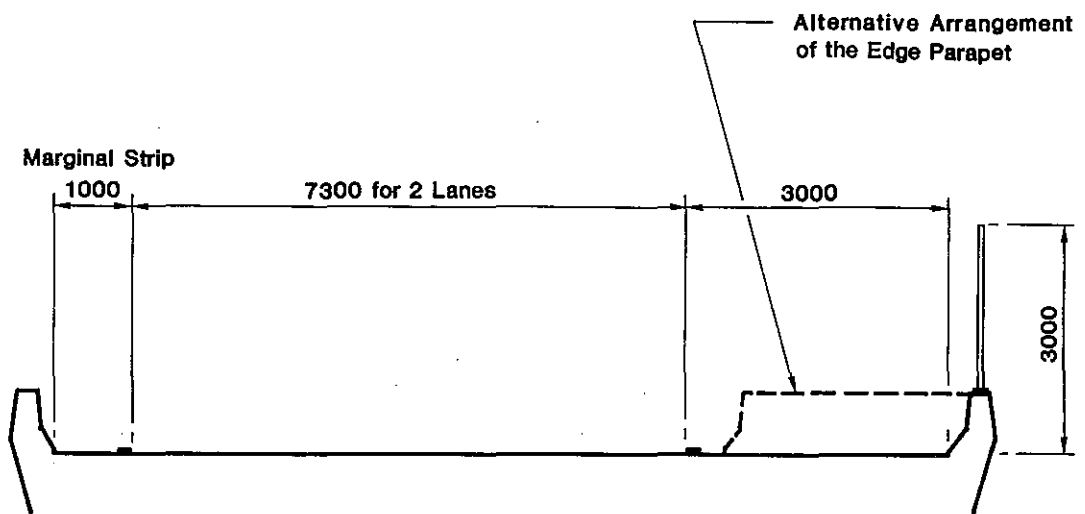
NO₂ Concentration Contours (μgM^{-3}) for the 2011 Traffic Flows

Figure 3.4.3



Location of Noise Sensitive Receivers for Road Traffic Noise and Possible Mitigation Measures to Phase IIA Flyover

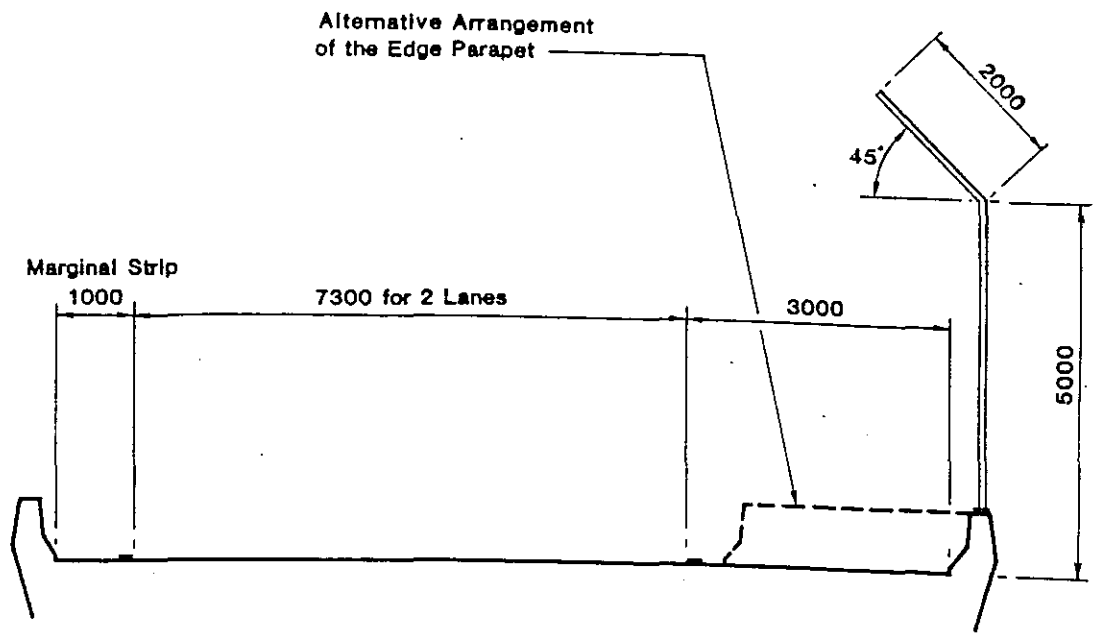
Figure 3.5.1



3m High Noise Barrier

Possible 3m High Noise Barrier on Phase IIA Elevated Road

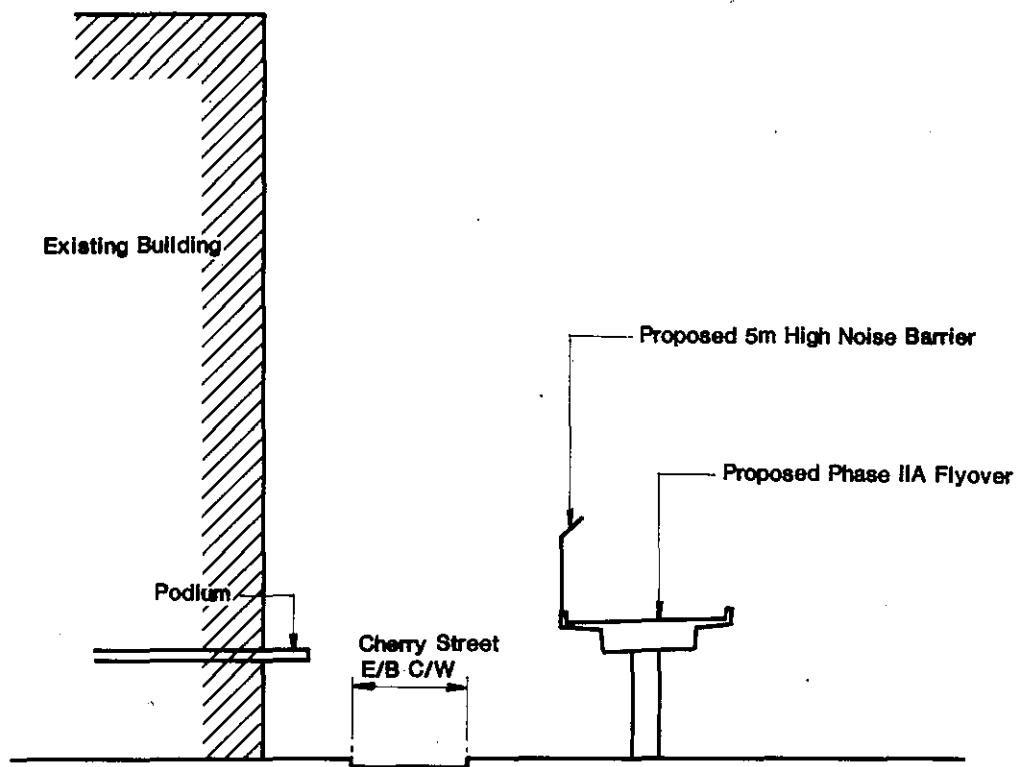
Figure 3.5.2



5m High Noise Barrier

Possible 5m High Noise Barrier on Phase IIA Elevated Road

Figure 3.5.3



Proposed Noise Barrier on Phase IIA Flyover
Section A-A

Figure 3.5.4

4. Environmental Assessment of Phase IIB

4.1 Introduction

4.1.1 The Phase IIB section of the West Kowloon Corridor involves the demolition of a portion of the existing Gascoigne Road Flyover and the construction of a new flyover across Waterloo Road to join Ferry Street at the ground level. The general layout of the Phase IIB section is given on Drawings 11 and 12 contained in Volume I of the Report.

4.1.2 This chapter describes the environmental assessment that has been undertaken for Phase IIB. The assessment has been conducted in accordance with Chapter 9 of the HKPSG and the statutory provisions of various Ordinances and related legislation. Each of the relevant sections contains a description of the approach and methodology, a listing of the assumptions made and a discussion of the results. Necessary mitigation measures and requirements for the environmental or audit monitoring have also been included in the relevant sections.

4.2 Air Quality Impacts from Construction

4.2.1 General Impacts

4.2.1.1 The major air quality impact during the construction of Phase IIB will result from dust emissions. Due to the small numbers of vehicle and plant on site, exhaust emissions are not considered to constitute a significant source of air pollutants.

4.2.1.2 Possible dust sources are:

- o site preparation;
- o excavations;
- o wind erosion of work areas;
- o material transfer to and from trucks;
- o vehicle/plant movements on unpaved roads and over the site;

4.2.2 Sensitive Receivers

4.2.2.1 Representative existing residential blocks, schools and recreational areas were selected as sensitive receivers, as well as analysis points on the proposed West Kowloon Reclamation (WKR) to represent potential residential areas. These are shown in Figure 3.4.1. The height used for the analysis was based on the first floor level for buildings.

4.2.3 Background Dust Levels

4.2.3.1 The major source of background dust levels will arise from the formation of the West Kowloon Reclamation (WKR). The West Kowloon Reclamation, Construction Environmental Impact Assessment Report, 1991, indicates potential high dust levels in the area. The levels are given in Table 4.2.1. Concrete batching was assumed to have dust control measures.

Table 4.2.1 Predicted Dust Levels from the WKR (μgm^{-1})

Down Wind Distance (m)	Dust Concentration at Wind Speed 2 ms^{-1}
50	1631
100	1065
200	503
300	299
400	177
500	122

4.2.4 Assessment Methodology of Construction Dust Impacts

4.2.4.1 Dust levels arising from construction work may be estimated using USEPA Compilation of Air Pollutant Emission Factors (AP-42). In order to make predictions of air quality impacts the following information is required: site area, nature of activity, quantities of stockpiled materials, vehicle movements to and from the site, vehicle speed over the site, silt content of excavated material and rainfall data. The basic emission categories are; dust from vehicles movements on unpaved roads, dust from material movement, dust from the erosion of the site. The PAL2.1 model was used for the dispersion modelling to assess the effects on the sensitive receivers. Worst case 1-hour average TSP concentrations were calculated.

Construction of roads, in particular elevated sections, is not a particularly dusty operation. Little excavation is required except piling for column foundations. Column and deck formation is usually achieved by in-situ casting of concrete, brought on site by ready mix trucks. The WKC will be mostly elevated, with a section of at-grade road. During the construction period, traffic will continue to use the existing at-grade roads.

4.2.4.2 The dust emissions were calculated using the methodology in AP-42. The major dust sources were considered to arise from excavation and handling of material from the column piles, and truck movements on site surfaces (in particular movement of ready-mix trucks). Site surfaces were considered to be unpaved, however, in practice trucks will use existing paved roads and this assessment may, therefore, overestimate dust generation levels from this source. The construction site was considered as a 10m wide strip, running the length of the proposed road. It was assumed the whole area would be worked simultaneously. Concrete batching will not take place on the site, concrete will be provided by ready mix trucks. In addition to the dust arising from the Phase IIB construction activities dust emissions from the construction of two storm water culverts and the diaphragm wall for the Central Kowloon Route (CKR) were also taken into account. Dust emission factors are given in Table 4.2.2.

Table 4.2.2 Construction Dust Emission Factors

Activity	Emission (kg day ⁻¹)
Formation of Column Foundations	2.0
Casting of Columns and Deck	7.0
Formation of at grade road section	2.0
Construction of Box Culvert 1	3.0
Construction of Box Culvert 2	1.0
CKR Diaphragm Walls	8.0

4.2.4.3 For the dispersion modelling, meteorological conditions of wind speed 2ms⁻¹, stability category D and a mixing layer height of 500m were adopted for the analysis. Selection of wind speed represents a compromise between low speed and hence decreased dispersion but possible settling of particulates, and a higher wind speed with greater dispersion and increased dust generation.

4.2.5 Dust Impact on Sensitive Receivers

4.2.5.1 The worst case 1-hour average TSP concentrations at the sensitive receivers are given in Table 4.2.3.

4.2.5.2 There are unlikely to be adverse impacts at any of the sensitive receivers as a direct result of the construction of the West Kowloon Corridor Phase IIB. The TSP concentrations are in compliance with the acceptable 1-hour average limit of 500 μgm^{-3} at the receivers. The predicted levels are insignificant in comparison with those predicted for the formation of the WKR. The worst case 1-hour average is also well below the 24-hour average AQO of 260 μgm^{-3} , and also below the annual average AQO of 80 μgm^{-3} , hence it is concluded that the construction of the WKC Phase IIB will have minimal effect on long term average dust concentrations in the area.

4.2.5.3 Dust reduction measures for construction work, however, should adopted as a matter of good working practice.

Table 4.2.3 Worst Case 1-hour TSP concentrations

Receiver	TSP μgm^{-3}
1	10
2	11
3	14
4	16
5	22
6	36
7	39
8	41
9	38
10	41
11	48
12	36

Table 4.2.3 Worst Case 1-hour TSP concentrations (Continued)

Receiver	TSP μgm^{-3}
13	42
14	35
15	37
16	40
17	39
18	39
20	15
21	11
22	11
24	24
25	16
27	12
28	7
29	11
30	5

4.2.6 Construction Dust Control Measures

4.2.6.1 General control measures are described in Section 3.2.

4.2.6.2 It is not considered that a regular dust monitoring program is undertaken, due to the low predicted dust levels in relation to the WKR formation. Dust minimisation could be accomplished by regular visual inspection by the Engineer or his representative. Should there appear to be a dust nuisance, discussions should be held with the contractor to establish the cause of the nuisance and to find ways of preventing future occurrences.

4.3 Noise Impacts from Construction

4.3.1 Legislation

See Section 3.3.1.

4.3.2 Existing Conditions

4.3.2.1 As identified in Section 3.3.2.2, noise levels were monitored at the Yau Ma Tei Catholic Primary School that fronts Ferry Street. Ambient noise levels outside the first floor window facing Ching Ping Street were taken between 8 am and 7 pm. This sensitive receiver reflects the ambient noise conditions in the vicinity. All results are presented in Appendix A.

4.3.2.2 Noise levels at the facade of the school peaked at 9 am when the recorded noise level reached 82 dB(A) (1 hour Leq). Thereafter noise levels dropped to approximately 77 dB(A) for the remainder of the day. After 5 pm noise levels dropped to below 76 dB(A).

4.3.2.3 The information supplied in sections 3.3.2.8 to 3.3.2.10 concerning noise impacts from the West Kowloon Reclamation also apply during this part of the assessment.

4.3.3 Sensitive Receivers

4.3.3.1 For the purposes of assessing noise impacts from the construction of the Phase IIB flyover and the at grade section joining the Phase IIA flyover, four different intensities of activity were identified. The closest sensitive receiver for each construction area was selected in order to determine the worst case situation.

4.3.3.2 The location of each selected sensitive receiver and the relevant construction area is shown in Figures 4.3.1 and 4.3.2 and the distance between the NSR and the assumed notional noise source (NNS) is given in Table 4.3.1.

Table 4.3.1 Distance between NSR and NNS for each Construction Area

Construction Area	NSR	Distance (m)
A	8	50
B	9	30
C	10	60
D	11	45

4.3.4 Assessment Procedure

4.3.4.1 Noise prediction calculations have been undertaken in accordance with the methodologies identified in Section 3.3.4.1.

4.3.4.2 Section 4.3.3.1 of Working Paper 4 identified the preliminary equipment requirements of layout option A2. This data has been updated for the purposes of this assessment but plant requirements remain broadly the same. Due to the extremely complicated construction programme that will be necessary to enable erection of the elevated sections and ramps, as well as permitting as normal as possible use of the existing road network, a different approach to assessing the noise impacts from construction activities to that used for Phase IIA was required.

4.3.4.3 The total work area for the Phase IIB flyover was divided into four construction areas reflecting the varying intensity of construction activities resulting from flyover construction, diaphragm wall construction (Central Kowloon Route) and stormwater culvert excavation. The equipment required in each area was identified and for the purposes of this assessment assumed to be operating at all times.

4.3.4.4 The identified construction areas are as identified in Figures 4.3.1 and 4.3.2 and discussed below in the following sections.

(1) **Construction Area A, Intensity 1** (on a scale of 1 to 4, 4 being the highest). This area comprises the at grade section of the road which joins the Phase IIA flyover to the Phase IIB ramps and flyover. The activities and equipment required in this area can be divided into two sections:

- i) Breaking out of existing surface
- ii) Laying of new road surface

The equipment requirements for the above are given in Appendix F.

The NNS for Area A has been taken as the central area of the two lanes being constructed at that point where residential areas are closest to the new road (50 m between NNS and NSR)

- (2) **Construction Area B, Intensity 2.** Activities within this area will comprise the construction of up and down ramps ultimately carrying some 6 traffic lanes. The equipment required for the construction operations are illustrated in Appendix F.

The NNS has been taken as a point in the middle of the new carriageway directly opposite the nearest residential area (some 30 m separate the two). As the location of bore pile and the excavator can be identified exactly (at the point of the nearest bridge support), the distance between the NSR and this equipment has been assumed to be 40 m.

- (3) **Construction Area C, Intensity 4.** Activities within this area include the construction of 2 flyover sections (each 2 lanes wide), several up/down ramps (totalling 7 traffic lanes), the diaphragm wall for the Central Kowloon Route and the excavation and subsequent fabrication of a stormwater culvert. Equipment requirements are listed in Appendix F.

The NNS has been taken as a point along the new central carriageway above the construction area for the diaphragm wall. The NSR has been assumed to be 60 m away at the nearest facade of the six streets development (under construction). The position of the culvert is shown on Figure 4.3.1. The equipment involved this work has been assumed to be some 190 m away from the NSR.

- (4) **Construction Area D, Intensity 3.** Construction activities in this area are restricted to the excavation for a 3 m x 3 m box culvert and the fabrication and erection of two elevated roads of short section totalling four traffic lanes. The equipment required are shown in Appendix F.

The NNS has been taken as a point between the two flyovers midway along the construction area. The NSR is taken as the closest facade of the Six Streets Development - a distance of some 45 m separates the two. The presence of a bridge support 30 m away from the NSR has enabled the precise positioning of the excavator, bore piler and lorry at this point instead of at the NNS.

4.3.4.5 In addition to the assumptions included in the above construction areas a number of assumptions have been adopted during the assessment that are common to all construction areas in the Phase IIB schedule;

- i) Sound power levels used for identified plant areas contained in the 'Technical Memorandum on Noise from Construction Work other than Percussive Piling'.
- ii) Concrete mixer lorries identified as being on site are assumed to be operating at all times.

- iii) Lorries rather than dump trucks are utilised for the handling of excavated material.
- iv) The start date of construction is taken as November 1993.
- v) The work area identified in WP4 as shown in Figure 4.3.3 is not used for any significant construction work.

4.3.4.6 As can be seen from the envisaged construction schedule (Appendix F) for the Phase IIB works, it is likely that almost all construction activities will be taking place in all construction areas during months 1 - 19. As such there is little value in separating each of the activities and identifying their individual impact on each of the sensitive receivers.

4.3.4.7 The approach adopted during the assessment was to predict impacts during a worst case operation, whereby all construction equipment has been assumed to be operating at a particular point in each of the construction areas. It has also been assumed for the purposes of this assessment that the calculated noise levels will occur for the duration of the construction period i.e. from month 1 - 19. In reality, of course, this intensity of activity is unlikely to occur for eight hours per day, six days per week.

4.3.4.8 The results indicate a realistic worst case noise level at the closest noise sensitive receiver to each of the construction areas; noise levels at other residential areas adjacent to the route are not likely to exceed those reported here.

4.3.5 Results

4.3.5.1 The distance corrected noise levels predicted for each NSR from each construction area is given below in Tables 4.3.2. A facade correction of +3 dB(A) has been added to the results.

Table 4.3.2 Noise Levels at NSR's

NSR	Construction Area	Maximum Predicted Noise level (dB(A))
8	A	84.2 (78.2)
9	B	84.7
10	C	80.7
11	D	85.6

Note: Figure in brackets denotes the significantly lower level of activity at this site that results when breaking out of the road surface is completed.

4.3.6 Discussion of Results

4.3.6.1 From Table 4.3.2 above it can be seen that the predicted maximum noise levels at the sensitive receivers at any time during the construction period will be approximately 84 dB(A) or lower. Such noise levels are not exceptional for this type of construction site.

- 4.3.6.2 Noise levels at the NSR's will only be in the order of 2 dB(A) greater than the current peak hour traffic noise level and some 7 dB(A) above the normal daily noise level for the rest of the day. With mitigation, the impact may be reduced further.
- 4.3.6.3 Noise impacts at NSR 10 will be reduced after 4 months following the completion of the temporary ramps. Equipment used in the near vicinity to this NSR will be relocated and used else where in the work area.
- 4.3.6.4 It should be noted that vibratory concrete compactors/vibrators have not been included in the equipment schedules shown in Appendix F and the noise produced by them has not been taken into account during the above calculations. As this equipment only operates for a maximum of half hour at any one site, it was not considered realistic to include them within calculations that predicted constant noise levels during any day time period. The effect on noise levels that the operation of this equipment would cause have been taken into account. At NSR's 9, 10 and 11 (no concrete vibrators will operate in work area A, so NSR 8 will not be affected), the noise levels in Table 4.3.2 will be increased by 0.5, 0.3 and 0.2 dB(A) respectively demonstrating that little additional noise impact will result from their operation.
- 4.3.6.5 During the construction period, schools within Construction Area C (particularly the Yau Ma Tei Catholic Primary School that fronts directly onto Ferry Street) will suffer maximum noise levels of around 81 dB(A). A number of classrooms nearest to Ferry Street would be insulated with double glazing and air conditioning; the noise impact at these classrooms will therefore be reduced. Additional mitigation measures should however be considered to protect what are classified as 'super sensitive receivers'.
- 4.3.7 Mitigation Measures
- 4.3.7.1 As stated in the previous sections it is not considered that these noise levels will be achieved in reality at the NSR's. It is probable that the operation of all plant scheduled to be operating at any one time in any week will not occur and noise impacts at the NSR's will be lower than that predicted above. However, given the possibility that they do operate all at once, mitigation measures should be considered for inclusion within the contract.
- 4.3.7.2 Section 3.3.6 of this Report examined the possible measures that could be taken to reduce noise impacts from similar sources for Phase IIA. It was concluded that stationary items of plant were the best targets to concentrate mitigation efforts upon.
- 4.3.7.3 As for the Phase IIA flyover, it is recommended that noise barriers are placed around stationary plant items such as hand held pneumatic drills, concrete pumps, the bentonite filtering plant, the hydraulic extractor and the bore pilers. Adopting these mitigation measures, the received noise level at the NSR's are reduced to those shown in Table 4.3.3 below. A facade correction of +3 dB(A) has been added in all cases.

Table 4.3.3 Success of Mitigation Measures

NSR	Noise Level without Concrete Vibrators Operating	Noise Level with concrete Vibrators Operating
9	82.6 (84.7)	83.4 (85.2)
10	78.9 (80.7)	79.3 (81.0)
11	84.6 (85.6)	84.8 (85.6)

Note: 1. Figures in brackets are noise levels without mitigation measures applied.

2. No mitigation is possible in Work Area A (NSR 8) using barriers methods as all operating plant are mobile.

4.3.7.4 Even with mitigation measures included, the super sensitive receivers (e.g. Yau Ma Tei Catholic Primary School) on Ferry Street will receive noise levels of around 79 dB(A). In order to reduce the extent of impact further, it is recommended that discussions be held with the Head Teacher to identify particularly sensitive periods e.g. examinations and restrictions placed on the operation of very noisy plant during those times. Special clauses on the restriction of the use of noisy construction plants during the school examination period and the requirement to keep a close consultation with the school authority should be included in the contract documents.

4.3.7.5 To enable the construction of the Phase IIB flyovers, a pair of temporary steel ramps are required to connect Ferry Street and the Gascoigne Road flyover near the Police Station for diverting the the traffic from the length of the existing flyover to be demolished. The steel ramp on the east side of Ferry Street is located on the existing central median in between Ching Ping Street and Ferry Street and is very close to the residential blocks at the Six Streets Redevelopment site. The predicted noise levels due to the traffic being diverted onto this steel ramp ranges from 77 to 79 dB(A). In order to reduce the noise impacts, the following mitigation measures are proposed.

- (i) Use of black-top road surface for this steel ramp.
- (ii) Attachment of a transparent plastic board to the open vehicular parapet at the nearest edge of the steel ramp (total height is about 1 metre). This plastic board acts as a noise barrier.

These measures will reduce the noise levels by about 2 dB(A). Installation of a higher noise barrier will create sightline problems and is therefore not considered in view of the temporary nature of the steel ramp which would only be used for no more than two years.

4.3.8 Conclusion

4.3.8.1 The construction period of Phase IIB flyover will result in slightly elevated noise levels in the immediate vicinity of operations. Adopting the recommended mitigation measures will result in a reduction in received noise levels to a level that are not excessive in relation to the activities being undertaken and the current level of traffic noise.

4.4 Air Quality from Road Traffic

4.4.1 Introduction

4.4.1.1 The air quality assessment was undertaken for the 2011 design year traffic flows/vehicle composition, and for the existing conditions. The selected alignment for Phase IIB was option A2. With regard to air quality, this was favourable, because it will provide a traffic engineering solution, and hence congestion around the Waterloo Road/Ferry Street junction should be minimised. This assessment also includes pollutants from the Phase IIA road network, rather than considering Phase IIB in isolation.

4.4.2 Legislation and Assessment Criteria

See section 3.4.2.

4.4.3 Existing and Future Background Conditions

See section 3.4.3.

4.4.4 Sensitive Receivers

4.4.4.1 Representative existing residential blocks, schools and recreational areas were selected as sensitive receivers, as well as analysis points on the proposed West Kowloon Reclamation (WKR) to represent potential residential areas. These are shown in Figure 3.4.1. The height used for the analysis was based on the first floor level for buildings. Assessment were also carried out at third and fifth floor level, however first floor level proved to be the worst case. Additionally analyses were performed for a grid of points for the purpose of presenting pollutant contours.

4.4.5 Assessment Methodology

4.4.5.1 The air quality assessment was undertaken using an expanded version of the CALINE4 dispersion model, which allows a greater number of road links to be input, thus increasing the resolution of the model. Pollutants NO₂, CO and TSP were investigated, with particular emphasis on NO₂.

4.4.5.2 Vehicle emissions were based on USEPA AP-42, with the following assumptions:

- 1) By 2011 all light petrol vehicles will fitted with catalytic converters. Estimated average mileage is 50000 miles. A basic NO_x emission level of 1.02 g veh⁻¹ mile⁻¹ was used for vehicles fitted with catalytic converters. 1975-76 (pre-catalytic converter) emission levels were used for the remainder of the light petrol fleet.
- 2) Light diesel vehicles will be on average 7 years old with an average mileage of 50000 miles. 1985+ data were used.
- 3) Heavy diesel vehicles will be on average 10 years old with an average mileage of 200000 miles. 1987-92 figures were used.
- 4) Only speed correction was applied. No other adjustments were made eg. extra load, humidity etc due to lack of available data.
- 5) 20% NO_x to NO₂ conversion was assumed.

4.4.5.3 The same peak hour traffic flow predictions for the design year 2011 were used as were adopted for the initial assessment. Although there are minor changes to flows on some road links, the overall traffic flow on the corridor remains virtually unchanged. On this basis it was not considered necessary to revise the traffic flows for modelling purposes as the changes would be undetectable. The flows as used for the assessment are shown in Figure 3.4.2.

The vehicle composition used for the assessment is given in Table 4.4.1.

Table 4.4.1 Traffic Composition (%)

Year	Light Petrol	Light Diesel	Heavy diesel	Motor Cycle
2011	28	61	8	3
Existing	24	66	10	*

* Not itemised

4.4.5.4 Composite vehicle emission factors for the existing and 2011 traffic compositions were calculated. The emissions are given in Table 4.4.2. The selected option (A2) provided a traffic engineering solution, hence for this assessment the impacts of congestion were not investigated.

Table 4.4.2 Vehicle Emission Factors

	50 kmh ⁻¹ (gveh ⁻¹ mile ⁻¹)			70 kmh ⁻¹ (gveh ⁻¹ mile ⁻¹)		
	CO	NOx	TSP	CO	NOx	TSP
2011	3.1	1.7	0.7	2.1	1.8	0.7
Existing	5.2	3.1	0.7	*	*	*

4.4.5.5 Meteorological conditions of wind speed 1 ms⁻¹, stability class D, mixing height of 500 m, horizontal standard deviation of 12 deg. and worst case wind direction were considered to represent realistic worst case 1-hour conditions, and were used for the dispersion modelling for the existing situation and for the 2011 traffic flows. Additionally, an annual average for NO₂ was calculated for the 2011 scenario, based on 5-years meteorological statistics from the Royal Observatory. For this assessment, the peak hour traffic flows were assumed to represent 5% of the 24-hour flow, hence the hourly average over the day was calculated to be 0.83 times the peak hour flow.

4.4.6 Impacts on Receivers

4.4.6.1 The calculated pollutant concentrations at sensitive receivers are shown in Table 4.4.3. All predicted levels are within the AQOs. Even with the addition of background concentrations (in particular those from the WKE) it is not expected that there would be exceedance of the AQOs. NO₂ concentration contours for the area (including Phase IIA road network) for the 2011 traffic flows are shown in Figure 3.4.3.

4.4.7 Summary

4.4.7.1 Under worst case 2011 conditions, the maximum CO, NO₂ and TSP concentrations arising directly as a result of the WKC are 2%, 23%, and 22% of the respective AQOs. It is concluded that the WKC will not cause unacceptable air quality impacts.

Table 4.4.3 Pollutant Concentrations at Sensitive Receivers (μgm^{-3})

Receiver	CO		NO ₂			TSP	
	Worst Case 1-Hour Av. Existing	Worst Case 1-Hour Av. 2011	Worst Case 1-Hour Av Existing	Worst Case 1-Hour Av. 2011	Annual Average 2011	Worst Case 1-Hour Av. Existing	Worst Case 1-Hour Av. 2011
1	679	767	111	112	11	97	176
2	687	673	113	99	11	98	154
3	724	622	119	91	11	103	143
4	757	634	124	93	13	108	146
5	857	713	141	105	12	122	164
6	897	688	147	102	16	128	159
7	715	709	117	105	9	102	163
8	732	665	120	99	9	104	154
9	698	585	115	85	6	99	134
10	787	604	129	88	7	112	138
11	968	728	159	106	7	138	166
12	668	532	110	78	6	95	122
13	826	593	136	87	6	118	135
14	673	502	110	73	6	96	115
15	720	503	118	73	7	103	115
16	738	564	121	83	6	105	130
17	659	545	108	81	5	94	127
18	540	533	89	82	5	77	127
19	466	488	77	76	5	66	118
20	290	246	48	36	2	41	56
21	259	221	43	32	2	37	51
22	249	212	41	31	2	35	49
23	444	485	73	77	1	63	119
24	306	305	50	45	10	44	71
25	276	270	45	41	9	39	64
26	266	273	44	43	9	38	67
27	238	244	39	41	7	34	63
28	1031	472	169	69	14	147	108
29	469	355	77	52	8	67	81
30	669	374	110	55	10	95	85

4.5 Road Traffic Noise

4.5.1 Introduction

This section examines the possible impact of the road traffic noise from the proposed Phase IIB of the West Kowloon Corridor. The assessment covers the length of the corridor from Nelson Street to Kansu Street. An elevated structure on Ferry Street north of Dundas Street will be constructed in the WKC - Phase I contract. The assessment of the combined noise levels at the adjacent sensitive facades are reported but the noise mitigatory proposals for the Phase I Corridor are not examined as this is not a requirement of the Study Brief.

4.5.2 Methodology

The methodology adopted for the Phase IIB road traffic noise assessment is the same as that for the Phase IIA assessment. The detailed traffic flow figures are highlighted in Figures 4.5.1 and 4.5.2.

4.5.3 Noise Sensitive Receivers

4.5.3.1 All building facades fronting Ferry Street would be affected by the traffic running on the corridor. A total of 18 noise sensitive receivers were identified for the assessment. The locations of these receivers are highlighted in Figures 4.5.1 and 4.5.2. Facades 1 to 13 represent the existing developments on the eastern side of the road corridor; facades 15 to 18 are typical facades for the proposed residential developments on the West Kowloon Reclamation.

4.5.3.2 The numbers of household units at each facade are as follows :-

<u>Facade No.</u>		<u>Total Number of Household Units</u>
1	- Yuen Fat Buildings	132
2	- No. 314-334 Ferry Street - No. 103 Shantung Street) 256
3 & 4	- Kwong Wing Building	121
5	- No. 82-100 Tak Cheong Street	88
6	- No. 70-80 Tak Cheong Street	44
7 & 8	- Po Hang Building - No. 250-252 Ferry Street) 124
9 & 10	- Tung On Court - Shun Lee Building) 143
11	- Tak Hay Building - Wah Tak Building) 236
12 & 13	- Six Streets Redevelopment	868

4.5.4 Assessment

4.5.4.1 Five options as considered in the Phase IIA environmental assessment were investigated. There are briefly described as follows :-

Option 1 Assumes no new flyovers are proposed on Ferry Street.

Option 2 Assumes the proposed West Kowloon Corridor is constructed with porous friction course as surfacing, no other noise mitigatory measures are provided.

Option 3 As for option 2, but with a 3 metre noise barrier on the strategic location of the flyover and the application of porous friction course surfacing on the corridor.

Option 4 As for Option 3, but with the barrier height increased to 5 metres.

Option 5 Assumes a noise enclosure is provided on the elevated structure and the application of porous friction course surfacing on the corridor.

4.5.4.2 The possible location for the provision of the noise barrier or the noise enclosure is indicated in Figures 4.5.5 and 4.5.6. Where barriers are located at the inner curves of the flyover, the carriageway would require curve widening to meet with the sightline requirements. The diagrammatic arrangements for the 3m and 5m barriers are given in Figures 4.5.3 and 4.5.4.

4.5.4.3 The existing buildings on the eastern side of the road corridor along Ferry Street were divided in the following areas for assessment.

Area 1 - Between Nelson Street and Soy Street

Area 2 - Between Soy Street and Dundas Street

Area 3 - Between Dundas Street and Waterloo Road

Area 4 - Between Waterloo Road and Kansu Street

The assessment and the results of each of the areas are discussed in the following sections.

4.5.4.4 In order to assess the traffic noise impact from the corridor, calculations were also carried out at the potential sensitive receivers at the proposed residential sites on the reclamation.

4.5.5 Area 1 - Between Nelson Street and Soy Street

4.5.5.1 The sensitive receivers identified in this area are represented by facade numbers 1 to 4, which represent the residential units of the following building blocks.

No. of Household Units

i)	Yuen Fat Building	132
ii)	No. 314-334 Ferry Street	240
iii)	No. 1 to 3 Shantung Street	16
iv)	Kwong Wing Building	121
Total :		509
		=====

4.5.5.2 These facades face the Phase I flyover on which the only noise mitigatory measures to be provided are the 1.2 metre high concrete profile barrier and the porous friction course surfacing on the bridge deck.

4.5.5.3 The predicted noise levels at these sensitive receiver facades at various floor heights are tabulated below. All results are presented in dB(A) L_{10} 1 hr.

Facade 1

Option	2/F	5/F	14/F	23/F
1	86.6	85.1	81.5	80.0
2	82.3	84.6	81.5	80.0

Facade 2

Option	2/F	5/F	14/F	23/F	26/F
1	86.2	84.6	81.7	79.8	79.3
2	80.7	83.0	81.5	79.8	79.7

Facade 3

Option	2/F	5/F	14/F
1	86.4	84.8	82.4
2	81.8	82.1	82.6

Facade 4

Option	2/F	5/F	14/F
1	77.9	78.4	77.6
2	73.7	75.3	76.5

4.5.5.4 Discussion of Results

4.5.5.4.1 Option 1 assumes that all the anticipated traffic on the West Kowloon Corridor would be running on the ground level Ferry Street. The noise levels at the facades facing Ferry Street at lower floors are in the order of 86 dB(A) L_{10}^1 hr. Noise levels are expected to reduce to the order 79 to 80 dB(A) at the higher floors.

4.5.5.4.2 For Option 2, there would be a reduction of 3 to 4 dB(A) at the lower floor levels of all NSR's when the new road is in position. For these properties, the construction of the Phase I flyover will result in an improvement in noise conditions. With the inclusion of the Phase IIA road, there would be a slight increase in the noise of the selected noise sensitive facades, but the increase is predicted to be less than 1 dB(A).

4.5.5.4.3 The results indicate that the residential units would experience a very high traffic noise level in the range of 74 to 84 dB(A).

4.5.5.4.4 The Kowloon Region Highways Department advised that the noise assessment undertaken for the Phase I flyover concluded that noise enclosures or barriers would not be included on the flyover and that the mitigatory measures to be included are 1.2 metre high concrete profile barrier and porous friction course as the deck surfacing. Noise mitigatory measures, such as barriers or enclosures, on the Phase I flyover have therefore not been investigated.

4.5.6 Area 2 - Between Soy Street and Dundas Street

4.5.6.1 The facades identified in this area are represented by facades 5 and 6, which represent the following residential units.

	<u>No. of Household Units</u>
(i) No. 82-100 Tak Cheong Street	88
(ii) No. 70-80 Tak Cheong Street	44
Total	<hr style="width: 100px; margin-left: auto; margin-right: 0;"/> 132 =====

4.5.6.2 These units are directly facing Ferry Street with a total height of 11 floors. The upper floors of these units are currently experiencing noise levels of 80 to 83 dB(A) L_{10}^1 hr. during the peak hour period. The predicted noise levels at the selected facades for the considered options are tabulated below :-

Facade 5

Option	2/F	5/F	8/F	10/F
1	83.2	83.4	82.3	82.2
2	81.9	82.1	81.5	80.8
5	71.1	72.1	72.2	72.0

Facade 6

Option	2/F	5/F	8/F	10/F
1	83.5	83.7	83.1	82.5
2	81.7	81.8	81.2	80.5
5	75.1	77.0	76.8	76.3

4.5.6.3 The road width of this section of the road corridor is about 45 metres, with only one central median at the middle of the road. It is obvious that the provision of the noise barrier along the road edge would not be effective and therefore Options 3 and 4 are not considered.

4.5.6.4 Discussion of Results

4.5.6.4.1 The residential units would experience a very high traffic noise level in the range of 80 to 82 dB(A) based on option 2.

4.5.6.4.2 The provision of a noise enclosure over this section of road corridor will reduce the noise levels at facade 5, by 11 dB(A), to 71 to 72 dB(A), close to the acceptable values in the planning guidelines. Facade 6 located closer to the ramps of the Phase IIB flyover would have higher noise levels in the order of 75 to 77 dB(A).

4.5.7 Area 3 - Between Dundas Street and Waterloo Road

4.5.7.1 The sensitive receivers identified in this area are represented by facades 7 to 11, which represent the residential units of the following building blocks.

- i) Po Hang Building
- ii) No. 250-252 Ferry Street
- iii) Tung On Court
- iv) Shun Lee Building
- v) Tak Hay Building
- vi) Wah Tak Building

The total number of household units is in the order of 503 units.

4.5.7.2

Most of these buildings are high rise blocks with 20 to 30 storeys. The predicted noise levels at these sensitive receiver facades at various floor heights are tabulated below. All results are presented in dB(A) L_{10} 1hr.

Facade 7

Option	2/F	5/F	14/F	20/F	26/F
1	80.1	80.6	78.4	77.2	76.2
2	78.3	78.5	76.4	75.1	74.2
3	75.5	75.5	75.8	74.9	74.0
4	75.3	74.8	74.7	74.2	73.5
5	75.3	73.5	73.6	73.0	72.8

Facade 8

Option	2/F	5/F	14/F	20/F	26/F
1	82.0	83.6	82.0	80.9	79.9
2	80.0	81.4	79.8	78.7	77.7
3	76.1	76.7	78.7	78.3	77.5
4	75.8	75.4	77.0	76.8	76.4
5	75.0	74.5	73.0	72.7	72.1

Facade 9

Option	2/F	5/F	14/F	20/F	26/F
1	75.4	78.7	78.7	77.9	77.1
2	73.7	76.5	76.5	75.8	75.0
3	70.6	70.4	73.7	74.8	74.6
4	70.3	70.0	71.7	73.5	73.5
5	70.1	69.4	69.2	68.1	67.4

Facade 10

Option	2/F	5/F	14/F	20/F	26/F
1	79.0	83.2	82.2	81.1	80.2
2	74.4	80.9	79.9	79.0	78.0
3	74.8	74.6	78.5	78.4	77.8
4	74.5	73.4	75.2	76.9	76.5
5	74.0	73.0	70.8	69.7	69.4

Facade 11

Option	2/F	5/F	14/F	20/F	26/F
1	73.6	77.5	81.1	80.3	79.5
2	72.4	75.5	78.7	77.9	77.6
3	70.7	70.9	74.1	76.0	76.1
4	70.5	70.4	71.6	73.1	74.2
5	70.1	69.5	70.5	71.0	70.5

4.5.7.3 Discussion of Results

4.5.7.3.1 The corner building at the Dundas Street/Ferry Street junction, Po Hang Building (represented by facade 8), is the worst location within this section of road. The noise levels based on option 2 are in the order of 76 to 81 dB(A). The lower floors are commercial podium development while the residential development is from the fourth floor upward. It was identified that the main contribution of the noise is from the proposed flyover. The installation of a barrier along the near side of the carriageway would achieve a reduction in the order of 4 dB(A). A 5 metre high barrier will give more benefits to the upper floor but there would be little difference at the lower floor. If the main carriageway is covered by a noise enclosure, a greater reduction can be achieved, thus bringing the highest noise level down to 75 dB(A).

4.5.7.3.2 The adjacent buildings represented by facades 10 and 11 are in the similar situation at Facade 8. The provision of a noise enclosure will significantly reduce the noise levels at these facades.

4.5.7.3.3 Facades 7 and 9 are not subject to the same noise as at the other facades because they are partially screened by the adjacent buildings. The provision of a noise enclosure will reduce the noise levels at these facade to levels generally consistent with the planning guidelines. The provision of noise barrier can only reduce the noise levels at the lower floors close to the planning guidelines; the upper floors are still subject to noise levels of 73 to 75 dB(A).

4.5.8 Area 4 - Between Waterloo Road and Kansu Street

4.5.8.1 The developments in this area comprise a fruit wholesale market, a primary school and a residential development scheme at Six Streets. There is a current proposal by the LDC to redevelop the fruit wholesale market into a comprehensive commercial/hotel/residential complex. The predicted noise levels at this proposed redevelopment site would be similar to those at facade 11. The predicted noise levels (option 2) at facade 11 range from 74 dB(A) at lower floors to 80 dB(A) at upper floors. These predicted noise levels should be taken into consideration in the planning of the redevelopment of the fruit wholesale market.

4.5.8.2 The Yaumatei Catholic Primary School has been included in the insulation programme and therefore no assessment at this location was undertaken.

Six Street Redevelopment

4.5.8.3 The Six Streets Redevelopments comprise several residential blocks of 28 storey high. The typical noise sensitive receivers are represented by facades 12, 13 and 14. These selected facades are similar to those identified in an early noise assessment for this particular development conducted in November 1986. The report on 'Noise Aspects of Urban Renewal Scheme - Six Streets (Yaumatei), prepared for the Housing Society, indicated that these facades were expected to have noise levels in the order of 77 to 80 dB(A). The current assessment indicated that similar results are expected.

4.5.8.4 The predicted noise levels at these sensitive receiver facades at various floor heights are tabulated below. All results are presented in dB(A) L_{10} 1 hr.

Facade 12

Option	2/F	5/F	14/F	20/F	26/F
1	75.5	78.6	78.8	77.8	77.1
2	75.5	77.0	76.7	75.8	75.2
3	74.7	73.7	74.7	74.8	74.6
4	74.6	73.3	72.3	72.9	73.0
5	74.6	73.1	71.3	71.2	71.5

Facade 13

Option	2/F	5/F	14/F	20/F	26/F
1	75.5	78.5	78.2	77.3	76.7
2	75.2	77.1	76.4	75.5	74.9
3	74.6	73.7	74.7	74.2	73.9
4	74.5	73.4	72.5	73.3	73.1
5	74.1	72.8	71.9	72.0	72.2

Facade 14

Option	2/F	5/F	14/F	20/F	26/F
1	75.5	79.8	79.4	78.1	77.2
2	75.1	79.8	79.4	75.9	74.9
3	73.6	72.8	75.5	75.1	74.6
4	73.4	72.3	73.0	73.4	73.1
5	73.1	72.1	69.0	68.0	68.0

4.5.8.5 Discussion of Results

4.5.8.5.1 There would be a slight improvement over the predictions presented in the 1986 assessment for the redevelopment. This is partly due to the shielding effects of the elevated road system. In general, without any mitigatory measures, these facades would experience noise levels in the order of 77 to 79 dB(A). The noise levels will be reduced by about 2 dB(A) if porous friction course is used on the bridge surface. If a noise enclosure is provided, these predicted noise levels would reduce to the order of 71 to 74 dB(A). The proposed noise barriers would bring the noise levels down to the order of 72 to 75 dB(A).

4.5.8.5.2 The previous noise assessment study for the Six Street redevelopment indicated that the affected buildings would be provided with noise insulation. The noise predictions undertaken here have indicated that with the proposed flyover, the predicted noise levels are slightly less than those anticipated in the previous assessment for the redevelopment. The mitigatory measures to the residential units in this building development as recommended in the previous noise assessment report should be followed.

4.5.9 Proposed Development on the Reclamation

4.5.9.1 Four sensitive receiver facades representing the proposed residential development on the reclamation were identified for the traffic noise assessment. Locations of these facades are shown in Figures 4.5.1 and 4.5.2.

4.5.9.2 The predicted noise levels at these sensitive receiver facades at various floor heights are tabulated below. All results are presented in dB(A) L₁₀ 1 hr.

Facade 15

Option	2/F	5/F	14/F	20/F	26/F
1	71.4	73.9	77.1	77.2	77.0
2	69.6	71.9	74.8	75.0	74.8
3	66.2	67.7	70.7	71.8	73.3
4	65.5	66.9	68.9	69.9	70.3
5	65.0	65.3	68.0	68.4	68.0

Facade 16 *

Option	2/F	5/F	14/F	20/F	26/F
1	69.2	74.7	78.0	77.9	77.6
2	67.2	72.8	76.1	76.4	76.2
3	64.6	70.5	74.7	75.3	75.3
4	63.4	70.0	73.6	75.0	75.0
5	63.2	70.1	73.2	74.4	74.0

* Note: No barrier or enclosure assumed on the section of Ferry Street between Soy Street and Dundas Street

Facade 17

Option	2/F	5/F	14/F	20/F	26/F
1	69.5	70.3	73.6	74.1	74.1
2	69.5	70.3	73.6	71.8	71.8
3	69.3	68.1	69.4	69.0	69.3
4	69.2	67.8	68.9	68.5	68.3
5	69.2	67.8	68.8	68.5	68.2

Facade 18

Option	2/F	8/F	17/F	26/F
1	72.5	78.3	77.9	76.9
2	71.6	77.3	78.3	77.5
3	68.9	75.2	77.5	77.4
4	67.0	73.6	76.8	76.6

4.5.9.3 Discussion of Results

4.5.9.3.1 The proposed R1 type residential development represented by facade 17 is separated by the non-sensitive landuses from the West Kowloon Corridor. These non-sensitive landuses are a GIC market and a multi-storey car park. The assessment indicated that these non-sensitive provisions are very effective in reducing the road traffic noise at this residential development, particularly at the lower floors. The upper floors would still experience noise levels in the order of 72 to 73 dB(A). The provision of direct mitigatory measures on the Phase IIB flyover will reduce the traffic noise down to the HKPSG.

4.5.9.3.2 The proposed residential development (RS and HOS) represented by Facades 15 and 16 is separated by a strip of area designated as district open space about 40 metres wide. Part of this land is designated for non-sensitive uses which would act as a noise barrier for the proposed residential development. The developments would still however suffer from noise levels in the region of 67 to 76 dB(A). The provision of mitigatory measures on the flyover will benefit the developments by reducing the noise levels by 2 to 5 dB(A).

4.5.9.3.3 The proposed R1 development on the reclamation, immediately south of Cherry Street is represented by facade 18. The facade facing Cherry Street was investigated in the Phase IIA Environmental Assessment and the results are reported in Section 3.5. The predicted noise levels in Option 2 are slightly lower than Option 1 because of the adoption of the porous friction course on the corridor surface. The provision of a 3 metre barrier will further benefit the development by 1 to 3 dB(A). A 5m barrier will offer additional benefits to the lower floors but there would be little difference at the upper floors.

4.5.9.3.4 The provision of a noise enclosure on the road corridor is more effective than the noise barrier. A 5m barrier does not offer significant additional benefit over a 3m barrier.

4.5.10 Costing for the Provisions

4.5.10.1 The mitigatory measures considered in the analysis include noise barrier of 3 metre and 5 metre high, and noise enclosure. The estimated costs for each of the provisions are as follows :-

- (i) 3 metre high barrier
 - Protection to the existing developments in the hinterland \$ 30.4 Million
 - Protection to the proposed developments on the reclamation \$ 10.8 Million
- (ii) 5 metre high barrier
 - Protection to the existing developments in the hinterland \$ 60.8 Million
 - Protection to the proposed developments on the reclamation \$ 21.6 Million
- (iii) Noise enclosures \$500.0 Million

These cost estimates are inclusive of 15% project contingencies and 20% contract preliminaries and contingencies.

The extent of the provisions of these measures to be considered is shown in Figures 4.5.5 and 4.5.6.

4.5.11 Discussions and Conclusions

Area 1 - Between Nelson Street and Soy Street

4.5.11.1 The total number of residential units in this area affected by the road traffic noise is in an order of 509 units. The analysis indicated that these units would experience a very high traffic noise level in the range of 74 to 84 dB(A) and that the noise from the Phase I flyover is the dominant noise source.

4.5.11.2 The Phase I flyover has been designed with 1.2 metre high concrete profile barrier and porous friction course as the deck surfacing. Investigation on further mitigatory measures to the Phase I flyover is not included in the study..

4.5.11.3 If the HKPSG is to be met, the only alternative in respect of these units is the provision of individual noise insulation and air conditioning. It is understood that it is not Government policy to provide such measures as a matter of general principle unless they are part of an overall settlement in respect of valid objections raised under the Roads Ordinance.

Areas 2 to 4 - Between Soy Street and Kansu Street

4.5.11.4 The do nothing situation (Option 1) indicated that the residential units in this area would experience a very high traffic noise level in the range of 76 to 84 dB(A) without the Phase IIB flyover in place and this is confirmed by the existing noise levels. The construction of the Phase IIB flyover (Option 2) would slightly improve the noise levels as compared with Option 1 because the noise from the flyover which is the dominant noise source can be reduced with the application of porous of friction course as the deck surfacing.

4.5.11.5 The provision of a noise enclosure on the road corridor reduces the noise level at most of these residential units to levels generally consistent with the planning guidelines. The estimated cost for the provision of a noise enclosure along the whole length of the corridor is about \$500.0 Million.

4.5.11.6 The provision of noise barriers on the flyover reduces the noise level by 2 to 9 dB(A), however the noise level is still well in excess of the levels given in the planning guidelines. The 5m barrier will give more benefits to the household units at the higher floors than the 3 metre barrier. The estimated cost for the installation of 5m high noise barriers on the flyover is about \$60.8 Million.

4.5.11.7 Aesthetically, an enclosure or a barrier on the flyover will have a significant visual impact on the residential units at the lower floors and concerns have been expressed that one form of mitigatory measure can produce another adverse impact. A 5 metre high noise barrier is more visual intrusive than a 3m high barrier.

4.5.11.8 The section of the corridor between Waterloo Road and Kansu Street is elevated and has horizontal bends. Further, two pairs of up and down ramps are provided to connect to the main corridor. The installation of noise enclosure or barriers on the flyover will impose sightline problems which would cause safety to the road users. Unless the corridor is substantially widened to satisfy the sightline requirement, the provision of noise enclosure or barriers on the flyover would not be considered acceptable. Widening of the corridor would result in encroachment onto the Six Streets Redevelopment site which is certainly unacceptable.

4.5.11.9 The section of the corridor between Soy Street and Dundas Street is mainly at-grade. The provision of a noise enclosure on an at-grade road of more than 40 metre wide is not regarded as practical. Further, the installation of a noise barrier along the eastern edge of such a wide carriageway would not be effective in reducing the traffic noise levels. It is therefore concluded that the provision of noise enclosure or barrier on this section of corridor is not considered to be useful.

4.5.11.10 The section of the corridor between Dundas Street and Waterloo Road is mainly an elevated carriageway. The assessment indicated that the main contribution of the road traffic noise is from the proposed flyover. The installation of noise enclosures or barriers on the flyover is practical and can achieve a reduction in noise levels in the order of 4 to 7 dB(A). As the 5 metre high barrier only produces marginal additional benefits than a 3 metre high barrier, the Environmental Assessment Working Group concluded that the investigation of the possible direct mitigatory measures be confined to either a total enclosure or two rows of 3 metre high barrier on the eastern edges of the northbound and southbound elevated carriageways of the corridor.

4.5.11.11 A comparison of these two direct mitigatory measures is given as follows:

(i) Costing

The estimated costs of these two measures are :-

Noise enclosure	\$200 million
3m high noise barriers	\$ 10 million

These costs are inclusive of 15% for project preliminaries and 20% for contract preliminaries and contingencies.

(ii) Visual Consideration

The enclosure would give far serious visual intrusion than the barriers and is likely to attract more adverse comments.

(iii) Construction Programming

The enclosure would require installation of special lighting and ventilations as the corridor will behave like a short tunnel after the erection of the enclosure. This would have programme implications, longer construction time is required for the completion of the corridor

(iv) Air quality impact

A qualitative air quality impact assessment was undertaken for these two measures and the results indicated that the air quality near to the portals of the noise enclosure is likely to worsen such that the AQO's may be exceeded. As for 3 metre high barrier, the air pollutant concentrations are not expected to increase.

(v) No. of household units to be benefited

The total number of the households units directly affected by this section of the corridor is about 500 units. The assessment results indicate that only the units at the middle and upper floors would receive greater benefits if noise enclosures are used. It is estimated that only 300 household units would be benefited more if noise enclosures are used in lieu of the 3 metre high barriers.

New Developments on the West Kowloon Reclamation

- 4.5.11.12 Facades 15, 16, 17 and 18 represent the possible facades for the proposed development. The residential development on the reclamation is indicated on the draft outline development plan which has yet to be endorsed and as a result no details are available of the form that these proposed buildings will take. The effect of noise mitigatory measures can therefore only be indicative and based upon an assumed building form there would be significant reductions in the noise level at lower floors of 3 dB(A) but minimal reductions at upper floor levels. Noise levels would still exceed the HK Planning Standards and Guidelines. Accordingly other means would need to be investigated in the building layout and design to achieve further reductions in noise levels to meet the acceptable standards. As determination of these means is premature it is not known whether they would supersede the need for noise protection measures adjacent to the flyover.

4.5.12 Recommendations

Existing Buildings Along Ferry Street

- 4.5.12.1 Taking into considerations the cost, the effectiveness, the visual and air quality impacts of the various direct mitigatory measures, it is recommended that the provision of two rows of 3 metre high noise barrier for the section of the corridor flyover between Dundas Street and Waterloo Road is the most desirable solution. The proposed extent of this barrier is shown on Figure 4.5.7 and 4.5.8. This barrier would be visible and would effectively eliminate the outlook from the five lower floors of the building blocks and hence is likely to receive adverse comment from the residents. It is recommended that the visual aspect of these barriers be carefully designed in the detailed design of the flyover.
- 4.5.12.12 In addition to the provision of noise barriers on the flyover, it is recommended that the following measures should also be implemented to reduce the road traffic noise
- (i) Use of porous friction course as the road surface of the corridor
 - (ii) Use of 1 metre high concrete profile barrier

New Development on the West Kowloon Reclamation

- 4.5.12.3 It is understood that it is not Highways Department policy to incorporate noise mitigatory measures on the highway structures to cater for possible future developments. However, as provision of noise mitigatory measures on the flyover, if required in the future, would be difficult to provide if appropriate provisions are not included in the flyover design, it is recommended that the flyover be designed to accommodate future 3m high noise barriers along the western side, the extent of which is shown in Figures 4.5.7 and 4.5.8. The timing for installation of this noise barrier should tie in with the proposed residential development programme.

4.5.12.4 For the at-grade section of the corridor from the Phase IIA flyover abutment to Dundas Street, it is considered that the provision of the noise barrier along the edge of the corridor can be incorporated as part of the features of the district open space immediately west of the corridor. It is recommended that the requirement of the provision of a 3 metre high noise barrier be included in the design of the district open space.

4.6 Visual and Landscape Impact

4.6.1 Introduction

4.6.1.1 An initial assessment on the visual and landscape impacts for various layout options has been undertaken and the details are contained in Working Paper No. 4 issued in November 1991.

4.6.1.2 The initial assessment considered only those elements of the proposed options which could be evaluated in a comparative study. Other elements of the proposed alignment which were common to all layout options and would therefore have identical results will be addressed in the following assessment of the endorsed option.

4.6.1.3 In the primary selection process options were selected based upon a numerical scoring system whereby Traffic was given a relative weighting of 55%, Environmental 30% and Landscape/Landuse 15%. The three highest scoring options were A1, A2 and B1. In the secondary selection process it was concluded that B1 did not fully comply with TPDM requirements and A2 had a preferable ground layout to A1. Therefore A2 was recommended as the optimum corridor alignment and was endorsed by the Project Steering Committee on 20th December 1991.

4.6.1.4 Due to the lower weighting of the Landscape/Landuse category (15%), landscape considerations did not significantly affect the selection process, and it should be noted that the recommended option, Option A2, received a low score in the Landscape/Landuse category and consequently has a more limited potential for reducing visual impact and increasing landscape planting opportunities.

4.6.1.5 However given the location of the Phase IIB alignment it was inevitable that all options would affect the surrounding landuses and existing landscape but to varying degrees. It is also important to note that in environmental terms Option A2 will have the lowest impact on air and noise.

4.6.1.6 Having identified the constraints and limited opportunities for incorporating planting as a landscape mitigation measure it becomes increasingly important to maximise planting opportunities where they do exist and to ensure new structures associated with the roads works will have a positive rather than negative effect on the surrounding urban landscape.

4.6.2 Site Evaluation and Urban Landscape Character

4.6.2.1 Site Evaluation

A summary of the site evaluation was included in Section 3.6.2.

4.6.2.2 Urban Landscape Character and Existing Vegetation

A survey and analysis of the existing conditions including the urban landscape character and vegetation were undertaken and the details are given in Appendix G.

4.6.3 Visual Quality and Visibility

A summary of visual quality and visibility for the road corridor was described in Section 3.6.3.

4.6.4 Project Characteristics

4.6.4.1 Phase IIB of the WKC involves the extension of the Gascoigne Road flyover over Waterloo Road to join Ferry Street at ground level. The elevated section of Phase IIB will connect with Phase 1 of the WKC (not included in this study).

4.6.4.2 The recommended alignment of Phase IIB involves demolishing the existing Gascoigne Road flyover up to the existing bridge pier at Kansu Street and will include four up and down ramps to allow for merging and diverging traffic to and from Yau Ma Tei and Jordan.

4.6.4.3 Table 4.6.1 describes the project characteristics associated with Phase IIB of the WKC for both the operational and construction phases.

Table 4.6.1 Project Characteristics for Phase IIB

OPERATIONAL PHASE - PHASE IIB	
PROJECT CHARACTERISTICS	PHASE IIB
Realignment of existing road	- Realignment of sections of Ferry Street
Road at grade	- At grade sections of Ramp A, B, C & D to link with Ferry Street
Elevated ramp	<ul style="list-style-type: none"> - Ramp A diverges from the elevated mainline in front of Waterloo Road and ramps down to meet southbound Ferry Street in line with Lee Tat Street - Ramp B (closest to buildings to the east) ramps up in front of Yau Ma Tei Catholic Primary School to meet the southbound elevated mainline adjacent to the new Housing Society development - Ramp C (closest to WKR) ramps up from Ferry Street directly west of Lee Tat Street to meet the northbound elevated mainline above Waterloo Road - Ramp D diverges from the elevated mainline directly east of Public Square Street to meet northbound Ferry Street in line with Yau Ma Tei Catholic Primary School
Elevated road	<ul style="list-style-type: none"> - Elevated section of mainline for WKC continues on from phase II A above Ferry Street and meets Gascoigne Road east of Canton Road - The southern section of the mainline crosses above an existing playground on Public Square Street
Walls	- Abutment and wing walls where Ramps A, B, C and D meet Ferry Street at grade
Noise barrier	
Loss of vegetation and areas of open space	- Playground on Public Square Street, trees removed from beneath the new flyover
Footbridge	- Footbridge across Ferry Street at Waterloo Road
CONSTRUCTION PHASE - PHASE IIB	
PROJECT CHARACTERISTICS	PHASE IIB
Demolition of	<ul style="list-style-type: none"> - Demolition of existing section of Gascoigne Road flyover up to pier C34 near the police station - Demolition of eastern staircase and ramp of existing pedestrian subway at Ching Ping Street - Demolition of temporary steel ramps. Two temporary steel ramps required to provide access to Gascoigne Road flyover
Temporary access road	
At grade road construction	- Realignment of sections of Ferry Street due to construction of new lanes leading to and from Ferry Street for Ramps A, B, C, D
Construction of elevated roads and footbridges	- Construction of new section of West Kowloon Corridor and elevated sections of Ramps A, B, C & D
Walls construction	- Abutment and wing walls where slip roads A, B, C and D ramp up and down from at grade Ferry Street
Noise barrier construction	
Works areas	- Ferry Street Rest Garden, proposed works area for Phase II B

4.6.5 Visual Impact Assessment

4.6.5.1 Visual Impact

4.6.5.1.1 Table 4.6.2 gives a summary of the visual impact associated with the proposed road for Phase IIB. The visual impact associated with Phase IIB of the WKC is generally low to moderate due to the existing poor visual quality of the area. However the effect of the elevated road and ramps would be higher for views from the reclamation if amenity strips were not included in WKR proposal.

4.6.5.1.2 The amenity strips separate areas of DOS from the road corridor and planting within these areas will screen views of the elevated road from the reclamation.

4.6.5.1.3 The elevated road will also affect the existing open views for lower level floors from buildings east of Ferry Street which currently enjoy open views over the PWCA and the harbour.

4.6.5.1.4 The visual impact of Phase IIB increases to high south of Public Square Street where the elevated WKC crosses above an existing playground and the corner of an adjacent site (currently a police station) which is planned to be redeveloped as a secondary school.

4.6.5.1.5 The elevated road will significantly intrude upon views from the playground and future secondary school and result in the loss of existing vegetation from the existing playground.

4.6.5.1.6 The construction phase impacts are likely to be similar to those described for the operational phase but more severe as the proposed planting will not yet be implemented and there will be additional visual impacts associated with the road construction equipment and works area.

4.6.5.1.7 Undesirable dark spaces will be created by the overhead structures. These spaces are sterilised and aesthetically unacceptable. They contribute very little but degrade the general urban character significantly.

4.6.5.1.8 Visual corridors of Waterloo Road, Dundas Street, Tung Kun Street and Public Square Street will be blocked by the elevated roads of the Phase IIB. However, it should be noted that this effect is lessened by the existing signboards which block the views from a distance.

4.6.5.1.9 Although there will not be a net loss in the number of local open space, in terms of area some LOS will be affected by the placement of structures within the open space. Nevertheless all LOS (including those in the hinterland) will be affected by the corridor in environmental terms, especially those directly facing the corridor. The following table summarises the effect due to the overhead structures on the areas of the open spaces which directly face the corridor.

<u>Open Space</u>	<u>Original Area</u>	<u>Area Lost Due to Overhead Structures</u>
Public Square Street Playground	620 m ²	188 m ²
Ferry Street Playground	960 m ²	nil

It is possible, however, that the overhead structures like these could be incorporated into the open space design as feature elements.

From a landscape point of view, the enjoyment in these Open Spaces will be reduced. Within the context of insufficient provision in the highly congested districts of Yau Ma Tei and Mong Kok, this effect constitutes a high impact. Therefore it is proposed that considering the adverse constraints, any affected LOS should be re-designed with a robust and high quality treatment.

4.6.5.10 In conclusion, the future West Kowloon Corridor will further reduce the visual quality of the area and create an adverse impact on visibility by obstructing views.

4.6.5.2 View from the Road

4.6.5.2.1 The view from the road for motorists travelling along the elevated section of Phase IIB will be open to the west overlooking areas of DOS on the reclamation. To the east views will generally be closed extending no further than adjacent building facades.

4.6.5.2.2 Long narrow views extending up each of the roads leading to the east would be possible but it is unlikely that these views would be significant from the road due to the anticipated speed most motorists will be travelling along the road.

Table 4.6.2 Visual Impact Assessment for Phase IIB

SENSITIVE RECEIVERS		ROAD WORKS	VISUAL IMPACT
Dundas Street - Pitt Street		<ul style="list-style-type: none"> Southbound and northbound elevated carriageways of WKC. Southbound carriageway approximately 20 metres away from building facades to the east and northbound carriageway, 80 metres way from boundary of Home Ownership Scheme Housing on WKR. 	<p>VISUAL IMPACT - LOW</p> <ul style="list-style-type: none"> Existing visual quality of the area low however the elevated WKC will obstruct views to the west towards the reclamation affectively existing residential buildings which currently enjoy open views across the PWCA and harbour. The elevated carrageway will also intrude into views from the reclamation to the east.
<p>EXISTING</p> <ul style="list-style-type: none"> Residential building with some commerical and industrial uses at ground level and an area of LOS between Block A and Block B of Shun Lee building. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and Home Ownership Scheme residential development. 		
Pitt Street - Waterloo Road		<ul style="list-style-type: none"> Major interchange at Waterloo road with links to Ferry Street, Waterloo Road, WKR and West Kowloon Expressway. Ramp C meets with the elevated mainline adjacent to the reclamation. 	<p>VISUAL IMPACT - LOW</p> <ul style="list-style-type: none"> Existing visual quality already degraded by proximity of busy ground level intersection, however the elevated road will block views across Ferry Street. The impact of the new elevated road will increase for buildings further away from the intersection.
<p>EXISTING</p> <ul style="list-style-type: none"> Residential with some industrial use at ground level. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip and Indoor Recreation Centre. 		
Waterloo Road - Tung Kun Street		<ul style="list-style-type: none"> Ramp B diverges from southbound Ferry Street and ramps up towards the elevated mainline. Ramp A diverges from elevated WKC and ramps down to merge with ground level slip road to Waterloo road Road D1. Abutment and wing walls associated with merging and diverging ramps. 	<p>VISUAL IMPACT - MODERATE</p> <ul style="list-style-type: none"> The existing visual quality of the area in low however the numerous slip roads ramping up and down at this section of the road corridor will obstruct existing open views toward the future reclamation.
<p>EXISTING</p> <ul style="list-style-type: none"> Existing market and road designated for redevelopment under the Yau Ma Tei ODP as a petrol station and area of LOS. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip and Indoor Recreation Centre. 		
Tung Kun Street - Public Square Street		<ul style="list-style-type: none"> Ramp B merges with elevated mainline in front of housing authority development, ramp approximately 25 metres from building facade and approximately 8 metres above ground level. Ramp D diverges from elevated mainline and ramps down towards ground level slip road. 	<p>VISUAL IMPACT - MODERATE</p> <ul style="list-style-type: none"> Elevated mainline and up and down ramps will obstruct existing views to the west. Views from high level floors of housing authority development should not be affected.
<p>EXISTING</p> <ul style="list-style-type: none"> Tenement housing with some commercial and industrial uses at ground level and new Housing Society development currently under construction with first stage completed. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Carpark and market with private residential behind. 		
Public Square Street - Intersection of Battery Street and Kansu Street		<ul style="list-style-type: none"> Southbound and northbound elevated mainline curves to the east to meet Gascoigne Road flyover passing above existing playground and south western corner of proposed secondary school boundary. 	<p>VISUAL IMPACT - MODERATE TO HIGH</p> <ul style="list-style-type: none"> The existing visual quality of the area is generally low however the elevated WKC will pass above an existing playground and the corner of an adjacent site which is to be redeveloped as a secondary school significantly affecting views from both sites.
<p>EXISTING</p> <ul style="list-style-type: none"> Playground and Yau Ma Tei police station to the north. Site of police station is to be redeveloped as a secondary school. Timber yard to the south, to be redeveloped as a secondary school. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Telephone exchange adjacent to Ferry Street with private residential development behind. 		

WKR = West Kowloon Reclamation

4.6.6 Advice on Structures and Treatment beneath Elevated Roads

4.6.6.1 Structural Forms and Finishes

General principles to consider during the design of structural forms and finishes were discussed in Section 3.6.6.

4.6.6.2 Treatment of Spaces beneath Elevated Roads and Flyovers

4.6.6.2.1 Elevated sections of Phase IIB are predominantly located above an existing road corridor however spaces landlocked by surrounding roads and unsuitable for noise and air sensitive uses will be created beneath the new structures.

4.6.6.2.2 Due to the harsh urban conditions created by the proximity of adjacent roads and overhead flyovers and ramps, planting in these areas is not likely to be successful and would not be recommended as an appropriate treatment.

4.6.6.2.3 Landscape hardworks solutions can be incorporated into landscape proposals for the area beneath elevated roads. However if a more efficient use of land can be found which is not air or noise sensitive then the land should be designated for such use.

4.6.6.2.4 Recommended landuses should comply with the list of 'Permitted Tolerated and Prohibited Uses of Land beneath Flyovers/Footbridges' endorsed by the LDPC on the 10th July 1987.

4.6.6.2.5 Landuses from this list which may be appropriate for areas beneath the elevated sections of Phase IIB include the following:-

- Government service or storage area for non flammable good
- Police, ambulance or fire station
- Permanent/temporary refuse collection point
- Office of voluntary agency or associations
- Carparking
- Motorcycle parking

For all of the landuses listed above further consideration would need to be given to vehicular and pedestrian access to ensure the safety of road users and pedestrians.

4.6.6.2.6 It may be possible to incorporate pedestrian subways into proposals for landlocked areas beneath elevated roads to facilitate pedestrian access across Ferry Street into these areas.

4.6.6.2.7 In areas where a suitable landuse cannot be found landscape hardworks will be recommended. Visual interest can be added to these areas by the imaginative use of lighting, cladding, coloured finishes on columns, perforated screens and decorative metal work structures.

4.6.6.3 Noise Mitigation Measures

- 4.6.6.3.1 The visual appearance of any noise mitigation measures should be carefully considered as a part of the total urban environment. For instance, placing noise barriers on the inside curve of an elevated road may involve increasing the width of the deck, thus making the entire corridor much more dominant and aggravating the sterilising influence of spaces at-grade.
- 4.6.6.3.2 In order to reduce the visual intrusion, the design of the noise barriers could incorporate features, patterns etc. which when viewed from any sensitive receivers appears as part of the urban streetscape.

4.6.7 Landscape Strategy

- 4.6.7.1 The landscape proposals for the Phase IIB section of the WKC will incorporate very little planting due to the limited amount of available space suitable for vegetation. Areas associated with the road scheme are generally below elevated flyovers and surrounded by existing roads at ground level. Planting in such locations is rarely successful due to the harsh conditions created by the proximity of busy roads and the lack of water and sunlight.
- 4.6.7.2 Recommendations for these areas will include possible landuses or landscape hardworks.

Proposals for Phase IIB are summarised below and illustrated on Drawing 24 in Volume 1 of the Report.

- **Roadside planting:** Roadside planting will be possible on the reclamation where an amenity strip has been proposed adjacent to the existing road corridor.

However the current proposals for the WKR do not allow for the WKC alignment which will run through areas designated as Amenity and District Open Space on the reclamation, substantially reducing the potential for roadside planting. This situation may be amended once proposals for the WKR incorporate the WKC alignment.

At present there is only limited space for street trees adjacent to the road to the east of Ferry Street. This includes a small area between Dundas Street and Waterloo Road, and adjacent to a new subway entrance west of Ferry Street. Future redevelopment proposals for the existing areas of Yau Ma Tei should allow for an approximate minimum set-back of 15-20 metres from the road edge to adjacent building facades to accommodate effective street tree planting.

Another planting opportunity is to include climbers on highway structures wherever possible, such as on the viaduct piers. This can provide a green and soft cover on a hard structure. Given the existing low landscape quality, any planting opportunities should be prioritised and safe-guarded against interference from works, such as utility installations.

- **Areas beneath elevated roads and ramps:** Proposals include landscape hardworks and a list of possible landuses which include the following:-

- Government service or storage area
- Police, ambulance or storage area
- Permanent/temporary refuse collection point
- Office of voluntary agency or charity
- Carparking
- Motorcycle parking

Visual interest could be added to storage or parking areas by the imaginative use of screen walls or other enclosures. Climbers tolerant of low light conditions could also be planted to partially cover the surface of both.

Vehicular and pedestrian access would need to be carefully considered to ensure safe access to and from the area.

- **Traffic islands at the junction of Ferry Street and Kansu Road:** Low shrub planting to accommodate sightlines is incorporated in the overall design.
- **Public Square Street Playground:** Reinstatement planting to replace trees lost due to construction of the elevated road is included.
- **Subway entrance:** Tile graphics on the subway wall can be incorporated.

4.7 Landuse Impact

4.7.1 Future Landuse

Future landuses adjacent to the road corridor include existing areas to be redeveloped to the east of the road and proposed areas to be developed on the West Kowloon Reclamation to the west of the road. The relevant Outline Development Plan for Yau Ma Tei and the Draft ODP for the West Kowloon Reclamation were examined and the landuses are summarised as follows:-

Yau Ma Tei ODP

- Future land use proposals adjacent to the Phase IIB section of the road corridor include a comprehensive development comprising commercial, hotel and residential developments in an area between Waterloo Road and Tung Kun Street that is currently occupied by a market. The redevelopment will be undertaken by the LDC.
- The area between Tung Kun Street and Public Square Street will be comprehensively redeveloped under an urban improvement scheme comprising a Housing Society estate incorporating areas of open space and G/IC facilities.
- The existing Yau Ma Tei Police station and timber yard opposite will both be redeveloped as a secondary schools.

West Kowloon Reclamation Draft ODP

- Proposed landuses on the West Kowloon Reclamation adjacent to Phase IIB of the road corridor include a Home Ownership Scheme residential area, indoor games and community centre and market north of Waterloo Road. The residential area is separated from the road corridor by a linear area of district open space and an amenity strip.
- South of Tung Kun Street proposed landuses include a residential development, indoor games and community centre, car-park, market and small amenity area immediately adjacent to the road.

The WKC alignment intrudes into the proposed area of amenity on the WKR between Waterloo Road and Public Square Street.

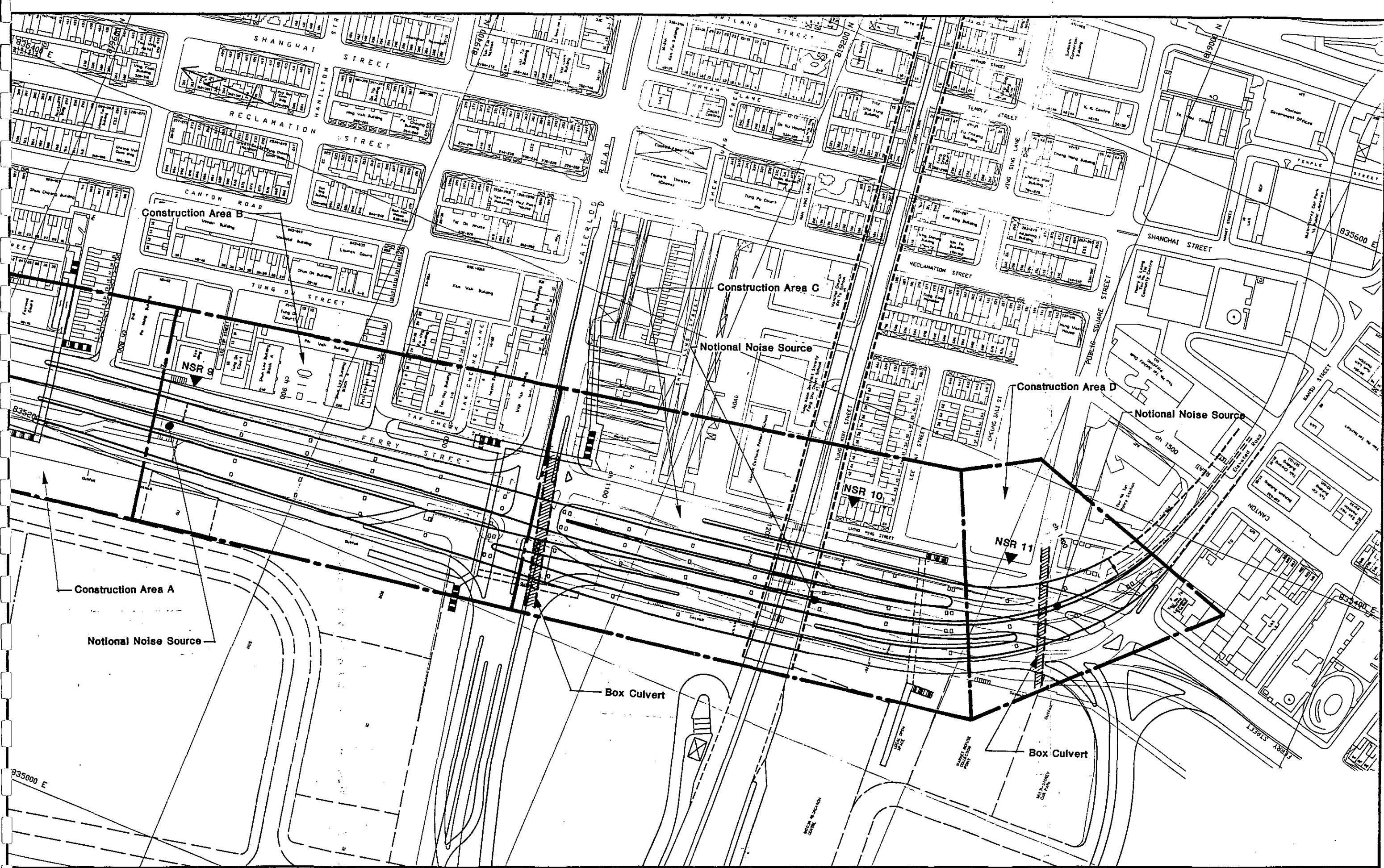
4.7.2 Landuse Impact

- 4.7.2.1 The impact of Phase IIB proposals for the WKC is expected to be predominantly low. For the most part the new road is elevated above an existing road corridor and does not significantly affect existing landuses. However the effect on future landuses particularly areas of DOS on the reclamation will be higher due to the loss of Amenity strips included in proposals for the WKR. This may change once WKR proposals take into account the alignment of the WKC.
- 4.7.2.2 South of Public Square Street the impact increases to high where the elevated WKC crosses above an existing playground and the corner of an adjacent site currently occupied by a police station (to be redeveloped as a secondary school). Existing trees will be removed from the playground and the proximity of the elevated road will reduce the amenity of both sites.
- 4.7.2.3 The elevated WKC and associated ramps will also increase the area of space below flyovers where suitable landuses will be limited and access restricted.
- 4.7.2.4 Table 4.7.1 describes the impact of the Phase IIB roadworks on existing and future landuses.

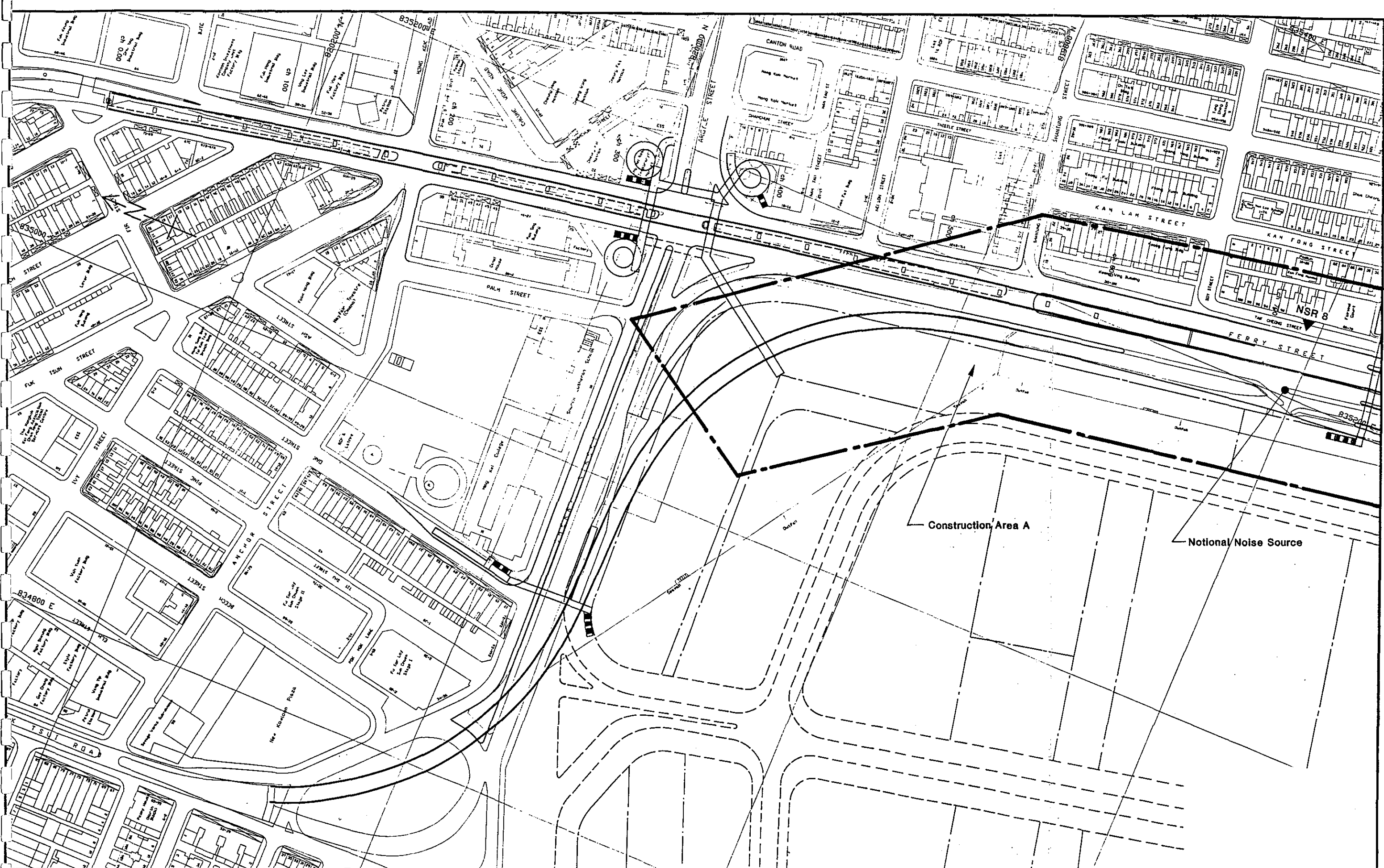
Table 4.7.1 Landuse Impact Assessment for Phase II B

SENSITIVE RECEIVERS		ROAD WORKS	LANDUSE IMPACT
Dundas Street - Pitt Street		<ul style="list-style-type: none"> Southbound and northbound elevated carriageways of WKC. Southbound carriageway approximately 20 metres away from building facades to the east and northbound carriageway, 80 metres way from boundary of Home Ownership Scheme Housing on WKR. 	<p>LANDUSE IMPACT - LOW</p> <ul style="list-style-type: none"> The elevated carriageway of phase II B does not physically affect adjacent landuses but is close to areas of DOS on the reclamation. The impact of the new elevated road will not be significantly higher than the impact of the existing roads below. The spaces created beneath the flyovers cannot successfully support vegetation and finding suitable uses for these areas will be difficult.
<p>EXISTING</p> <ul style="list-style-type: none"> Residential building with some commercial and industrial uses at ground level and an area of LOS between Block A and Block B of Shun Lee building. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and Home Ownership Scheme residential development. 		
Pitt Street - Waterloo Road		<ul style="list-style-type: none"> Major interchange at Waterloo road with links to Ferry Street, Waterloo Road, WKR and West Kowloon Expressway. Ramp C meets with the elevated mainline adjacent to the reclamation. 	<p>LANDUSE IMPACT - LOW AND HIGH</p> <ul style="list-style-type: none"> (Low) The elevated WKC creates areas below where the choice of suitable landuses will be limited but does not physically affect adjacent landuses. (High) The effect on future landuses particularly areas of DOS on the reclamation will be higher due to the loss of the Amenity strips included in proposals for the WKR. However if future landuse proposals are adopted to incorporate the WKC, the impact may be reduced.
<p>EXISTING</p> <ul style="list-style-type: none"> Residential with some industrial use at ground level. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip, DOS and Indoor Recreation Centre. 		
Waterloo Road - Tung Kun Street		<ul style="list-style-type: none"> Ramp B diverges from southbound Ferry Street and ramps up towards the elevated mainline. Ramp A diverges from elevated WKC and ramps down to merge with ground level slip road to Waterloo road Road D1. Abutment and wing walls associated with merging and diverging ramps. 	<p>LANDUSE IMPACT - MODERATE</p> <ul style="list-style-type: none"> The four ramps associated with Phase II B are located in this area increasing the area of space beneath flyovers where suitable landuses will be limited and access restricted. Ramp C also crosses an area of designated Amenity on the reclamation restricting planting.
<p>EXISTING</p> <ul style="list-style-type: none"> Existing market and road designated for redevelopment under the Yau Ma Tei ODP as a petrol station and area of LOS. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Amenity strip and Indoor Recreation Centre. 		
Tung Kun Street - Public Square Street		<ul style="list-style-type: none"> Ramp B merges with elevated mainline in front of housing authority development, ramp approximately 25 metres from building facade and rises up to 8 metres above ground level. Ramp D diverges from elevated mainline and ramps down towards ground level slip road. 	<p>LANDUSE IMPACT - MODERATE</p> <ul style="list-style-type: none"> Substantial areas of space beneath WKC and associated ramps where access is limited, planting not desirable and the choice of suitable landuses limited. Ramp C diverges from a ground level road through an area of designated Amenity on the reclamation restricting planting in the area.
<p>EXISTING</p> <ul style="list-style-type: none"> Tenement housing with some commercial and industrial uses at ground level and new Housing Society development currently under construction with first stage completed. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Carpark and market with private residential behind. 		
Public Square Street - Intersection of Battery Street and Kansu Street		<ul style="list-style-type: none"> Southbound and northbound elevated mainline curves to the east to meet Gascoigne Road flyover passing above existing playground and south western corner of proposed secondary school boundary. 	<p>LANDUSE IMPACT - HIGH</p> <ul style="list-style-type: none"> The elevated WKC crosses above an existing playground resulting in loss of vegetation and decrease in the quality of the area. The road also passes through the corner of the Yau Mau Tei police station site which is to be redeveloped as a secondary school.
<p>EXISTING</p> <ul style="list-style-type: none"> Playground and Yau Ma Tei police station to the north. Site of police station is to be redeveloped as a secondary school. Timber yard to the south, to be redeveloped as a secondary school. 	<p>WKR PROPOSALS</p> <ul style="list-style-type: none"> Telephone exchange adjacent to Ferry Street with private residential development behind. 		

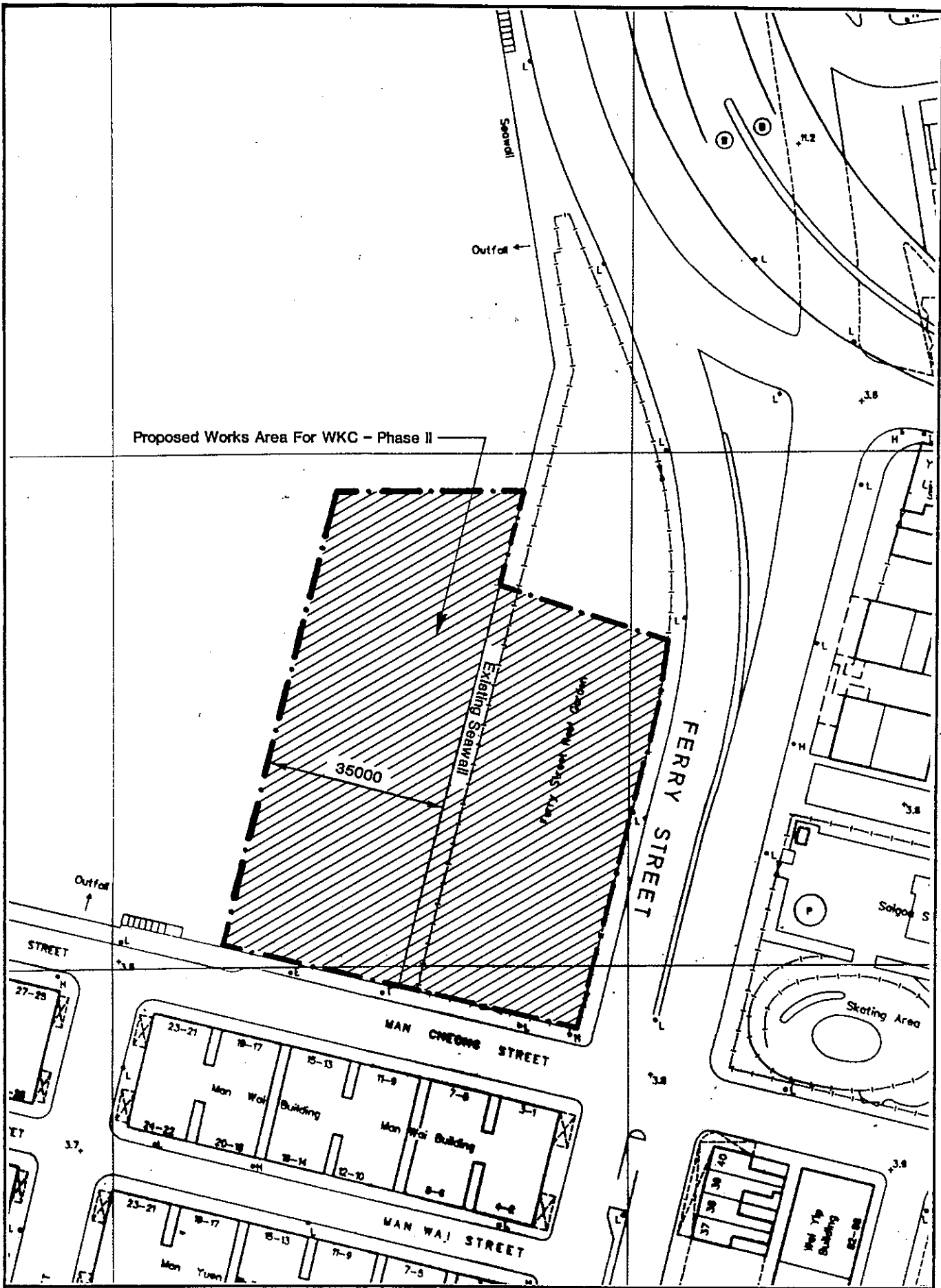
WKR = West Kowloon Reclamation



Location of Noise Sensitive Receivers and Construction Phase Notional Noise Source Points for Phase IIB

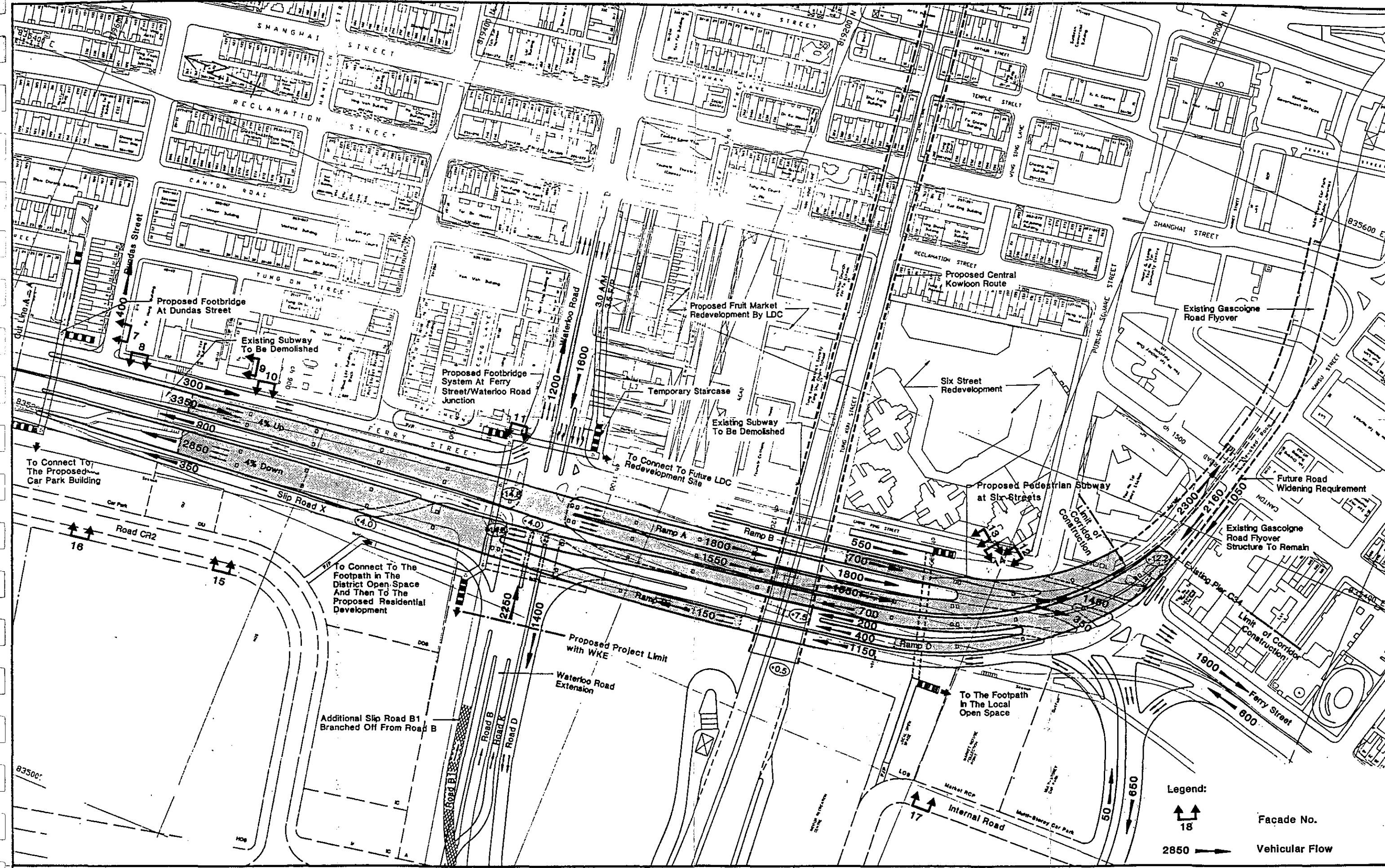


Location of Noise Sensitive Receivers and Construction Phase Notional Noise Source Points for Phase IIB

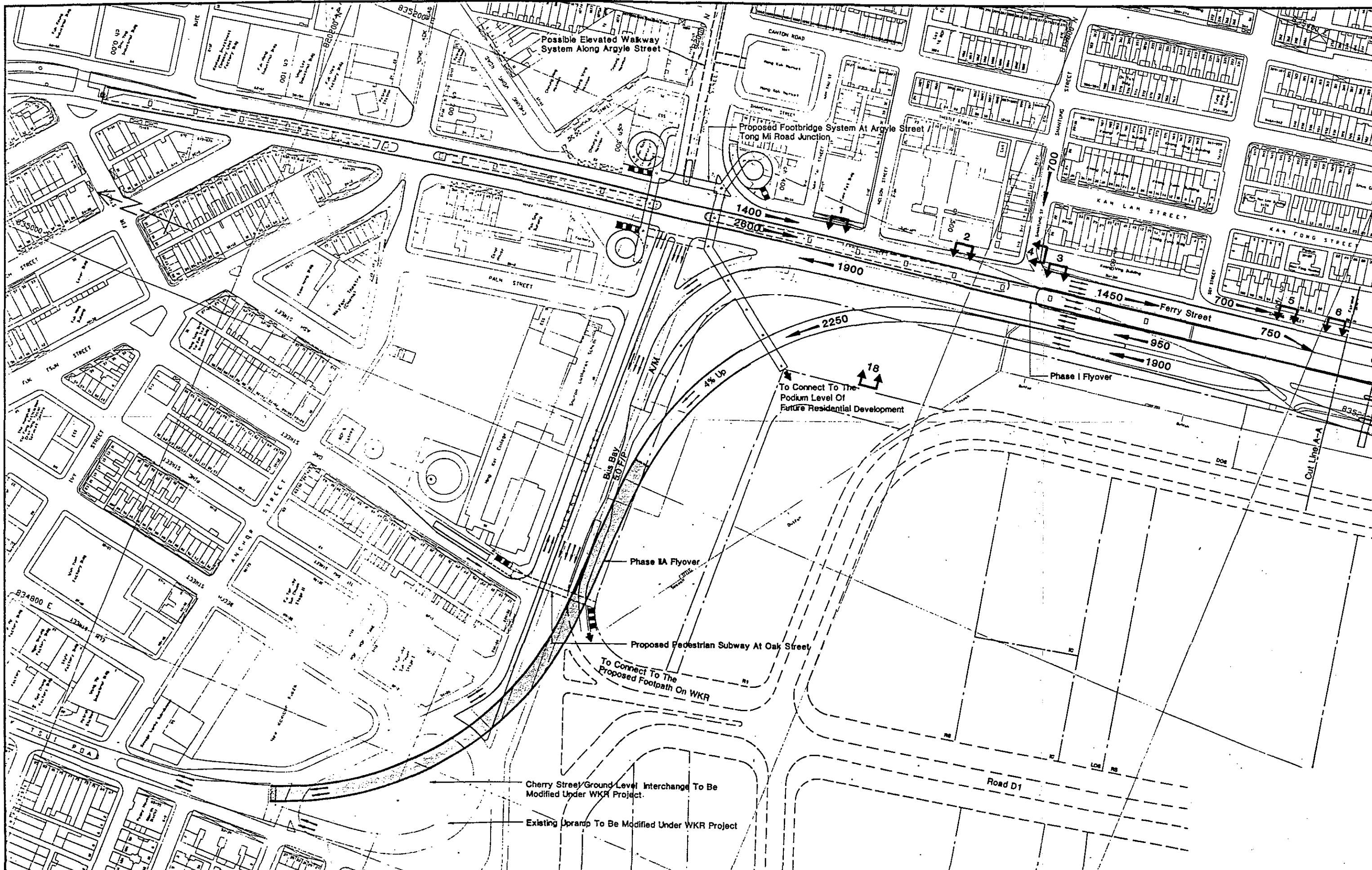


Proposed Works Area For WKC - Phase II

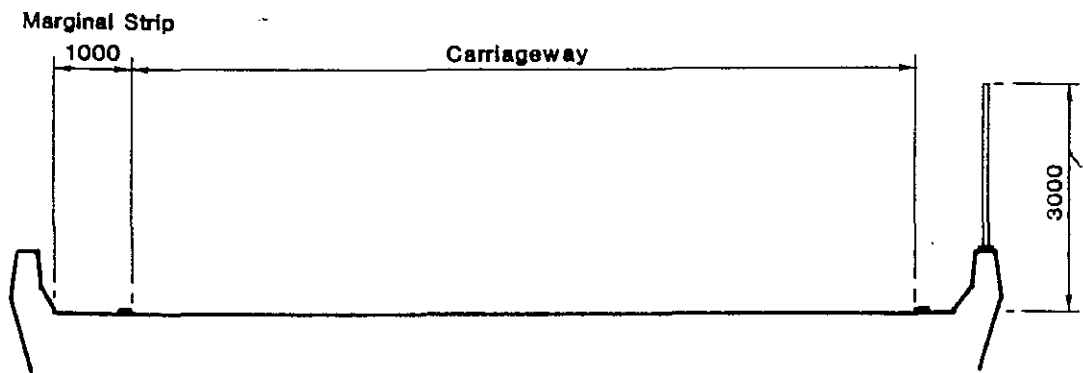
Figure 4.3.3



Location of Noise Sensitive Receivers for Road Traffic Noise for Phase IIB



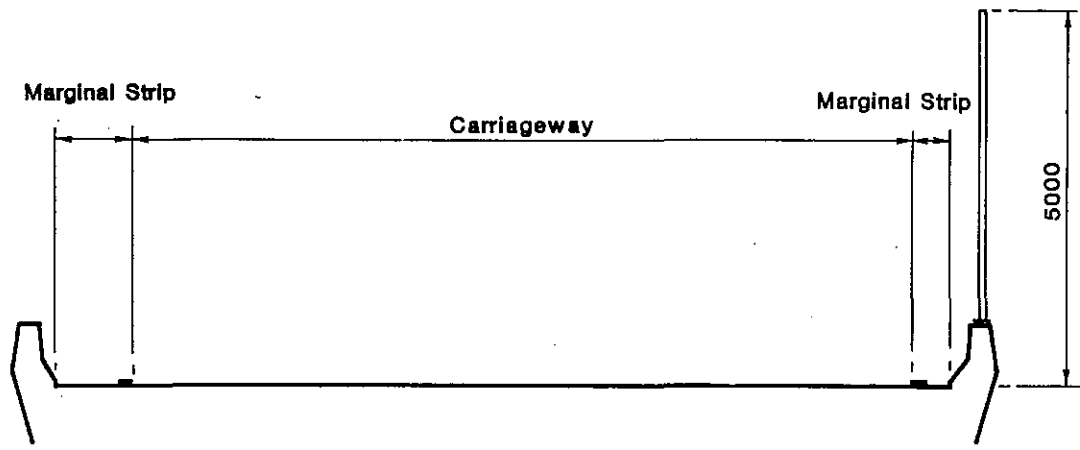
Location of Noise Sensitive Receivers for Road Traffic Noise for Phase IIB



3m High Noise Barrier

Possible 3m High Noise Barrier on Phase IIB Elevated Road

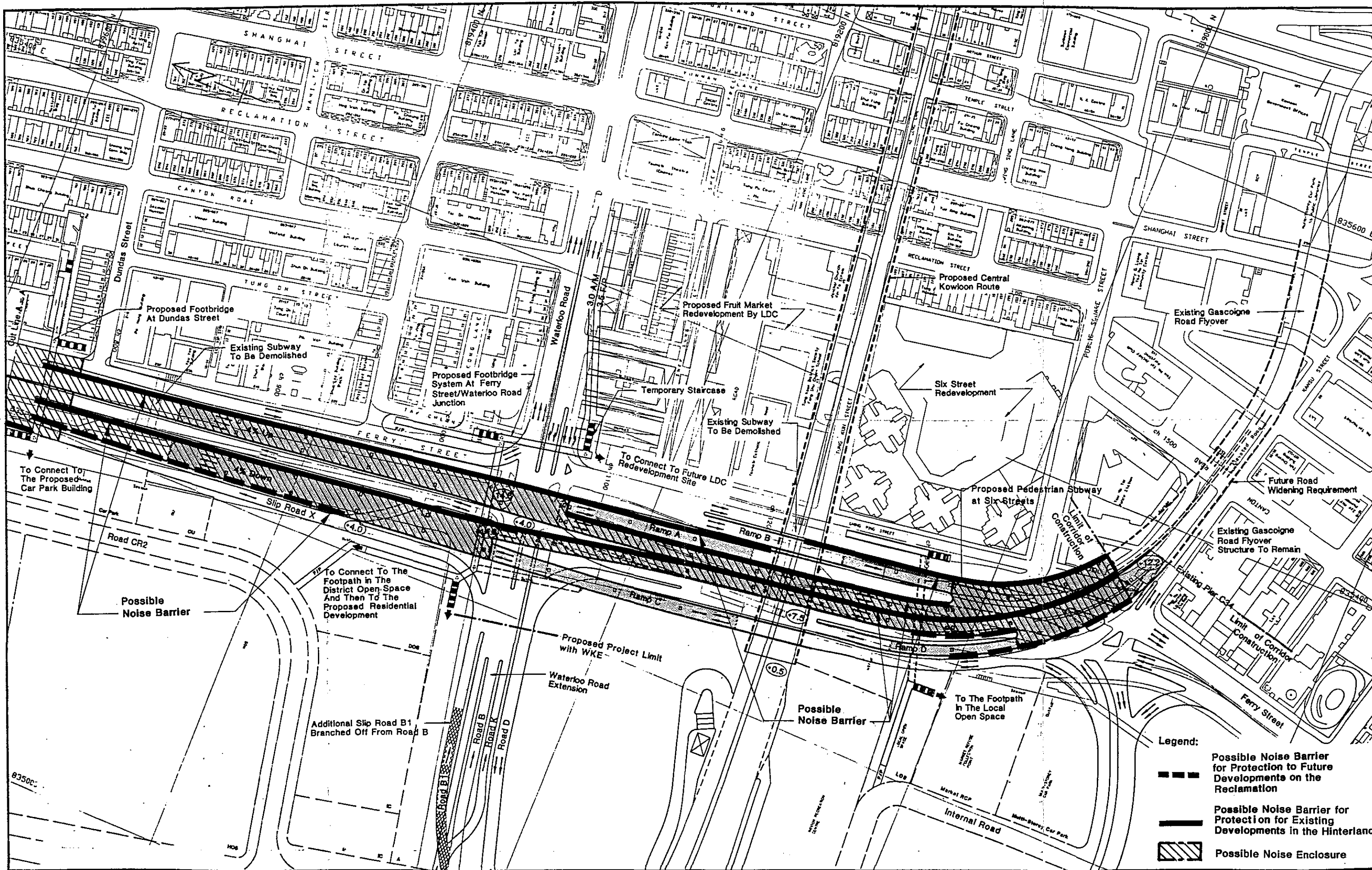
Figure 4.5.3



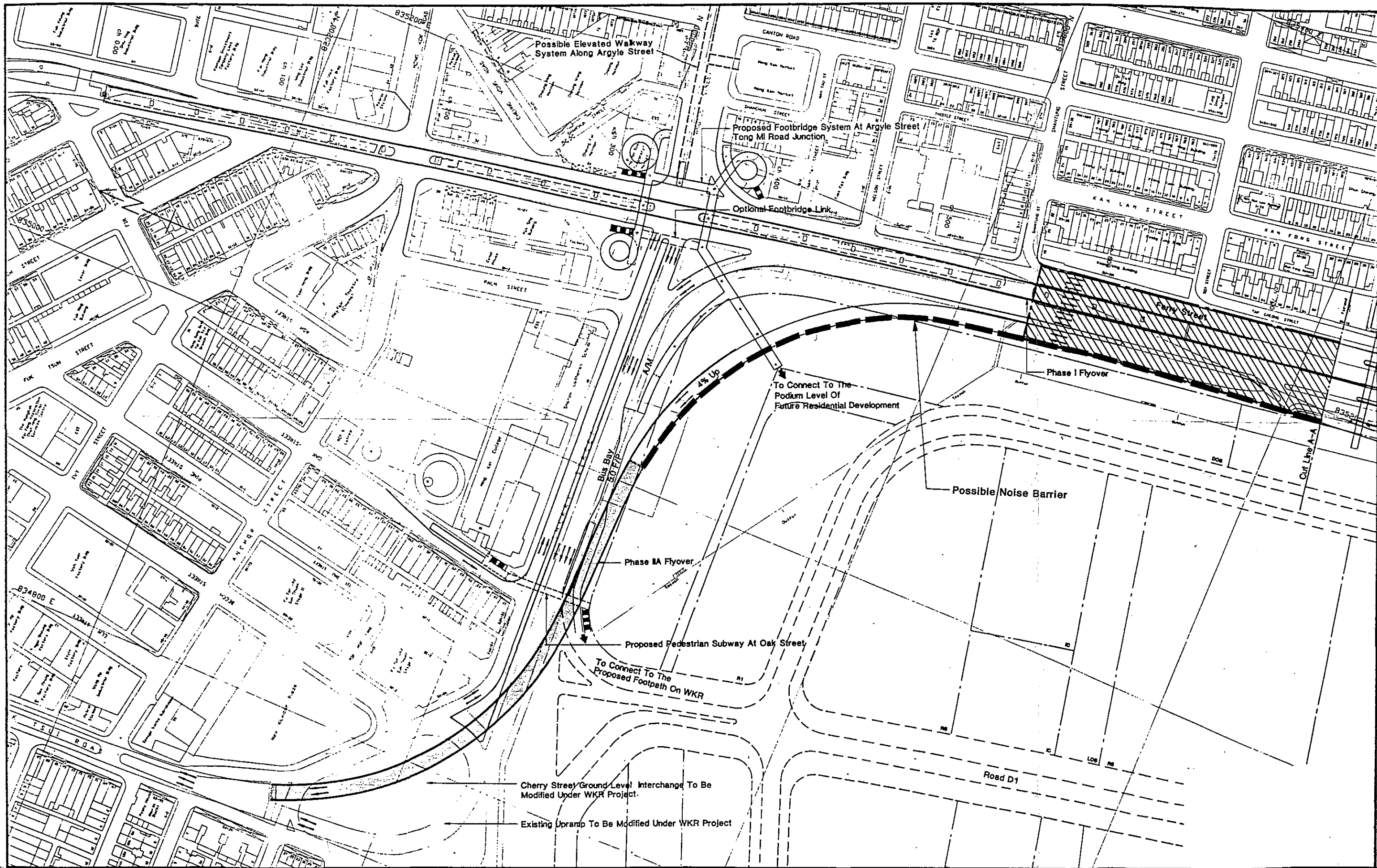
5m High Noise Barrier

Possible 5m High Noise Barrier on Phase IIB Elevated Road

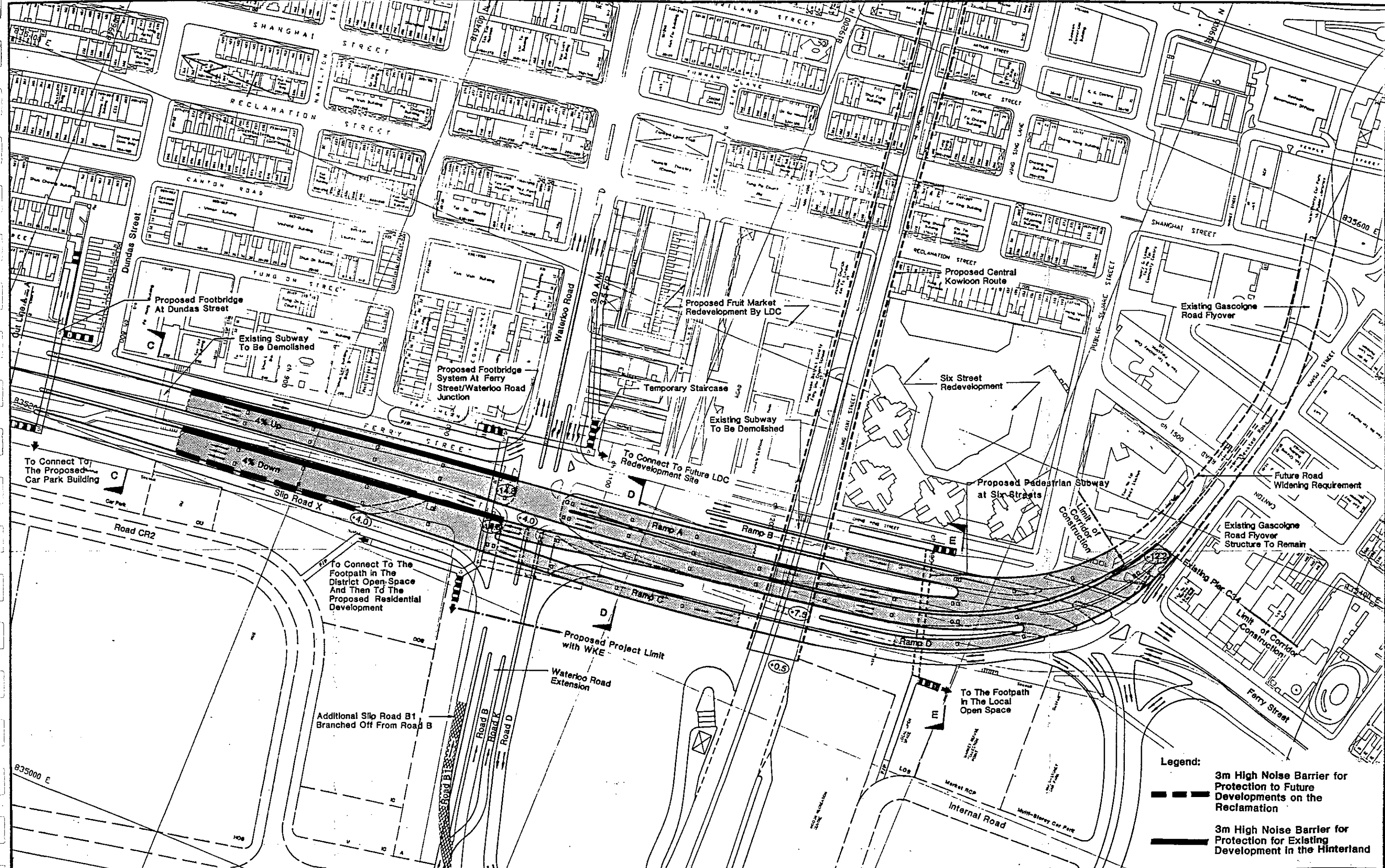
Figure 4.5.4



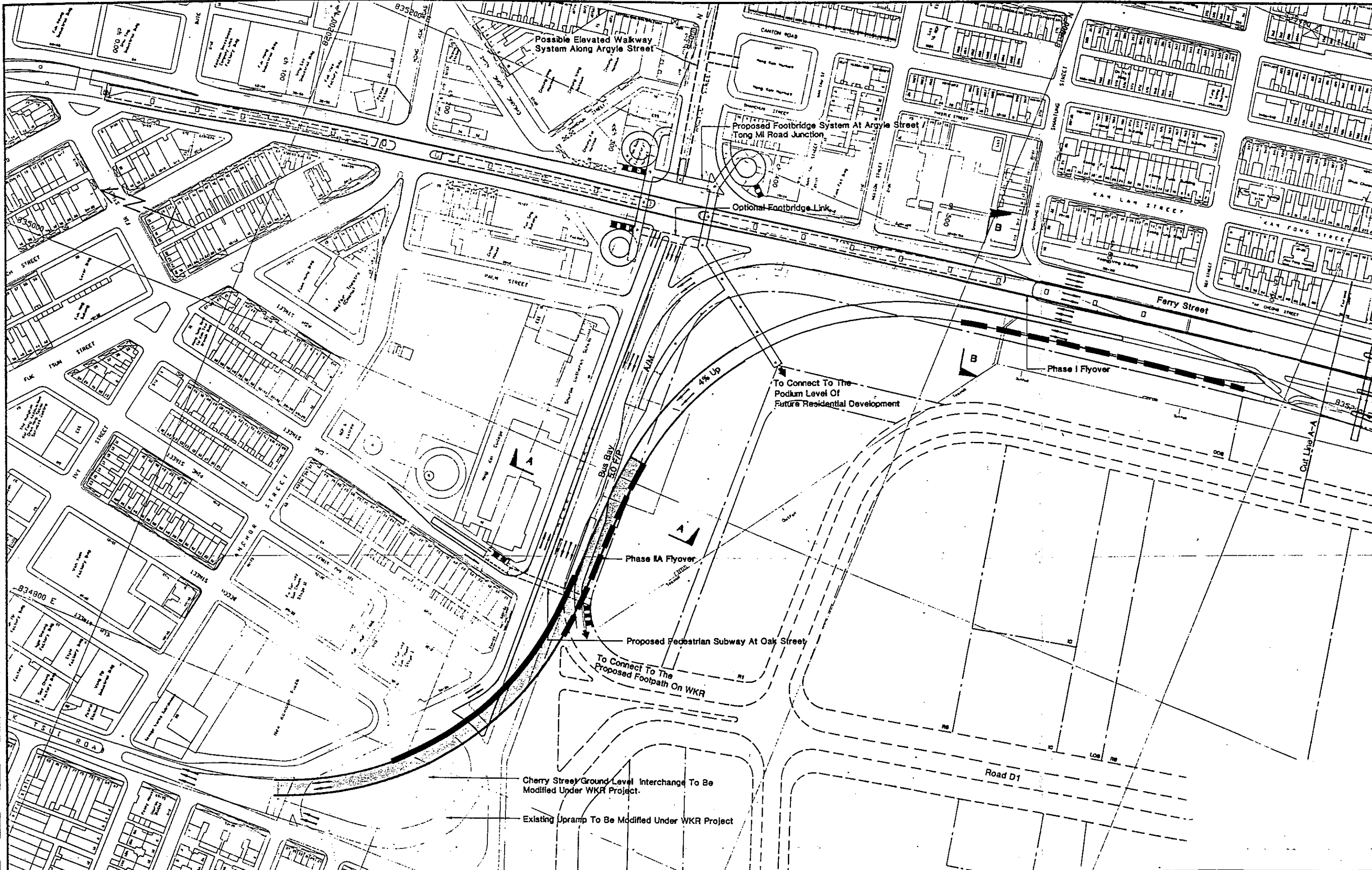
Possible Provision of Direct Mitigation Measures for Road Traffic Noise for Phase II B



Possible Provision of Direct Mitigation Measures for Road Traffic Noise for Phase II B



Provision of Direct Mitigation Measures for Road Traffic Noise for Phase II



Provision of Direct Mitigation Measures for Road Traffic Noise for Phase II

5. Conclusions

5.1 Construction Impacts

The construction of the Phase IIA and IIB flyovers will bring along nuisances to nearby properties in the form of elevated noise levels and slightly increased dust levels. The use of appropriate mitigation measures will reduce the extent of these impacts to a satisfactory level.

5.2 Noise Impact from Road Traffic

5.2.1 The road traffic noise associated with the road corridor is significantly in excess of the HKPSG and causes a significant impact on the existing buildings along Cherry Street and Ferry Street. In the Phase IIA, the planning guidelines cannot be met by the mitigatory measures on the flyover alone due to the prominent ground level noise source on Cherry Street. In the Phase IIB, the dominant noise source is the corridor flyover. While the provision of a noise enclosure on the flyover could be effective in reducing the noise levels to meet the guidelines, it is very expensive (about \$45 million for Phase IIA and \$500 million for Phase IIB) and causes a great visual impact. Further, the provision of noise enclosure will require 24 hour lighting and forced ventilation if the length is more than 150 metres. All of these will further increase its capital and running costs. The provision of the barrier would be visible and would effectively eliminate the outlook from the lower floors of the existing buildings and hence is likely to receive adverse comments from the residents. It is recommended that the visual aspects of this barrier should be carefully designed in the detailed design of the flyovers.

5.2.2 Taking into consideration the cost, the effectiveness, the air quality and the visual impacts of the various direct mitigatory measures, it is considered that the provision of a 3 metre high noise barrier is the desirable solution to give protection to the existing developments. The estimated costs of these provisions are \$16.4 million. The extent of the provision of the direct mitigatory measures is shown on Figures 4.5.7 and 4.5.8.

5.2.3 In addition to the provision of noise barriers on the flyover, it is recommended that the following measures should also be implemented to reduce the road traffic noise.

- (i) Use of porous friction course as the road surface of the corridor.
- (ii) Use of 1 metre high concrete profile barrier for the Phase IIB section.

5.2.4 The residential development on the reclamation is indicated on the Draft Outline Development Plan which has yet to be endorsed and as a result no details are available of the form that these proposed buildings will adopt. The effect of noise mitigatory measures can therefore only be indicative. It is concluded that the provision of a 3 metre high noise barrier is the most effective measure to give a protection to the development on the reclamation. The extent of this future provision of noise barriers is given in Figures 4.5.7 and 4.5.8. It is understood that it is not Highways Department policy to incorporate noise mitigatory measures in highway structures to cater for possible future developments. However as provision of noise measures on the flyover, if required in the future, would be difficult to provide if appropriate provisions are not included in the flyover design, it is recommended that the flyover be designed to accommodate future noise barriers. The timing for installation of this noise barrier should tie in with the proposed residential development programme.

5.2.5 For the at-grade section of the corridor from the Phase IIA flyover abutment to Dundas Street, it is recommended that the requirement of the provision of a 3 metre high noise barrier at the western edge of the corridor be included in the design of the district open space.

5.3 Air Quality Impact from Road Traffic

Serious air quality impacts from road traffic using the West Kowloon Corridor in the form of carbon monoxide, nitrogen dioxide and total suspended particulates are not expected. Predicted pollutant levels at sensitive receivers are below the Air Quality Objectives stipulated by the Air Pollution Control Ordinance.

5.4 Visual Impact

In assessing the visual impact of both Phase IIA and Phase IIB the existing poor visual quality of the area was taken into account. Generally it is expected that the elevated WKC and associated ramps will result in a low to moderate degree of visual intrusion except for the lower floors of the existing buildings whose view may be blocked by the elevated road.

The visual impact also increases for areas where sections of the WKC alignment cross through or are elevated above the areas designated as Amenity or DOS on the reclamation. However the impact may decrease once future proposals for the WKR take into account the alignment of the WKC.

5.5 Landuse Impact

The degree of the impact varies from low where the new road is elevated above the existing road corridor to high where it crosses through or above the areas designated as Amenity or DOS on the reclamation. The area of space below the elevated section of the WKC has only limited potential suitable uses.

5.6 Landscape Strategy

The opportunity to incorporate landscape mitigation measures is extremely limited; however where opportunities do exist, they have been maximised. The proposals associated with Phase IIA and IIB comprise predominantly advice on the treatment of spaces below the elevated structures, the roadside planting where possible and the conceptual designs for areas of LOS surrounding access ramps for a proposed footbridge.

Appendix A

Appendix A

1. Introduction

A background noise survey was conducted in Tai Kok Tsui and Yau Ma Tei. The results of this survey are presented here.

2. Existing Noise Environment

Yau Ma Tei and Tai Kok Tsui are typical well developed urban areas in Hong Kong. The noise environment in these areas is dominated by the traffic sources. Due to close proximity to Kai Tak International Airport, aircraft noise can be heard intermittently for most of the day. Apart from these, within the neighbourhood of schools, break times activities also represent a noise source.

3. Noise Survey

3.1 Measurement Locations

Four noise sensitive receivers (NSRs) were selected for this survey :

- (1) Top floor of 23-25 Tai Kok Tsui Road fronting Tai Kok Tsui Road;
- (2) the second floor of Ming Kei College facing Cherry Street;
- (3) top floor of 18 Shan Tung Street fronting Ferry Street;
- (4) first floor outside window at south end of Yau Ma Tei Catholic Primary School facing Ching Ping Street

Receiver (3) was selected in place of Shun King Building at 317 Ferry Street. Access was not available to the Shun King Building. Measurements recorded at Ming Kei College (receiver (2A)) were made at the south wing of the building, which is closer to Cherry Street. For comparison with the noise levels at classrooms further back from Cherry Street (receiver (2B)), two half-hourly measurements were taken at the corridor between 3:45 and 4:45 pm.

All measurements were made at the facade of the buildings. Figure A1 shows all the measurement locations.

3.2 Measurement Methodology

Ambient noise levels were measured at the four survey locations. Measurements were made using a Bruel & Kjaer Modular Precision Integrating Sound Level Meter (B&K 2231). It conforms with IEC 651:1979 and 804:1985 for Type 1 precision sound Level meters. Table 1 lists the equipment used. Standard acoustical principles and practices were followed in the measurements.

At all locations, hourly averages of L_{eq} , L_{10} , L_{30} , and L_{90} levels were measured between 0700 hours and 1900 hours. Table 1 lists all the equipment employed for this survey.

TABLE 1 List of Equipment Used for the Noise Survey

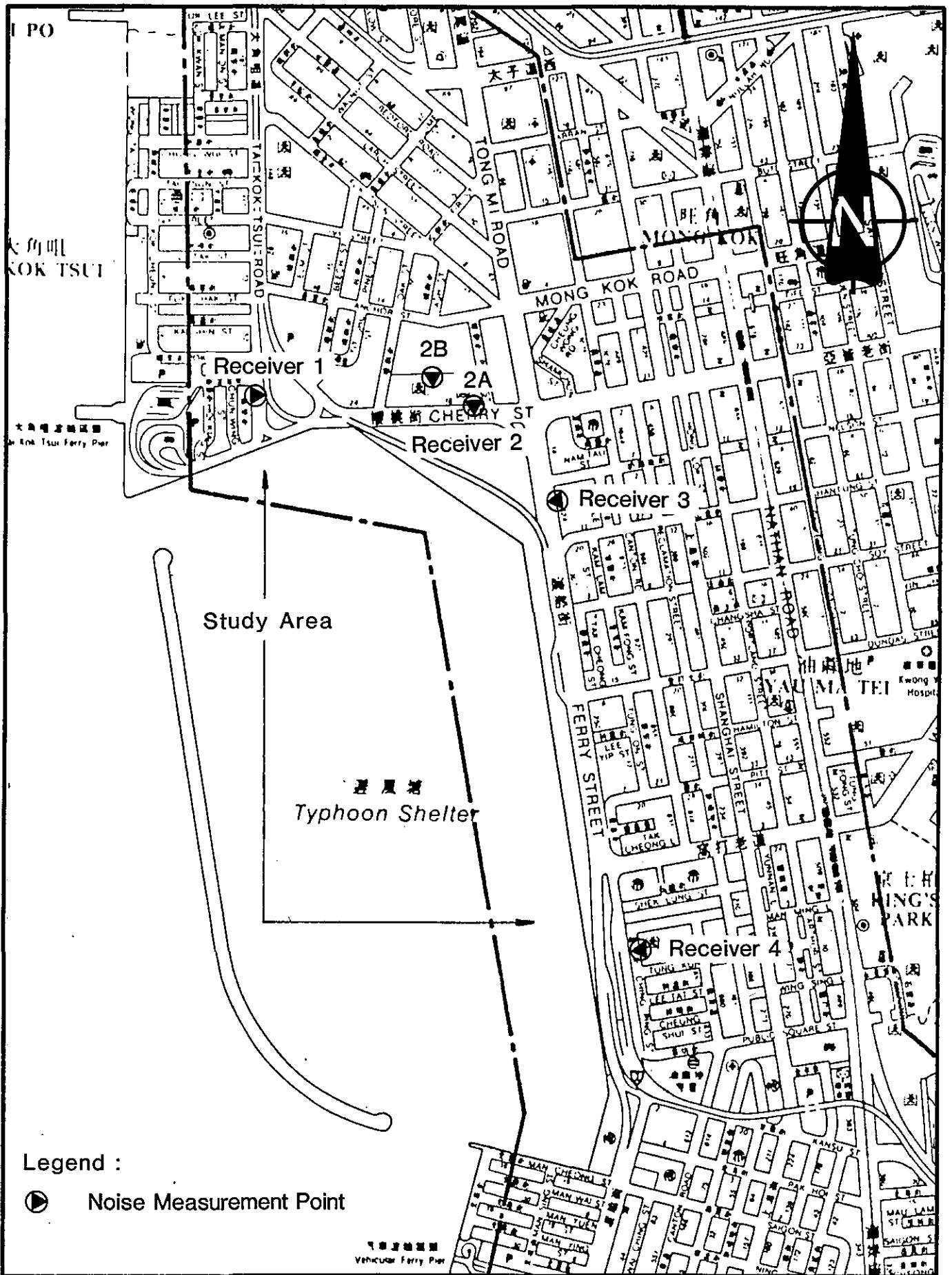
Sound Level Meter	B&K 2231 Rion NL-11
Acoustic Calibrator	E&K 4230
Condenser Microphone	B&K 4155 Rion UC-26
Preamplifier	B&K 2639 Rion NH-01
Windscreen	B&K UA0237 Rion WS-02

4. Results of Noise Survey

The results of this survey are presented in the attached figures. From the results it can be seen that the highest noise levels occur around 8 a.m. and 5 p.m. which correspond to the rush hours. A comparison of the measurements made at receiver (2) are given below in Table 2.

TABLE 2 Comparison of Measurements made at Ming Kei College between 3:45 to 4:45 p.m.

Time (p.m.)	<u>Classrooms</u> <u>(Receiver (2B))</u>		<u>South Wing</u> <u>(Receiver (2A))</u>	
	3:45-4:45	4:16-4:45	3:45-4:15	4:16-4:45
L10 dB(A)	79.5	77.5	82.6	82.5
L50 dB(A)	76.0	74.5	80.0	79.8
L90 dB(A)	73.0	72.0	78.7	78.5
L_{eq} dB(A)	77.0	75.3	74.6	74.9



Location of Noise Measurement Points Along Road Corridor

Figure A1

NL at 23-25 Tai Kok Tsui Road

(24-10-91)

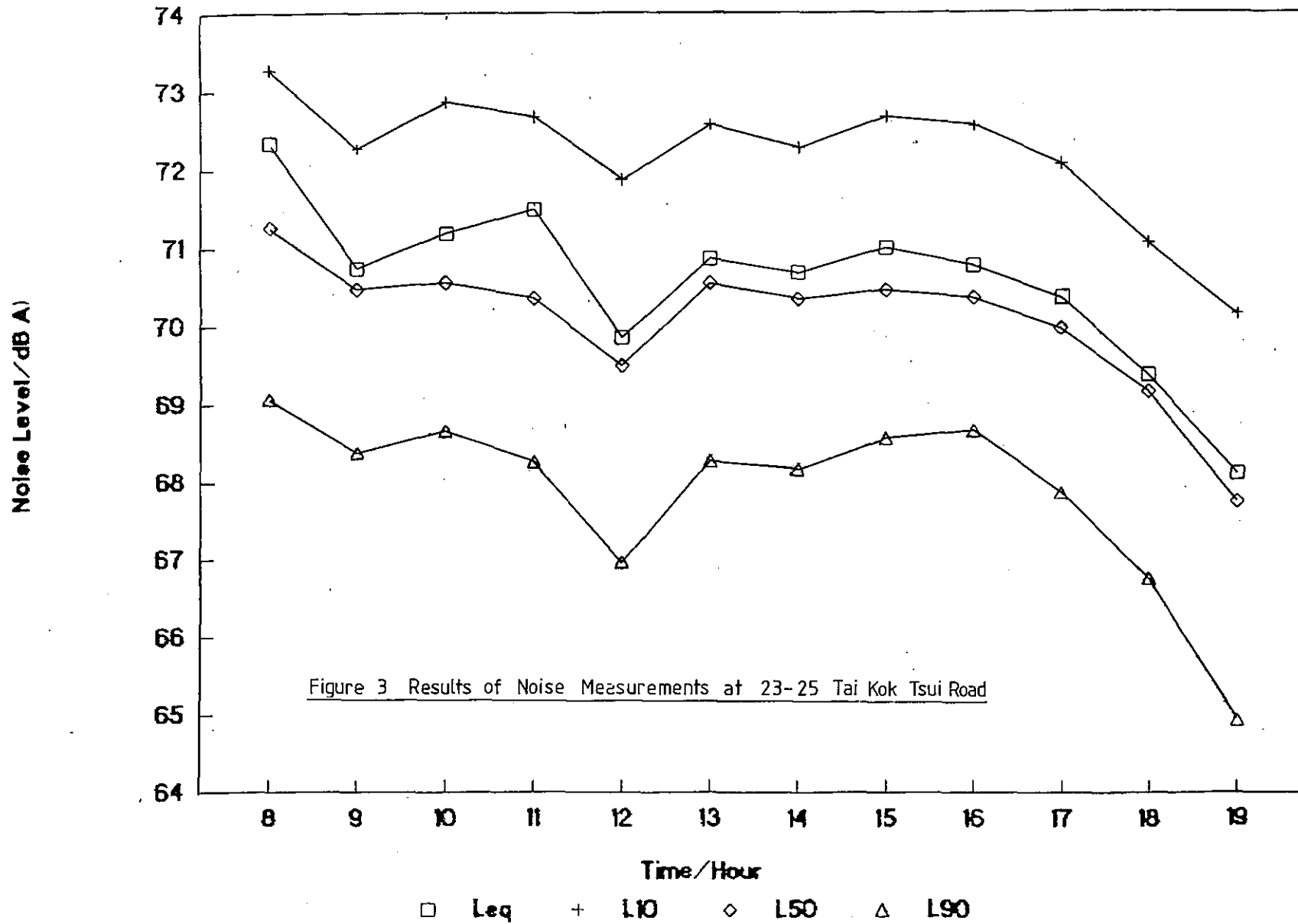
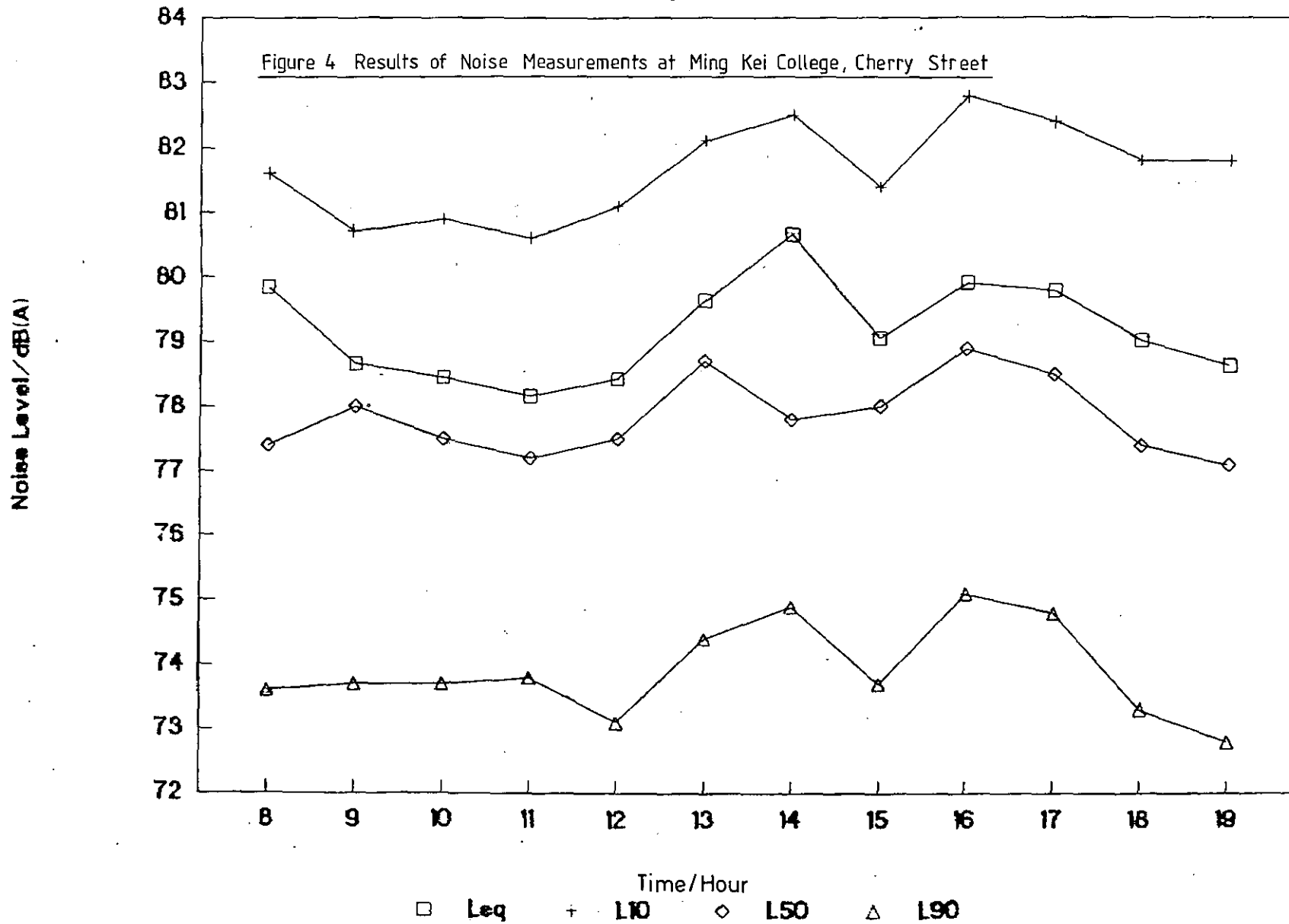


Figure 3 Results of Noise Measurements at 23-25 Tai Kok Tsui Road

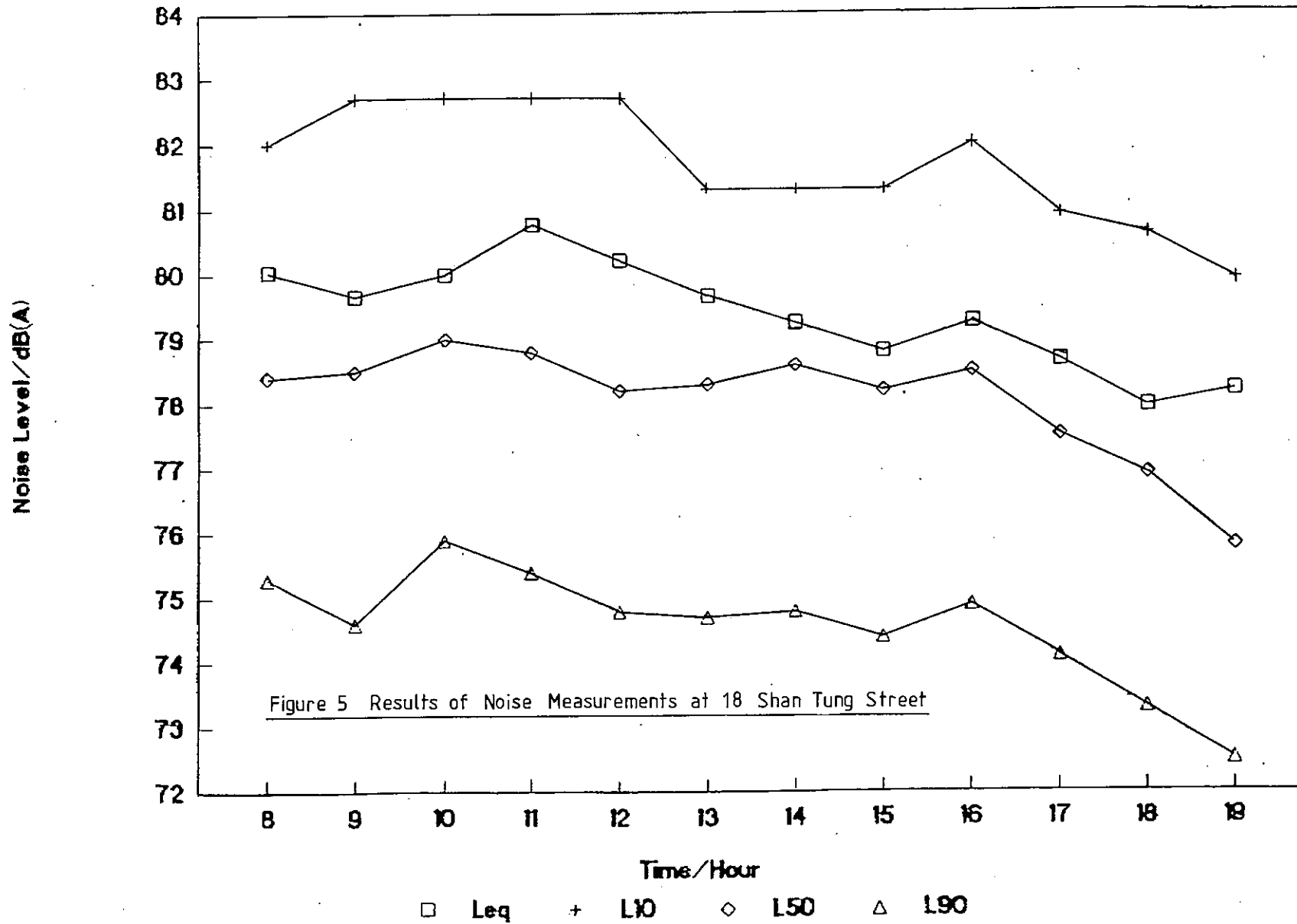
NL at Ming Kei College, Cherry St.

123-10-911



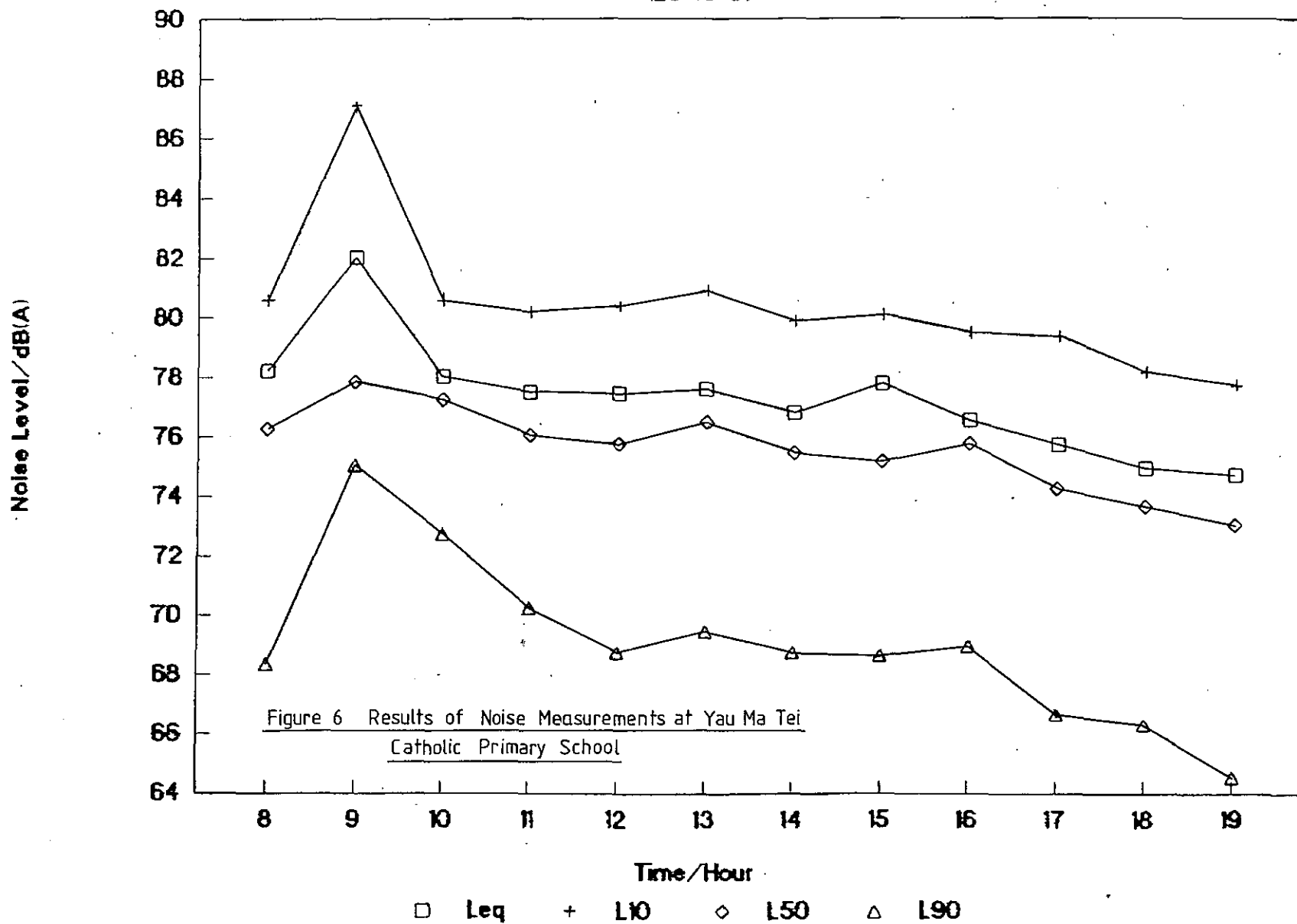
NL at 18 Shan Tung St.

(24-10-91)

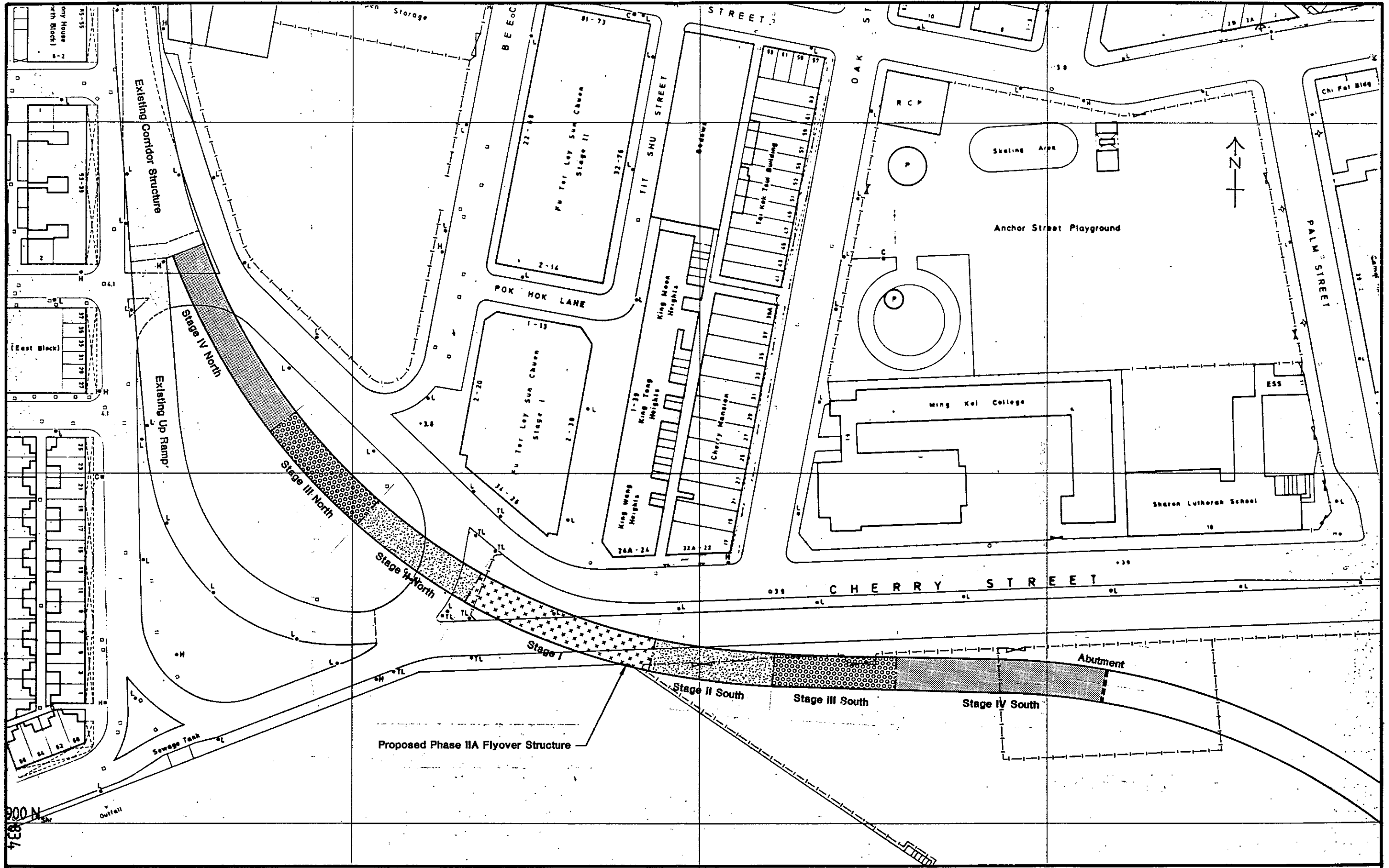


NL at Yau Ma Tei Catholic Pri. School

(23-10-91)

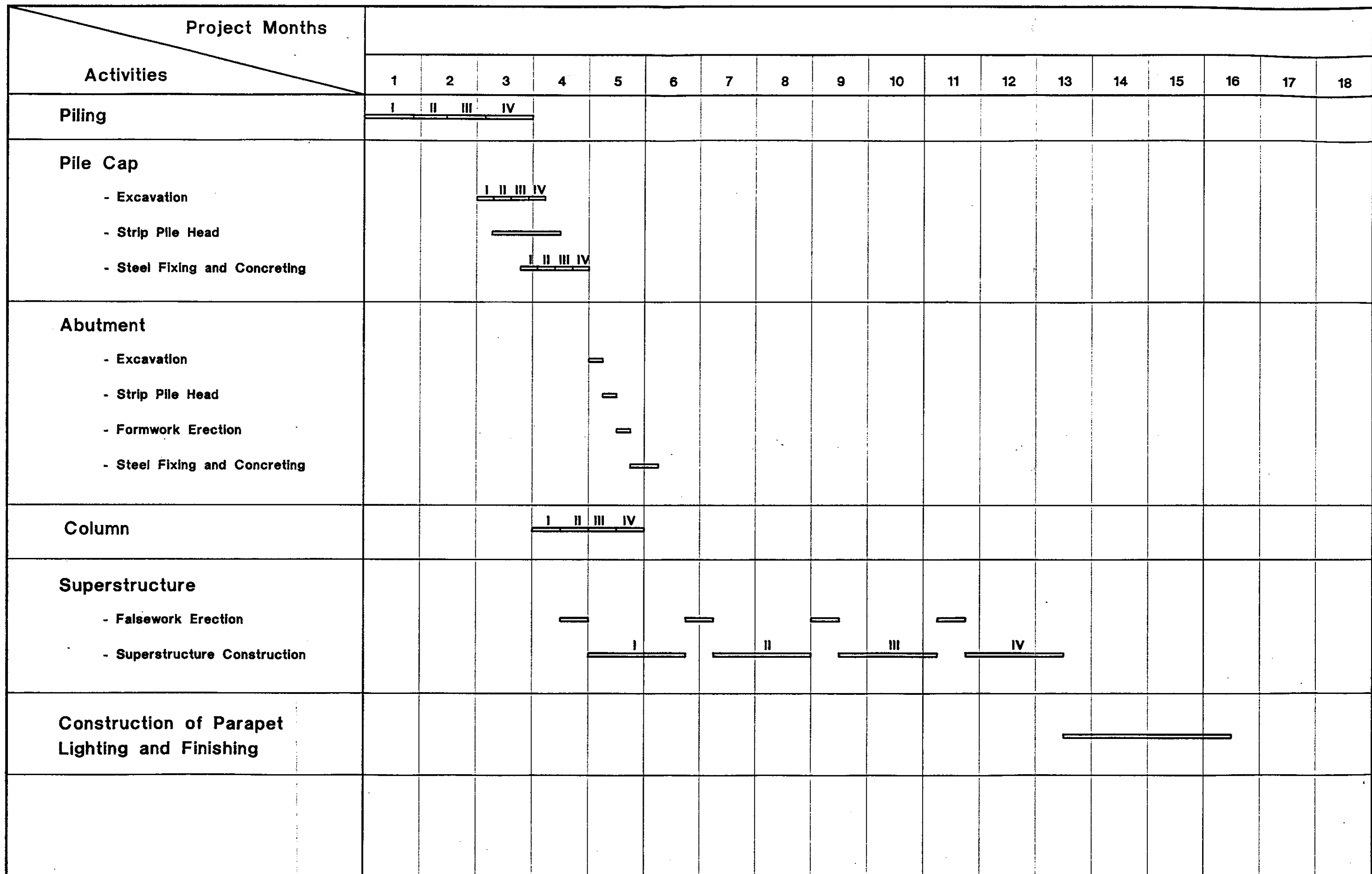


Appendix B



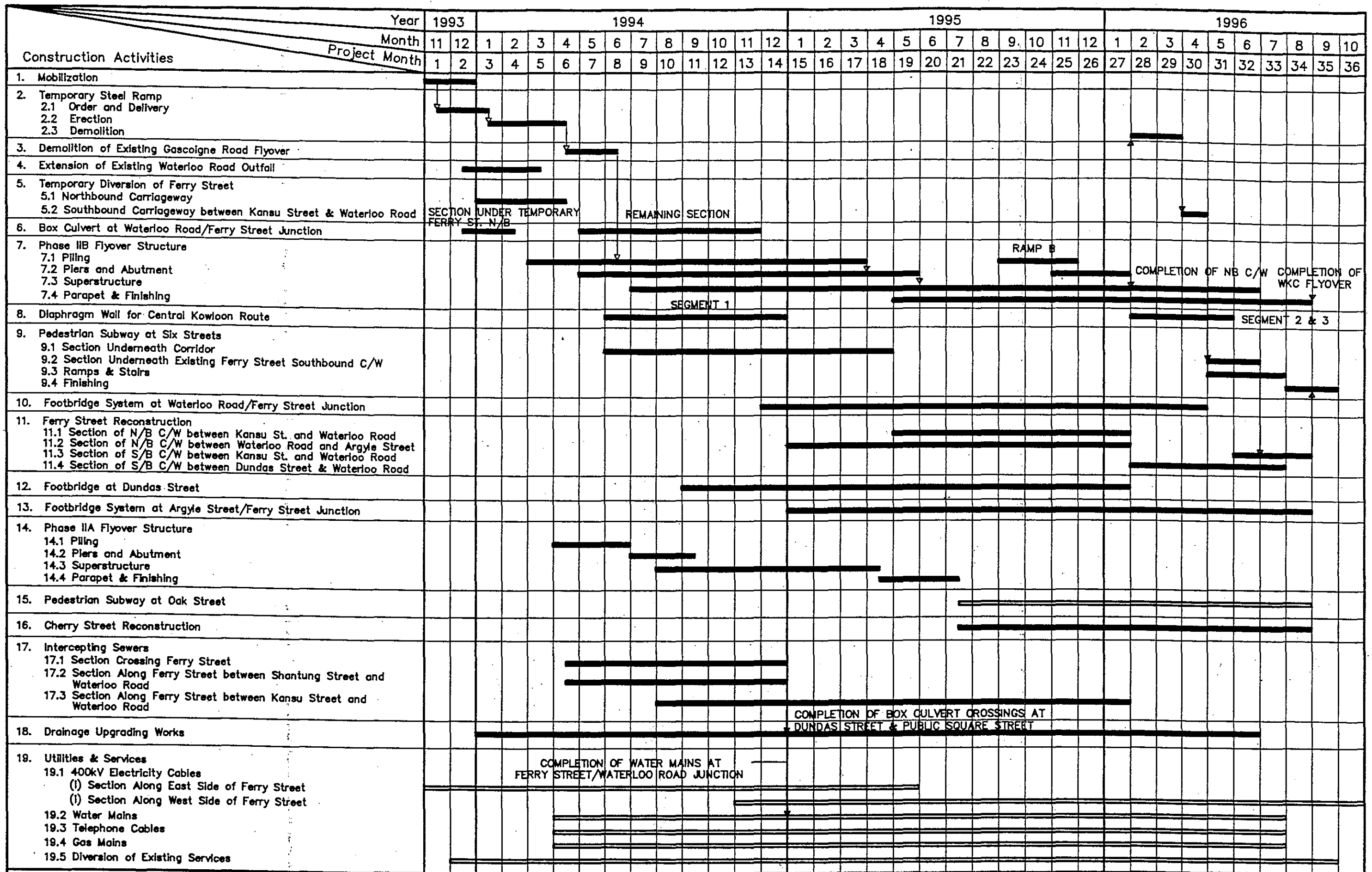
Proposed Construction Sequence for Phase IIA

Figure B1



Envisaged Construction Scheduling of the Corridor Structure for Phase IIA

Figure B2



Legend :

- Work to be Undertaken by WKC-Phase II Contractor
- Work to be Undertaken by Others

Envisaged Construction Programme for WKC - Phase II

Figure 11.5

EQUIPMENT SCHEDULE PHASE IIA - STAGE I

EQUIPMENT	MONTHS																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DRILLING RIG	222																
CRAWLER CRANE	222		11	11	1111	111											
CONCRETE TRUCK MIXERS	111		11	11	1111	111											
SPOIL LORRIES	333		33		3												
TRACKED EXCAVATORS			22		2												
PNEUMATIC DRILLS			33		3												
VIBRATORS			22	11	4444	444											
CONCRETE PUMP				11	2222	222											
PAVER													11	1			
ROLLER													11	1			

EQUIPMENT SCHEDULE PHASE IIA - STAGE II

EQUIPMENT	MONTHS																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DRILLING RIG	2	2 2															
CRAWLER CRANE	2	2 2	1 1	1 1													
CONCRETE TRUCK MIXERS	1	1 1	1 1	1 1			1 1 1	1 1 1 1									
SPOIL LORRIES	3	3 3	3 3		3		7 7 7	7 7 7 7									
TRACKED EXCAVATORS			2 2		2												
PNEUMATIC DRILLS			3 3		3												
VIBRATORS			2 2	1 1			4 4 4	4 4 4 4									
CONCRETE PUMP				1 1			2 2 2	2 2 2 2									
PAVER														1 1 1			
ROLLER														1 1 1			

NOTE:

AS CONSTRUCTION OF STAGE II IS FURTHER DEVIDED INTO TWO SECTIONS - NORTH AND SOUTH. ABOVE EQUIPMENT IS CONSIDERED TO BE DEVIDED BETWEEN THE TWO WORK AREAS. WHERE AN ODD NUMBER OF PLANT HAS BEEN PREDICTED FOR A PARTICULAR MONTH i.e. 3 DUMP TRUCKS, 2 NO. HAVE BEEN ASSUMED TO BE OPERATING AT EACH WORKSITE. WHEN ONE ITEM IS PREDICTED, THEN THIS IS DEEMED TO BE OPERATING AT BOTH THE NORTH AND SOUTH SITES.

EQUIPMENT SCHEDULE PHASE IIa - STAGE III

EQUIPMENT	MONTHS																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DRILLING RIG		2 2	2														
CRAWLER CRANE		2 2	2	1	1												
CONCRETE TRUCK MIXERS		1 1	1	1	1				1 1	1 1 1 1	1						
SPOIL LORRIES		3 3	3	3	3				7 7	7 7 7 7	7						
TRACKED EXCAVATORS				2	2												
PNEUMATIC DRILLS				3	3												
VIBRATORS				2	2				4 4	4 4 4 4	4						
CONCRETE PUMP									2 2	2 2 2 2	2						
PAVER																	1 1 1
ROLLER																	1 1 1

NOTE:

AS CONSTRUCTION OF STAGE III IS FURTHER DEVIDED INTO TWO SECTIONS - NORTH AND SOUTH. ABOVE EQUIPMENT IS CONSIDERED TO BE DEVIDED BETWEEN THE TWO WORK AREAS. WHERE AN ODD NUMBER OF PLANT HAS BEEN PREDICTED FOR A PARTICULAR MONTH i.e. 3 DUMP TRUCKS, 2 NO. HAVE BEEN ASSUMED TO BE OPERATING AT EACH WORKSITE. WHEN ONE ITEM IS PREDICTED, THEN THIS IS DEEMED TO BE OPERATING AT BOTH THE NORTH AND SOUTH SITES.

EQUIPMENT SCHEDULE PHASE IIA - STAGE IV

EQUIPMENT	MONTHS																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DRILLING RIG			2 2 2														
CRAWLER CRANE			2 2 2	1 1	1 1												
CONCRETE TRUCK MIXERS			1 1 1	1 1	1 1						1	1 1 1 1	1 1				
SPOIL LORRIES			3 3 3	3 3	3						7	7 7 7 7	7 7				
TRACKED EXCAVATORS				2 2	2												
PNEUMATIC DRILLS				3 3	3												
VIBRATORS				2 2	1 1						4	4 4 4 4	4 4				
CONCRETE PUMP					1 1						2	2 2 2 2	2 2				
PAVER																1	1 1
ROLLER																1	1 1

NOTE:

AS CONSTRUCTION OF STAGE IV IS FURTHER DEVIDED INTO TWO SECTIONS - NORTH AND SOUTH. ABOVE EQUIPMENT IS CONSIDERED TO BE DEVIDED BETWEEN THE TWO WORK AREAS. WHERE AN ODD NUMBER OF PLANT HAS BEEN PREDICTED FOR A PARTICULAR MONTH i.e. 3 DUMP TRUCKS, 2 NO. HAVE BEEN ASSUMED TO BE OPERATING AT EACH WORKSITE. WHEN ONE ITEM IS PREDICTED, THEN THIS IS DEEMED TO BE OPERATING AT BOTH THE NORTH AND SOUTH SITES.

Appendix D

Basic Noise Levels From Each Stage (dB(A) 30 mins L_{eq})

Week Number	
Site	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
1	119.5 119.5 119.5 0 0 0 0 0 0 123.6 123.6 0 0 115.4 115.4 0 0 121.2 122.3 117.2 117.2 117.2 117.2 117.2 0 0
2N	0 0 0 117.5 117.5 117.5 0 0 0 121.9 121.9 0 0 115.4 115.4 0 116.8 119 0 0 0 0 0 0 0 0
2S	0 0 0 117.5 117.5 117.5 0 0 0 121.9 121.9 0 0 115.4 115.4 0 116.8 119 0 0 0 0 0 0 0 0
3N	0 0 0 0 0 0 118.7 117.5 117.5 0 0 121.9 121.9 0 0 0 116.8 119 115.4 115.4 0 0 0 0 0
3S	0 0 0 0 0 0 118.7 117.5 117.5 0 0 121.9 121.9 0 0 0 116.8 119 115.4 115.4 0 0 0 0 0
4N	0 0 0 0 0 0 0 0 0 117.5 117.5 117.5 121.9 121.9 0 0 116.8 119 115.4 115.4 0 0 0 0 0
4S	0 0 0 0 0 0 0 0 0 117.5 117.5 117.5 121.9 121.9 0 0 116.8 119 115.4 115.4 0 0 0 0 0
	26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
1	0 0
2N	117.9 117.9 117.9 117.9 117.9 117.9 117.9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2S	117.9 117.9 117.9 117.9 117.9 117.9 117.9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
3N	0 0 0 0 0 0 0 0 0 119.3 119.3 119.3 119.3 119.3 119.3 119.3 0 0 0 0 0 0 0 0 0
3S	0 0 0 0 0 0 0 0 0 119.3 119.3 119.3 119.3 119.3 119.3 119.3 0 0 0 0 0 0 0 0 0
4N	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 119.3 119.3 119.3 119.3 119.3 119.3 119.3
4S	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 119.3 119.3 119.3 119.3 119.3 119.3 119.3
	51 52 53 54 55 56 57 58 59 60 61 62
1	109 109 109 0 0 0 0 0 0 0 0 0
2N	0 0 0 109 109 109 0 0 0 0 0 0
2S	0 0 0 109 109 109 0 0 0 0 0 0
3N	0 0 0 0 0 0 109 109 109 0 0 0
3S	0 0 0 0 0 0 109 109 109 0 0 0
4N	0 0 0 0 0 0 0 0 0 0 109 109 109
4S	0 0 0 0 0 0 0 0 0 0 109 109 109

Appendix E

Noise Levels at NSR 1 with Mitigation Measures Adopted

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
85.87	85.87	85.87	81.50	81.50	81.50	78.71	77.51	87.61	88.71	83.46	79.83	83.51	83.26	78.50	0	88.38	83.92	83.00	83.00	82.17	82.17	82.17	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
81.40	81.40	81.40	81.40	81.40	81.40	81.40	0	0	79.01	79.01	79.01	79.01	79.01	79.01	79.01	0	0	72.56	72.56	72.56	72.56	72.56	72.56	72.56
51	52	53	54	55	56	57	58	59	60	61	62													
75.37	75.37	75.37	73.00	73.00	73.00	69.01	69.01	69.01	62.56	62.56	62.56													

Noise Levels at NSR 2 with Mitigation Measures Adopted

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
81.24	81.24	81.24	84.28	84.28	84.28	80.63	79.43	84.27	87.78	86.23	81.87	83.17	83.26	81.28	0	86.97	81.09	80.52	80.52	77.54	77.54	77.54	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
84.18	84.18	84.18	84.18	84.18	84.18	84.18	0	0	80.93	80.93	80.93	80.93	80.93	80.93	80.93	0	0	75.31	75.31	75.31	75.31	75.31	75.31	75.31
51	52	53	54	55	56	57	58	59	60	61	62													
70.74	70.74	70.74	75.78	75.78	75.78	70.93	70.93	70.93	65.31	65.31	65.31													

Noise Levels at NSR 3 with Mitigation Measures Adopted

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
81.24	81.24	81.24	80.90	80.90	80.90	78.58	77.38	83.69	85.81	83.04	80.01	81.80	81.21	77.90	0	85.35	80.11	79.72	79.72	77.54	77.54	77.54	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
80.80	80.80	80.80	80.80	80.80	80.80	80.80	0	0	78.88	78.88	78.88	78.88	78.88	78.88	78.88	0	0	74.35	74.35	74.35	74.35	74.35	74.35	74.35
51	52	53	54	55	56	57	58	59	60	61	62													
70.74	70.74	70.74	72.40	72.40	72.40	68.88	68.88	68.88	64.35	64.35	64.35													

Noise Levels at NSR 4 with Mitigation Measures Adopted

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0	0	0	82.39	82.39	82.39	82.57	81.37	81.37	84.64	84.64	83.75	84.04	81.39	79.39	0	84.68	76.88	79.34	79.34	0	0	0	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
82.29	82.29	82.29	82.29	82.29	82.29	82.29	0	0	82.87	82.87	82.87	82.87	82.87	82.87	82.87	0	0	76.85	76.85	76.85	76.85	76.85	76.85	76.85
51	52	53	54	55	56	57	58	59	60	61	62													
0	0	0	73.89	73.89	73.89	72.87	72.87	72.87	66.85	66.85	66.85													

Noise Levels at NSR 5 with Mitigation Measures Adopted

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0	0	0	81.13	81.13	81.13	79.37	78.17	78.17	83.32	83.32	80.80	81.18	79.95	78.13	0	82.69	74.89	76.48	76.48	0	0	0	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
81.03	81.03	81.03	81.03	81.03	81.03	81.03	0	0	79.67	79.67	79.67	79.67	79.67	79.67	79.67	0	0	75.11	75.11	75.11	75.11	75.11	75.11	75.11
51	52	53	54	55	56	57	58	59	60	61	62													
0	0	0	72.63	72.63	72.63	69.67	69.67	69.67	65.11	65.11	65.11													

Noise Levels at NSR 6 with Mitigation Measures Adopted

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
70.52	70.52	70.52	71.36	71.36	71.36	75.53	74.33	76.26	81.19	80.66	81.34	82.69	81.83	68.36	0	81.18	74.09	78.23	78.23	66.82	66.82	66.82	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
71.26	71.26	71.26	71.26	71.26	71.26	71.26	0	0	75.83	75.83	75.83	75.83	75.83	75.83	75.83	0	0	81.33	81.33	81.33	81.33	81.33	81.33	81.33
51	52	53	54	55	56	57	58	59	60	61	62													
60.02	60.02	60.02	62.86	62.86	62.86	65.83	65.83	65.83	71.33	71.33	71.33													

Noise Levels at NSR 7 with Mitigation Measures Adopted

Week No																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0	0	0	0	0	0	0	0	0	0	74.65	74.65	74.65	76.35	76.35	0	0	73.95	66.15	71.65	71.65	0	0	0	0
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76.15	76.15	76.15	76.15	76.15	76.15
51	52	53	54	55	56	57	58	59	60	61	62													
0	0	0	0	0	0	0	0	0	0	66.15	66.15	66.15												

F. Construction Equipment Requirement

F.1 Equipment Requirement within Construction Area A

F.1.1 Breaking out of existing surface

Plant	Number
Mounted Pneumatic Breaker	1
Wheel Loader	1
Lorry	2

F.1.2 Laying of new road surface

Plant	Number
Paver	1
Power Rammer	1
Vibratory Roller	1
Lorry	2

F.2 Equipment Requirements within Construction Area B

Plant	Number
Hand Held Pneumatic Breaker	1
Ready Mix Concrete Truck	1
Concrete Pump	1
Crane	1
Lorry	1
Excavator	1
Large Diameter Bore Pile (grab and chisel)	1

F.3 Equipment Requirements within Construction Area C

Plant	Number
Hand Held Pneumatic Breaker	1
Ready Mix Concrete Truck	2
Concrete Pump	1
Crane	2
Lorry	2
Excavator	2
Bentonite Filtering Plant	1
Hydraulic Extractor	1
Large Diameter Bore Pile (Grab and chisel)	1

F.4 Equipment Requirements within Construction Area D

Plant	Number
Hand Held Pneumatic Breaker	1
Ready Mix Concrete Truck	1
Concrete Pump	1
Mobile Crane	2
Excavator	2
Large Diameter Bore Pile (Grab and chisel)	1
Lorry	2

SURVEY AND ANALYSIS OF EXISTING CONDITIONS

Urban Landscape Character

This section considers the urban character along the West Kowloon Corridor alignment. The urban character is the synthesis of the architectural form, land use, street activities, open space, vegetation and massing. A site investigation was carried out in addition to a desk study of aerial photographs, base plans and other relevant information available.

The north-south stretch of the area in question extends more than a kilometre, and the mixed light industrial, commercial and residential activities establish much of the overall urban character. Light industry, such as iron-mongery and air-conditioning repair shops, and retail outlets, such as fish mongers, give a bustling character to the street level. The heavy traffic on Ferry Street and the dense buildings (almost half are more than 25 storeys high and the remainder are about 20-30 years old and 6 storeys high) dictate the character of the built-up environment. The older mixed use buildings display an uncontrolled and non-uniform façade and express an aged and unclean appearance.

The road corridor consists of a continuous building façade to the east and is open to the west. The western side of Ferry Street has no buildings. Although the PCWA is usually full of barges and cargo boats and screen planting is present in one section, views to the sea are possible across Ferry Street and the PCWA, especially from the upper floors. The absence of buildings on the west side of the road corridor results in an overall open character for Ferry Street.

In conclusion, the amount of traffic and street-level industrial and commercial activities have yielded a busy character which is nevertheless counter-balanced by the openness towards the waterfront.

Referring to Figure G1, the following summarises the character based on the various attributes for each of the alignment section:

SECTION 1: Cherry Street : Tai Kok Tsui Road to Oak Street

This section is mainly occupied by 16-storey buildings with commercial uses at street level and residential on other floors. Two planted spaces are found in this area: at the slip road at the junction of Tai Kok Tsui Road/Cherry Street and the pedestrianised segment of Tit Shu Street.

SECTION 2: Cherry Street : Oak Street to Tong Mi Road

Institutional buildings (schools) and open space (playgrounds) dominate this section. All these have some planting at their perimeter. The open space, medium height institutional buildings (5-storey) and the organised game facilities give this area a relatively open but formal character. This is one of the three subzones which are distinctly different from other mixed commercial/light industrial/ residential/zones.

SECTION 3: Tong Mi Road/Ferry Street : Mong Kok Road to Shantung Street

This section is characterised by 25-26 storeys buildings of mixed residential and commercial uses. These buildings exhibit a bland monotonous style. At street level there are mostly butcheries and fish mongers, usually onto the pavement. On the corner of Argyle Street and Tong Mi Road is a temporary market. Opposite across Argyle Street is a sitting out area with some planting.

SECTION 4 : Ferry Street : Shantung Street to Waterloo Road

In terms of character, this area is similar to Section 3 but the buildings are lower, usually 7 to 11 storeys. The buildings are quite bland but older with metal balconies.

Again, mixed use is prevalent. However, this time the mix is between light industrial at street level and residential on the upper floors. There are two local open spaces facing on to Ferry Street : Ferry Street Playground and Tak Cheong Street Playground.

SECTION 5 : Ferry Street : Waterloo Road to Tung Kun Street

In this section there is a noticeable change from mixed commercial/light industrial/residential to government/institutional and community uses. This section consist of the Yaumatei Fruit Market and three schools. There is little vegetation or public open space.

Nevertheless, the market is comprised of one storey tin sheds or buildings and the school buildings are around 6 storeys high. Thus, this area is less dense than the other built up areas. Inside the school grounds some planting and open space can be found. The overall character is dominated by the market which is very busy and seemingly unorganised.

SECTION 6 : Ferry Street : Tung Kun Street to Public Square Street

This section is residential, mixed with light industrial on the street level. Half of this area comprises 20-30 years old, 6-7 storey high buildings and the other half is the newly constructed 30 storeys Hong Kong Housing Society housing estate, Horse Spirit Gardens, which has a clean and modern appearance. There is no major open space except the new podium garden which is still under construction.

SECTION 7 : Ferry Street : Public Square Street to Kansu Street /Pak Hoi Street

This section mainly consists of a mixture of government/institutional and community uses : various playgrounds, a police station, temporary markets/bazaars, a market building, a community centre, a polyclinic and a government office. There is also a timber yard and mixed commercial/residential buildings. This area is a node of activities, thus acting as a core, because of the busy markets and the bazaars.

SECTION 8 : PCWA and along the road corridor (Cherry Street, Ferry Street and Kansu Street)

At present, elevated structures are found at the junction of Ferry Street and Kansu Street and also at the beginning of Tai Kok Tsui Road. Scattered along the median strip are small planters containing palm trees. However, they do not create a significant contribution to the overall urban character.

Between the PCWA and Ferry Road, there is an area with some screen planting of trees and tall shrubs. The character of the road and that of the PCWA is busy and industrial.

General Vegetation Survey

As illustrated in Figure G2, the following table summarises where vegetation in the study area can be found and gives a general account of the vegetation type. It also lists examples of species. Almost all vegetation in this study is amenity planting.

SECTION	LOCATION	VEGETATION
1	Tit Shu Street Pedestrian Zone	Small trees in planters with pergolas e.g. <i>Cassia surattensis</i> <i>Livistona chinensis</i> <i>Acalypha wilkesiana</i> <i>Caryota ochlandra</i>
1	Slip road area to existing West Kowloon Corridor	Amenity planting of mature trees and tall shrubs in grass e.g. <i>Bauhinia blakeana</i> <i>Melaleuca leucadendron</i> <i>Aleurites moluccana</i> <i>Cassia surattensis</i>
2	Ming Kei College and Sharon Lutheran School on Cherry Street	Mainly trees in the school grounds, at the perimeter e.g. <i>Cassia surattensis</i> <i>Jacaranda mimosaeifolia</i>
2	Anchor Street Playground and Palm Street	Street trees around the playground, a few palms on Palm Street and dense ornamental trees and shrubs in the garden corner of the playground e.g. <i>Archontophoenix alexandrae</i> <i>Cassia surattensis</i> <i>Rhododendron</i> spp.
2	Cherry Street Playground	Mature trees and small trees in plant beds and some planter boxes of shrubs, all along the perimeter e.g. <i>Cassia surattensis</i> <i>Peltophorum pterocarpum</i>

3	Tong Mei Road Sitting Out Area (corner of Tong Mi Road and Argyle Street)	Ornamental planting of trees, palms, shrubs and climbers in planting areas e.g. <i>Cassia surattensis</i> <i>Livistona chinensis</i> <i>Acalypha wilkesiana</i> <i>Jasminum mesnyi</i> <i>Caryota ochlandra</i>
3	Safety island at the junction of Tong Mi Road and Cherry Street	Small shrubs in planters, rather insignificant e.g. <i>Hymenocallis americana</i> <i>Livistona chinensis</i>
3	Thistle Street Rest Garden (with play equipment)	Trees and shrubs in planters and plant beds e.g. <i>Ailanthus fordii</i> <i>Hibiscus tiliaceus</i> <i>Bauhinia glauca</i> <i>Bougainvillea spectabilis</i>
3	Road side planting (corner of Shantung Street and Ferry Street)	Apparently a very small private garden of trees and shrubs e.g. <i>Cassia surattensis</i>
4	Tak Cheong Street Playground (with toddler's play equipment and sitting out facilities)	Some trees with shrubs at the perimeter e.g. <i>Crateva religiosa</i> <i>Aleurites moluccana</i> <i>Hymenocallis americana</i> <i>Acalypha wilkesiana</i>
4	Tung On Street Rest Garden	Street trees and shrubs in planters at the perimeter e.g. <i>Cordyline terminalis</i> <i>Bauhinia blakeana</i>

4	Ferry Street Playground	Ornamental trees, palms and shrubs in planting areas and planters e.g. <i>Magnolia grandiflora</i> <i>Phoenix hanceana</i> <i>Cassia surattensis</i> <i>Duranta repens</i> <i>Ficus virens</i> <i>Ervatamia divaricata</i>
5	Pavement near Tak Cheong Street	Shrubs in plant boxes e.g. <i>Cordyline terminalis</i> 'Rubra'
5	Tung Koon District Society Fong Shu Chuen School and Wanchai Church Kei To School	Some trees and climbers along the perimeter of the school grounds e.g. <i>Bougainvillea spectabilis</i> <i>Bauhinia blakeana</i>
6	Ching Ping Street pavement	Small trees/shrubs in plant boxes e.g. <i>Cordyline terminalis</i> 'Rubra'
7	Public Square Street Playground	Matures trees in plant beds and various plant boxes e.g. <i>Aleurites moluccana</i> <i>Ficus elastica</i> <i>Ficus microcarpa</i>
7	Shanghai Street/Market Street Playground	Trees and tall shrubs in perimeter planting area e.g. <i>Bambusa</i> spp. <i>Ficus microcarpa</i>
8	Along Ferry Street Median Strip	Small palm trees and small shrubs in planters, on a wide median strip e.g. <i>Phoenix roebelenii</i> <i>Hymenocallis americana</i>

8

Between PCWA and western
pavement of Ferry Street, from
Shantung Street to Soy Street

Trees and shrubs mix in plant beds

e.g. *Ficus elastica*
Phoenix roebelenii
Caryota ochlandra
Aleurites moluccana
Macaranga tanarius

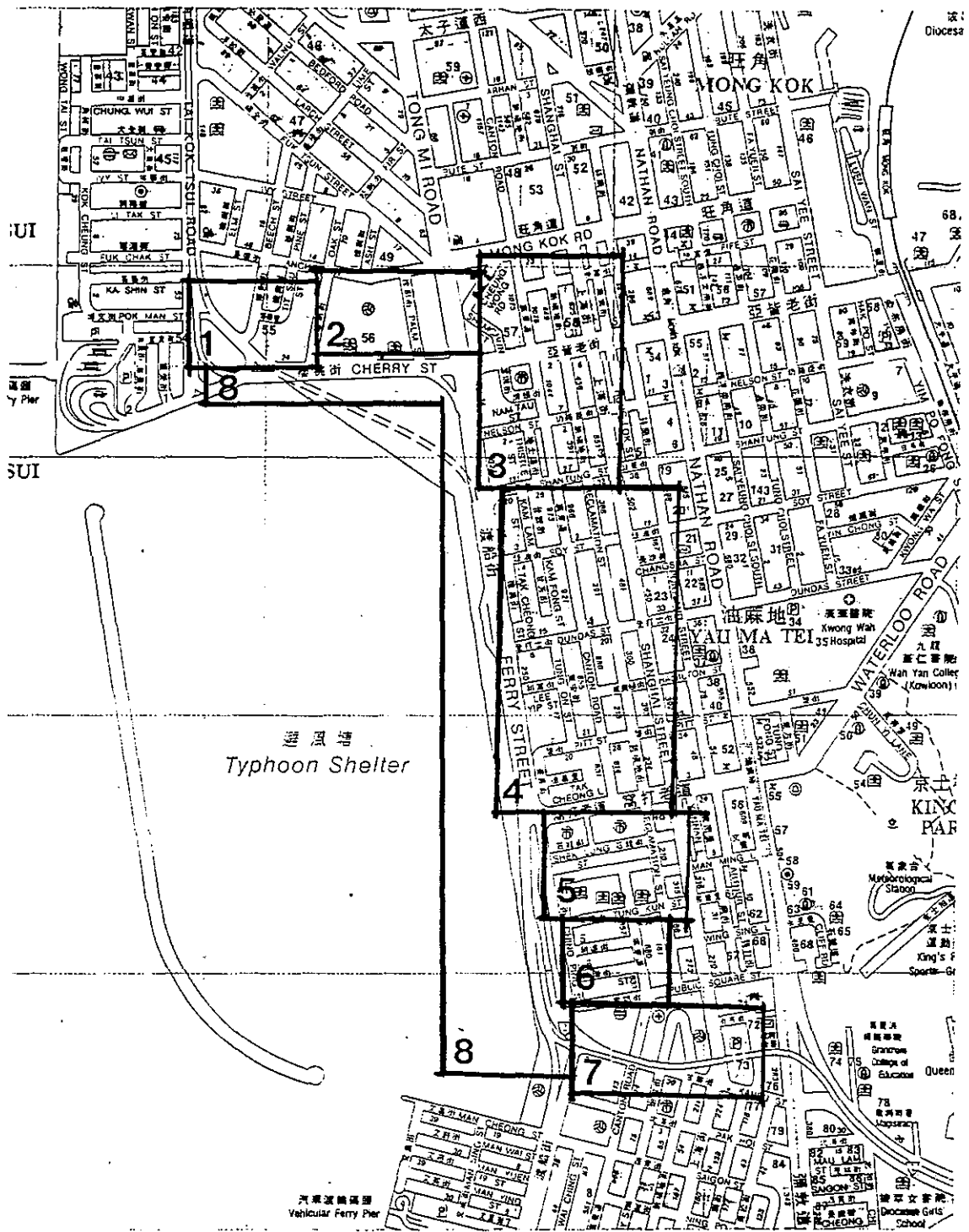
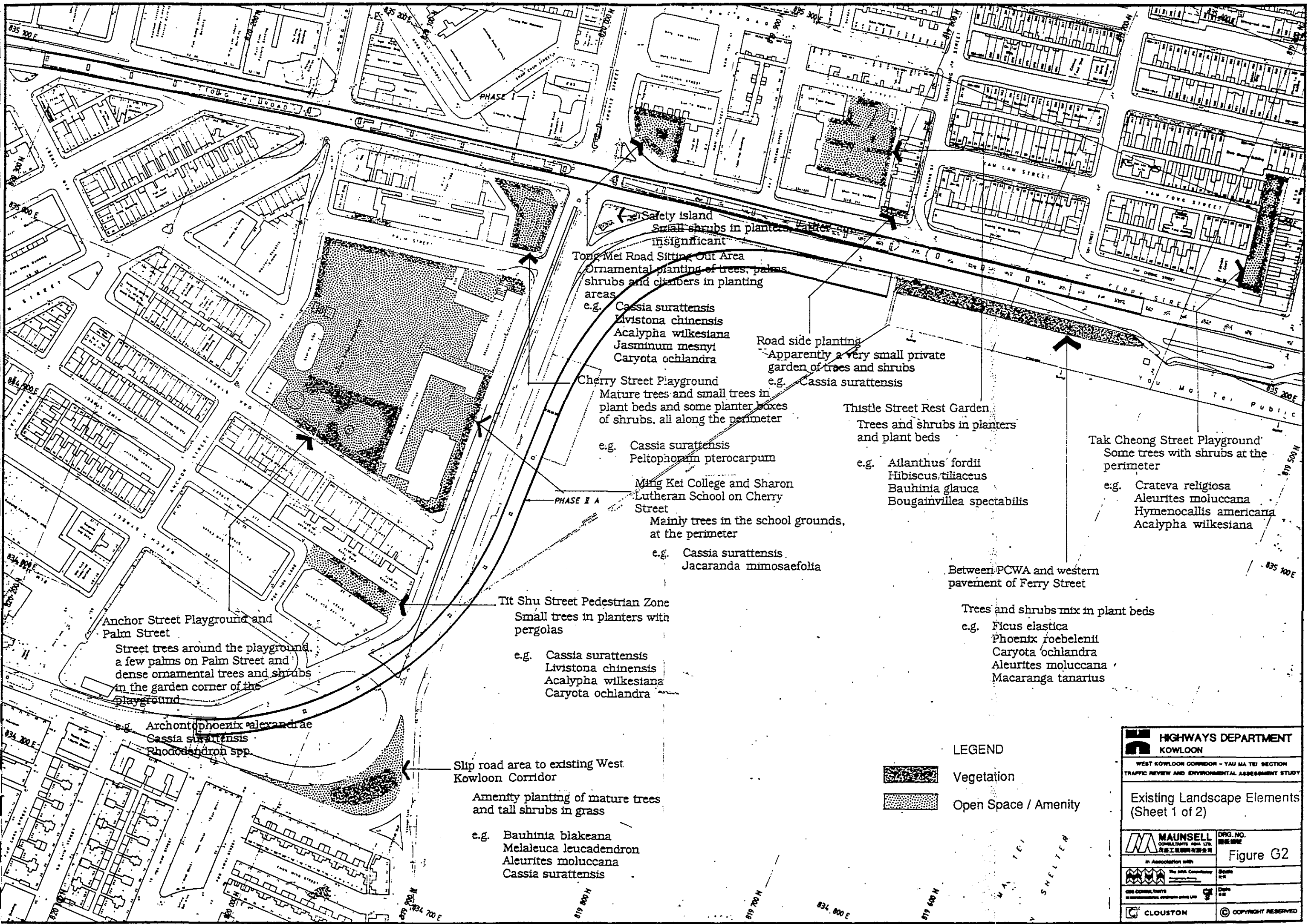


Figure G1 Urban Landscape Character Sections



Safety Island
Small shrubs in planters, but are insignificant

Tong Mei Road Sitting Out Area
Ornamental planting of trees, palms, shrubs and climbers in planting areas
e.g. *Cassia surattensis*
Livistona chinensis
Acalypha wilkesiana
Jasminum mesnyi
Caryota ochlandra

Cherry Street Playground
Mature trees and small trees in plant beds and some planter boxes of shrubs, all along the perimeter
e.g. *Cassia surattensis*
Peltoporum pterocarpum

Ming Kei College and Sharon Lutheran School on Cherry Street
Mainly trees in the school grounds, at the perimeter
e.g. *Cassia surattensis*
Jacaranda mimosaeifolia

Tit Shu Street Pedestrian Zone
Small trees in planters with pergolas
e.g. *Cassia surattensis*
Livistona chinensis
Acalypha wilkesiana
Caryota ochlandra

Slip road area to existing West Kowloon Corridor
Amenity planting of mature trees and tall shrubs in grass
e.g. *Bauhinia blakeana*
Melaleuca leucadendron
Aleurites moluccana
Cassia surattensis

Road side planting
Apparently a very small private garden of trees and shrubs
e.g. *Cassia surattensis*



Thistle Street Rest Garden
Trees and shrubs in planters and plant beds
e.g. *Alanthus fordii*
Hibiscus tiliaceus
Bauhinia glauca
Bougainvillea spectabilis

Tak Cheong Street Playground
Some trees with shrubs at the perimeter
e.g. *Crateva religiosa*
Aleurites moluccana
Hymenocallis americana
Acalypha wilkesiana

Between PCWA and western pavement of Ferry Street
Trees and shrubs mix in plant beds
e.g. *Ficus elastica*
Phoenix roebelenii
Caryota ochlandra
Aleurites moluccana
Macaranga tanarius

Anchor Street Playground and Palm Street
Street trees around the playground, a few palms on Palm Street and dense ornamental trees and shrubs in the garden corner of the playground
e.g. *Archontophoenix alexandrae*
Cassia surattensis
Rhododendron spp.

LEGEND

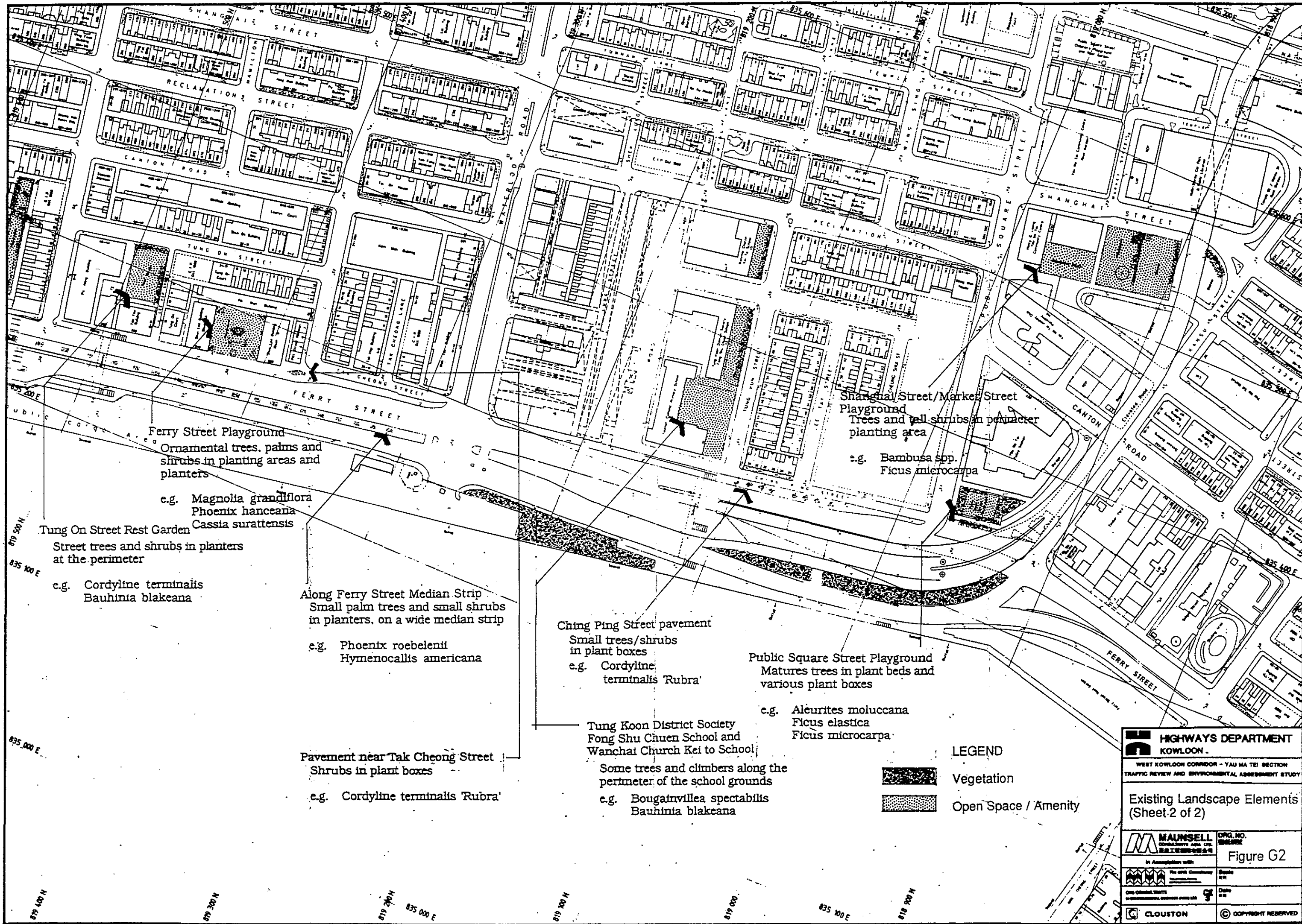
-  Vegetation
-  Open Space / Amenity

HIGHWAYS DEPARTMENT KOWLOON
WEST KOWLOON CORRIDOR - YAU MA TEI SECTION
TRAFFIC REVIEW AND ENVIRONMENTAL ASSESSMENT STUDY

Existing Landscape Elements (Sheet 1 of 2)

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Scale: 1:1000
Drawing No: G2

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Ferry Street Playground
Ornamental trees, palms and shrubs in planting areas and planters

e.g. *Magnolia grandiflora*
Phoenix hanceana
Cassia surattensis

Tung On Street Rest Garden
Street trees and shrubs in planters at the perimeter

e.g. *Cordylina terminalis*
Bauhinia blakeana

Along Ferry Street Median Strip
Small palm trees and small shrubs in planters, on a wide median strip

e.g. *Phoenix roebelenii*
Hymenocallis americana

Pavement near Tak Cheong Street
Shrubs in plant boxes

e.g. *Cordylina terminalis* 'Rubra'

Ching Ping Street pavement

Small trees/shrubs in plant boxes

e.g. *Cordylina terminalis* 'Rubra'

Tung Koon District Society
Fong Shu Chuen School and
Wanchai Church Kei to School

Some trees and climbers along the perimeter of the school grounds

e.g. *Bougainvillea spectabilis*
Bauhinia blakeana

Shanghai Street/Market Street
Playground
Trees and tall shrubs in perimeter planting area

e.g. *Bambusa* spp.
Ficus microcarpa

Public Square Street Playground
Matures trees in plant beds and various plant boxes

e.g. *Aleurites moluccana*
Ficus elastica
Ficus microcarpa

LEGEND



Vegetation



Open Space / Amenity

HIGHWAYS DEPARTMENT
KOWLOON

WEST KOWLOON CORRIDOR - YAU MA TEI SECTION
TRAFFIC REVIEW AND ENVIRONMENTAL ASSESSMENT STUDY

Existing Landscape Elements
(Sheet 2 of 2)

MAUNSELL
CONSULTANTS AND LTD.
MAUNSELL CONSULTANTS AND LTD.
Figure G2

In Association with
Scale 1:1
Date 11/11

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Responses to Comments on Volume 3

The following government departments and non-government bodies have offered the comments on the Volume 3 of the Draft Final Report :

1. Highways Department
 - 1.1 Highways (Kowloon) Region
 - 1.2 Highways/Structures Division
 - 1.3 Highways/Landscaping Unit
2. Planning Department
3. Environmental Protection Department
4. Mott MacDonald (HK) Ltd
5. New Airport Projects Coordination Office, Works Branch
6. Director of Housing
7. Urban Services Department
8. Yau Tsim/Mong Kok District Office
9. Fire Services Department

The responses of the Consultants to these comments are given in this Appendix.

Report Ref.

Summary of Comments

Consultants' Responses

Report Ref.	Summary of Comments	Consultants' Responses
	1. <u>Highways Department</u>	
	1.1 <u>Highways (Kowloon) Region</u>	
	(Ref. (24) in KH 168TH/2TE VII dated 25.2.92)	
Para. 3.2.3.1 5th line	(1) "Table 3.4.1" should read "Table 3.2.1".	Noted.
Para. 3.3.2.5 and 3.3.2.6	(2) "Tai Tsui Road" should read "Tai Kok Tsui Road".	Noted.
Para. 3.5.1.3	(3) To assess the traffic noise levels in the event that the proposed elevated road in Cherry Street is not constructed should not be considered as additional analysis. It is, in fact, a base line for the traffic noise assessment.	Noted.
	The details and exact locations of facades on Fu Tor Loy Sun Chuen should have been agreed with EPD prior to the commencement of your analysis.	
Para. 3.5.5.3	(4) See above comments (1) on para. 3.5.1.3.	Noted.
Para. 3.5.5.4	(5) "Figure 1" should read "Figure 3.5.1".	Noted.
Para. 3.5.9.5 .5th line	(6) "142 residential units" should be "143 residential units".	Noted.

Report Ref.	Summary of Comments	Consultants' Responses
	<p>1.2 <u>Highways/Structures Division</u></p> <p>(Ref. () in STR 5/20/5(7) dated 24.2.92)</p>	
Para. 3.2.3.1	(1) The 2nd last sentence should read 'The levels are given in Table 3.2.1.'	Noted.
Para. 3.3.2.3	(2) The results of the noise measurements are not presented in Appendix E. It should be appendix A. I have commented this point when you circulated Working Paper no. 4 in November 1991.	Noted.
Para. 3.3.2.5	(3) It should read '..... noise level at the Tai Kok Tsui Road monitoring position'	Noted.
Para. 3.3.2.6	(4) The 1st sentence should read '... were higher than those recorded at the Tai Kok Tsui Road ...'	Noted.
Para. 3.3.4.3	(5) The start date of construction work for Phase IIA was wrongly assumed. It should be April 1994. This was in my comments when you circulated Working Paper no. 4 in November 1991. The error was repeated here. Please ensure that it is corrected in the Final Report.	Noted.
Para. 3.4.2.1, 3.4.3.3 and 3.4.3.5	(6) The unit for gas concentration should be μgm^{-3} .	Noted.
Section 3.5	(7) This Division in principle does not favour the erection of noise barrier along the flyover for aesthetics and maintenance consideration. This was expressed when you circulated Working Paper nos. 2 and 4 in November 1991.	Noted.

Report Ref.

Summary of Comments

Consultants' Responses

The noise enclosure option would require very massive pier supports, which cannot be accommodated in the present ground level interchange layout.

Noted.

The 5 metres inclined barrier as shown in Figure 3.5.3 is the maximum limit that the Phase IIA flyover can carry without significant structural implication. However, it costs \$10 million. If Preliminaires and Contingencies are included, the cost will increase to \$14.5 million. It is noted that hush 185 household units representing about 700 residents will be benefited from such installation. The money that the Government would have to spend on each person would be over \$20,000. Is it cost effective? Furthermore, the 5 metres inclined barrier would be a visual nuisance to the residents living in the lower storeys. Though it alleviates some of the noise impact, it produces another environmental impact.

Noted. The Project Steering Committee had decided to adopt 3 metre high noise barrier after due considerations have been given to the road traffic noise impact, visual impact and the cost implications of various direct mitigatory measures.

Para. 4.2.5.1 (8) Table 4.2.3 is missing.

Table 4.4.3 should read Table 4.2.3.

Para. 4.2.5.2 (9) The unit for hourly average TSP concentration should be μgm^{-3} .

Noted.

Para. 4.3.3.1 (10) The 1st sentence should read '.... the construction of the Phase IIB flyover and the at grade section joining the Phase IIA flyover ...'.

Noted.

Para. 4.3.4.4 (11) It is noted that the equipment requirements listed in Appendix F are different from what previously advised by this Division. Please explain.

The equipment requirements listed in Appendix account for other construction works undertaken simultaneously with the flyover construction. The requirements are those typical of the likely equipment to be used at any one time for the purpose of calculating the construction noise.

Report Ref.

Summary of Comments

Consultants' Responses

Para. 4.5.4.1	(12) This Division in principle does not favour the erection of noise barrier or enclosure on flyovers for aesthetics and maintenance consideration.	Noted.
Para. 4.5.4.2	(13) A 1.2 metres high concrete profile barrier has been provided for the Phase I flyover. Please check if this warrants any adjustment to the noise levels reported for Option 2.	The effect is less than 1 dB(A) at lower floor level. It does not change the conclusion of the assessment.
Para. 4.5.5.4	(14) A further 2 to 3 dB(A) reduction in noise level is achievable by incorporating porous friction course in the surfacing.	This would only apply to the noise contribution from the elevated road. If the noise contribution from the ground level road is taken into account, the end reduction would be less than 2 dB(A).
Para. 4.5.6.4	(15) The provision of a noise enclosure over this section of at grade road corridor is impractical.	Noted.
Para. 4.5.7.3	(16) The provision of noise enclosures on the flyovers between Dundas Street and Waterloo Road appears to be effective in reducing the noise impact to the existing buildings there. However, it has the following drawbacks. (a) The noise enclosure if provided will be very close to the existing buildings. The shortest distance is as close as 14 metres. The noise enclosure required will be over 6 metres high. If the depth of the flyover is included, the overall height of the structures involved will be about 9 metres.	Noted.

Report Ref.

Summary of Comments

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With such a proportion, it will be difficult to achieve an aesthetically acceptable structure. In addition, very massive pier supports are required. The noise enclosure will be a visual nuisance to the nearby residents.

- (b) The noise enclosure if provided will be about 200 metres long. Forced ventilation and 24 hours lighting will have to be provided. These will increase its capital and running cost. Noted.
- (c) The noise enclosure will increase the burden of maintenance to the flyover. Noted.
- (d) You advised in the Environmental Working Group meeting on 21 February 1992 that the cost of the noise enclosure for this section of the corridor was about \$150 million. It is noted that there is only 503 household units representing about 1800 people along this section of Ferry Street. If noise enclosure were to be provided, the money that Government would have to spend on each person would be over \$80,000. I do not feel this is cost justifiable. Noted.

It is noted that laying of porous friction course plus the 3 metres barrier option will achieve the same benefit as that will be contributed by the 5 metres barrier option. Agreed.

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Para. 4.5.8.5	(16) For both options 3 and 4, erection of noise barriers would create sightline problem around the bend fronting the Six Streets Redevelopments. Both the WKC northbound and the southbound carriageways would have to be widened by about 3 metres in order to satisfy the sightline requirement. The nosing positions in the region of ramp B and ramp D would be affected. The current traffic layout as it is would not work.	Noted.
	For the noise enclosure option, in addition to the abovementioned sightline problem, very massive pier supports are required.	Noted.
Para. 4.5.9.3	(17) For facade 17, option 2 plus laying porous friction course will achieve a noise level close to the HKPSG standard.	Noted.
	For facade 15, option 3 plus laying porous friction course will reduce the noise impact down to below 73 dB(A). With proper layout and orientation design of the proposed residential developments on the reclamation, HKPSG standard is achievable.	Noted.
	For facade 16, as it is impractical to erect barrier or enclosure on the section of the road corridor between Soy Street and Dundas Street, the noise enclosure option is not as effective as for facade 15. Option 3 plus laying porous friction course will achieve similar benefit as the noise enclosure option will offer.	Noted.
	For facade 18, provision of ground level noise enclosure is impractical.	Noted.

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Para. 4.5.10

- (18) Do the estimated costs include
- (a) Preliminaries and Contingencies and
 - (b) carriageway widening associated with the erection of the noise mitigation measures?

The cost estimates do not include any allowances for preliminaries and contingencies. The costs for the necessary carriageway widening associated with the erection of the noise mitigatory measures have been included in the cost estimation.

Appx. A

- (19) Figure 2 mentioned in para. 3.1 is missing. The results of the noise survey tabulated in Table 2 do not agree with that shown in the attached figures. These were pointed out when you circulated Working Paper no. 4 in November 1991. The errors are repeated here. Please ensure that they are corrected in the Final Report.

Noted.

1.3 Highways/Landscaping Unit

(Ref. () in HyDT 12/6/8 dated 22.2.92)

- (1) The report clearly indicates how limited opportunities for soft landscaping in association with these works are. That in itself should be no surprise to any one who is aware of existing landscape conditions in the region. Keeping in mind the environmental importance of the ameliorating effect of green identified should be given a high priority and above all safe guarded against any interference from other works such as the routing of utility services.

Noted.

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- (2) Although the report identifies how some of the space may be developed for a specific use and lists other "permissible uses" as approved by LDPC it fails to state unconditionally that all spaces likely to be sterilized by overhead structures must be developed in a manner which ensures such spaces continue to play a positive role in the Urban Scene. The "Black hole" or "grey area" practice of the part should not longer be acceptable both from a practical management control and environmental (aesthetic) viewpoint as its overall effect is degrading.
- Noted. The text will be expanded in the Final Report.
- (3) The fact that a relatively narrow ramp structure has to be increased in width by something like 45% should be more clearly indicated and the increased structural cost of the deck added to the cost of the barrier structure to identify its negative implication. Also, the wider deck tends to make the structure significant by more dominant and aggravates the sterilizing influence on spaces at grade. These implications should also be clearly spelt out.
- Noted. The text will be expanded in the Final Report.
- (4) As noted during the meeting, the only purpose of such enormously expensive structures is ameliorate against higher than ideal noise levels. In order to justify their provision as part of a road construction project we need to see a detailed balance sheet identifying the losses against this singular gain under the following headings :
- Noted.
- a. Capital cost increase
 - b. Aesthetic (visual impact)
 - c. Environmental loss (annual energy take, maintenance costs, health of maintenance personnel)

Report Ref.	Summary of Comments	Consultants' Responses
	2. <u>Planning Department</u>	
	2.1 (Ref. (12) in K-R/TT/101 VII dated 27.2.92)	
	(1) The land use assumptions on the WKR ODP made in this report may subject to change pending ADSCOM decision on the alternative land use proposal on the southern section of the WKR.	Noted.
Para. 4.5.12.3 1st sentence	(2) As ruled by ADSCOM, this is only applied to Airport Core Project such as the WKE, WHC. As WKC is not regarded as an Airport Core Project, considerations on mitigation measures should be given in the adjacent planned uses on the WKC Reclamation Area whereas possible.	Noted.
Para. 3.5.7.1	(3) The heading should be amended to read "Options 1 and 2".	Noted.
Para. 3.6.6	(4) Proper access to the proposed open space beneath flyover should be mentioned in this section.	Noted.
	2.2 (Ref. () in SR D/K/801 dated 27.2.92)	
	(1) I have reservation on the recommendation of providing air-conditioning units as the most preferred method of addressing the noise impact of the WKC Phase IIB.	This measure is regarded as the most cost effective means in bringing down the road traffic noise to HKPSG. As directed by the Environmental Assessment Working Group and the Project Steering Committee, only the direct mitigatory measures were investigated in this study.

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Consultants' Responses

One of the objectives of the environmental assessment as specified in para. 1.2.2 is to identify the environmental impacts on the existing and proposed land uses. As far as the hinterland is concerned the constraints to the imposed by the WKC Phase IIB on redevelopment of properties adjoining it have not been adequately addressed in the assessment. A number of these properties fall into the urban renewal action areas proposed in the West Kowloon Development Statement as shown in the Figure 5.18 of the Volume 1 REport (PIA 41, 43, 47 and 48). Without any at source noise mitigation, these properties would not be suitable for redevelopment for any noise sensitive uses, unless very wide setbacks or appropriate buffer uses are incorporated. These will severely affect the viability of the redevelopment. Seen in this light, the provision of A/C units to existing affected properties is only cost-effective in the short term if they have high potential for redevelopment. Taking long term land use benefits into consideration, I would regard a combination of noise barriers and appropriate at receiver mitigation on the potential redevelopment sites a better solution to address the noise impact.

The assessment on the constraints to the redevelopment in the hinterland is outside the scope of this study.

'Para. 3.5.7.1

(2) The heading 'Do Nothing Scheme' should be amended to read 'No Mitigation Provisions'.

Noted.

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Consultants' Responses

Para. 4.5.7.3	(3) It seems that for most affected facades for Phase IIB, all 5 options investigated fail to bring the noise level to close to standard. What additional at receiver measures would be required to completely address the impact of the WKC? I would appreciate in particular some advice on the set back requirement for the adjoining building sites so as to guide future redevelopment along the corridor.	Indirect mitigatory measures have been proposed to bring the road traffic noise down to the standard. However, the Consultants were instructed to confine the assessment on the provision direct measures on the corridor. The assessment on the impact to the possible redevelopment in the hinterland is outside the scope of the study.
Para. 4.5.3.3	(4) It is uncertain who will pay for the future 3m high barriers to protect future development on the reclamation, if the government policy of not providing noise protection to future development still stands. The recommendation for making provision for such barriers on the WKC appears unrealistic.	Noted.
Para. 3.6 and 4.6	(5) The visual and land use impact assessment for both Phases should cover the following aspects : (a) the effect on existing and future view corridor at crucial road/street block junction and the effect of the corridor and ancillary structures on the streetscape; (b) similar to my above comment at (1), land use impacts in terms of constraints on redevelopment; (c) as the corridor will displace a number of local open spaces in the hinterland areas in Mong Kok and Yau Ma Tei, the effects of such displacement should be quantified and set within the context of insufficient provision in these two highly congested districts; and	Noted. The text will be expanded in the final report. See the responses to comment (1). In terms of area, some LOS will be reduced and all of them (including those in the hinterland) will be affected by the alignment. This point will be expanded in the Final Report.

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(d) the environmental impacts of the WKC on G/IC and open space uses on the WKR need to be ascertained. If the HKPSG recommended environmental setback of 20m for open space are to be met, the land area to be devoid of active recreational uses will be significant even if the adopted WKR ODP have incorporated the WKC proposed alignment.

Noted. This should be taken into account in the WKR urban design study.

3. Environmental Protection Department

(Ref. (26) in HK 8/2/214 dated 25.2.92)

(1) Comments should be updated as necessary further to the last EAWG meeting into the final report.

Noted.

(2) Porous flexible Macadam surface treatment should be considered throughout the work where there is an uninterrupted traffic flow.

Noted.

Section 3.3

(3) As schools are considered as super noise sensitive receivers and the predicted construction noise impact based on the worst situation indicated that it would exceed the existing high background for two weeks. The inclusion of special conditions/clauses for noise mitigation in the contract document is strongly supported.

Noted. It was assumed for the purposes of the assessment that the school would be vacated. As this now appears not to be the case, mitigation measures in the form of special conditions/clauses will be recommended for inclusion in the contract documents. The Final Report will be amended accordingly to reflect this.

Para. 3.3.1.3

(4) The imposition of a control level of 5 dBA above background is strongly supported. While the background should refer as the L90 and the contractual noise limit quoted should be reviewed accordingly.

Noted.

Report Ref.	Summary of Comments	Consultants' Responses
Para. 3.5.2	(5) The road surface type and height of road side profile barriers presumed in the noise assessment, if any, should be clearly indicated.	Noted.
Section 4.3	(6) It appears that the construction noise impact would far exceed the proposed contractual limit of 5 dBA above the background in working area C where several schools are located. The Consultant had agreed in the last EAWG meeting that further mitigation measures e.g. time restriction would be proposed.	Please refer to Section 4.3.2.2 which indicated background noise levels to be between 77 and 82 dB(A). Noted. This will be incorporated in the Final Report.
Section 4.5	(7) As canopy/partial enclosure between Dundas Street and Waterloo Road will be the most effective option in noise terms - a reduction of up to 10 dBA over option 2 for the majority of NSRs in this area, therefore it is preferred. 3m high barrier along the north bound lane in Phase 2B fronting WKR between the approach to the bend opposite Shantung Street and the down ramp opposite to Dundas Street should be considered.	Noted.
Para. 4.5.8.1	(8) The future development/land use of the fruit market indicated was different to that quoted in para. 4.7.1.	Para. 4.7.1 will be amended.
Para. 4.5.11.2	(9) It should be noted that there is provision of mitigatory measure in the form of porous flexible Macadam surface treatment in the design of Phase 1 flyover.	These measures have already been taken into account in the road traffic noise assessment.

(10) I agree with the Consultants' assessment that the construction and operation of the WKC Phase II would not cause unacceptable air quality impacts. The use of ready mixed concrete is supported and it's recommended that the proposed dust control measures be incorporated into the appropriate contract documents.

Noted.

(11) It's noted that the Consultants have proposed total enclosure and noise barriers as noise mitigation measures. As appeared in figure 4.5.5, there are extensive noise barriers (about 350m) along Ferry Street. Could the Consultants please assess their air quality implications? On the other hand, portal air quality impacts and tunnel air quality issue should be addressed if total enclosure is recommended.

The impact that the inclusion of noise barriers will have on the air quality in the vicinity of the West Kowloon Corridor is negligible. The original assessment predicted that the location of the worst case air pollution levels would be the first floor of adjacent buildings; the inclusion of 3m high noise barriers may result in slightly elevated levels at the second floor. It is not envisaged that air pollution levels at this height will exceed those previously predicted for the first floor. Air pollution concentrations at all floors will not approach the AQO's. The addition of a noise enclosure with louvred roof along a section of a road will effectively increase the source height of emissions. In the initial assessment included in Section 4.4 of the Draft Final Report (Volume 3), this height was taken as 0.5m above the road level and impacts were predicted to be worst at the first floor level of adjacent buildings. The inclusion of a noise enclosure will raise the effective height of emissions to ambient air to 5.5 m above the road level. Worst case pollutant levels at the first floor of buildings can be expected. It is not envisaged that air pollutant levels at the second floor will increase beyond those predicted in Table 4.4.3 which, as stated, are well within the AQO's.

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Consultants' Responses

4. Mott MacDonald (HK) Ltd

(Ref.

Para. 3.6.7

(1) The land use strategy is supported.

Noted.

Para. 4.5.11.9

(2) The WKR Outline Development Plan (ODP) was endorsed on 24th February 1992. It is not the role of the ODP to depict buildings, however we have suggested single aspect developments in sensitive areas.

Noted.

Para. 4.7.1

(3) The WKC does not intrude into the proposed amenity area between Waterloo Road and Public Square Street.

Noted.

5. New Airport Projects Coordination Office, Works Branch

(Ref. PADS/PCOm 9/17/6 dated 20.2.92)

No comments.

6. Director of Housing

(Ref. HD 11/470/65 VI dated 25.2.92)

Para. 4.5.9 (1) The consultants had identified in para. 4.5.9 of Volume 3 that the housing development sites on WKR facing the WKC (both facing the flyovers and the at grade portion of the corridor) would experience noise levels between 70 to 78 dB(A) at the height above 5th floor. To attenuate this high noise levels, I would like to point out that it cannot be done successfully by locating podium development for noise non-sensitive use at this

The WKR Consultants advised that the formulation of the land use on the West Kowloon Reclamation had taken full account of the environmental impact cause of the West Kowloon Corridor. As far as this study is concerned, we have identified that the proposed residential development on the reclamation will experience the calculated noise levels. The WKR Consultants should be requested to offer comments on this aspect.

front of the sites or rotating the domestic buildings in such a way that no noise sensitive receivers would expose to the noise. I must stress that the environmental impacts generated along the WKC should be resolved at source, and it should not impose development constraints to the aforesaid sites.

- (2) The consultants are required to clarify the last sentence of para. 4.5.9.3.2 that the kind of mitigatory measures on the flyover have been included, so that 2 to 5 dB(A) could be reduced.

The provision of a 3 metre high noise barrier along the west edge of the corridor and the use of porous friction course as the road surfacing will reduce the noise level by 2 to 5 dB(A).

7. Urban Services Department

(Ref. (47) in USDP 2/402/73 VI dated 25.2.92)

Para. 3.6.7.2

- (1) As the proposed footbridge landings (3 No.) will be located within the sites of the existing Tong Mei Road Sitting Out Area, the Cherry Street Playground and the Tong Mei Road Temporary Market, they will seriously affect the UC facilities provided therein. Consideration should be taken to divert these landings outside the site boundaries of the facilities concerned. If it is proved to be technically unachievable we would request for the temporary reprovisioning of the existing recreational and market facilities affected and subsequent re-instatement of the playground, SOA and market to the satisfaction of this Department and at no cost to the Council upon completion of the proposed footbridges. Furthermore, the designs of footbridge lands, i.e., ramps and staircases, should be improved to minimize the landtake and bulk.

It is necessary to locate the footbridge landings on the existing Urban Council facilities in order to provide connection between the footbridge and the ground level footpath. Details of the temporary reprovisioning of the affected facilities shall be determined in the detailed design by liaison with various departments.

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Consultants' Responses

Para. 4.5.12.4	(2) Noise barriers associated with any highway project should be built within land allocated to Highways Department. They should not be included within the open space site to be allocated to this Department. Construction of barriers should be funded by Highways Department and we may put some ornamental treatment on our side later on when the open space is developed.	Noted. It is understood that it is not Highways Department policy to incorporate noise mitigatory measures on highways to cater for the possible future developments, in particular the West Kowloon Reclamation on which the land use is still under review.
8.	<u>Yau Tsim/Mong Kok District Office</u> (letter dated 2.3.92)	
Para. 3.3	(1) It should be stipulated in the contract conditions that the contractors should adopt noise level monitoring and carefully schedule their works to avoid operating the machinery all at the same time. The environmental impacts of this project should preferably be included under the purview of the proposed Environmental Monitoring Office for the West Kowloon Reclamation.	Noted.
Para. 3.5.6	(2) A 3 metre high noise barrier on the northern side of the flyover between points A to C of Figure 3.5.1 should be provided. In addition, porous friction course should be provided throughout the length of the raised corridor.	Noted.
Para. 4.3.7.1	(3) The proposal that mitigation measures should be included within the construction contract is supported.	Noted.

Report Ref.	Summary of Comments	Consultants' Responses
Para. 4.6.6.2	(4) As far as possible, planting should be included as part of the landscape feature. The planting of creepers is one option to soften the outlook of the concrete pillars. Offices of voluntary agencies or associations, especially those affected by this project should be reprovisioned.	Noted. These should be dealt with in the detailed design.
Para. 5.2	(5) The use of 3 metre high noise barrier and porous friction course seems to be a more acceptable noise mitigation option having in view the need to balance out the adverse visual impact of 5 metre high noise barrier and enclosures.	Noted.
	9. <u>Fire Services Department</u>	
	(Ref. (38) in FSD 7596/73 XI dated 24.2.92)	
	(1) <u>Widening requirement for the elevated Gascoigne Road</u>	
	A minimum horizontal clearance of 4.5m between elevated road structures and adjacent properties has to be maintained for ladder operation of fire appliances.	Noted.
	(2) <u>Provision of noise enclosure to mitigate road traffic noise</u>	
	If complete enclosure is employed for mitigation of road traffic noise over a length of 450m, fire protection requirement may be imposed upon the enclosed section of flyover/roadway.	Noted.

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(3) Roadside planting in para. 3.6.7.2

Set back of buildings of more than 10m from the road edge is not recommended if the road is the designed as Emergency Vehicular Access for the buildings.

Noted.